Alaska Resource Data File, New and Revised Records Version 1.7

By U.S. Geological Survey

Open-File Report 2008-1225

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U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Site name(s): Lucky Shot; Willow Creek Mines Inc.

Site type: Mine

ARDF no.: AN002

Latitude: 61.779 **Quadrangle:** AN D-7

Longitude: 149.4078

Location description and accuracy:

The portal of the Lucky Shot Mine is on the northwest valley wall of Craigie Creek, 1.8 miles northeast of the junction of Craigie Creek and Willow Creek. The mine is marked by a symbol labeled 'Lucky Shot Mine' on the Anchorage D-7 1:63,360-scale topographic map. It is near the center of section 35, T. 20 N., R. 1 W. of the Seward Meridian. The underground workings and exploration activities extend far beyond the the portal. The adjacent War Baby Mine (AN003) and the Lucky Shot Mine were long ago consolidated into a single property which now is commonly referred to as the Lucky Shot.

Commodities:

Main: Au

Other: As, Cu, Pb, Sb, Te, Zn

Ore minerals: Arsenopyrite, chalcopyrite, galena, gold, pyrite, sphalerite, stibnite, tellurides, tetrahedrite

Gangue minerals: Quartz

Geologic description:

The Lucky Shot Mine consists of 4 blocks - the Coleman, Lucky Shot, War Baby, and Murphy blocks. In the early days of the district, these were more or less contiguous if somewhat separate properties at least in name but they are being explored and developed as a single property (Full Metal Minerals, 2010a; Stevens, 2010). The deposit consists of quartz veins along shear zones that cut the Late Cretaceous Willow Creek Pluton, which is jointed and sheeted near the surface but less so underground. The pluton is zoned; the outer part consists of hornblende quartz diorite and lesser hornblende tonalite; the core consists of hornblende-biotite granodiorite and lesser hornblende-biotite quartz monzodiorite and biotite quartz monzonite.

The classic mesothermal quartz veins at the Lucky Shot occur along shear zones that exhibit both ductile and brittle properties; the shear zones are up to 100 feet wide. The veins are between two major northeastward-dipping transverse faults. The quartz veins that were mined prior to WWII were generally 2 to 4 feet wide; they strike about N 80 E, and dip about 40 N. Post mineral faults offset the veins up to 800 feet and the quartz in the veins often is fractured. There are two generations of quartz veins. An older group is generally parallel to southwest-dipping joints in the pluton. These veins contain three different suites of ore minerals: 1) chalcopyrite, pyrite, and arsenopyrite; 2) pyrite and stibnite; and 3) sparse pyrite, sphalerite, and minor gold. The younger and economically important veins occur along the major shear zones. Pyrite is the most common ore mineral in them; arsenopyrite and galena are often present; scheelite is locally present; and there are trace tellurides including nagyagite, altaite, and possibly coloradoite. The wall rocks are intensely altered near the veins. Adjacent to the veins, the wall rock is bleached white or gray-green with much sericite, clay, and carbonates. There is an outer zone of propylitic alteration. There are two periods of mineralization, 66 Ma and 55 to 57 Ma (Madden-McGuire and others, 1988; Harlan, 2003). Fluid inclusion studies and isotope geochemistry indicate that the temperature of the ore forming fluids was 300 to 325 degrees (Burleigh, 1987, Silberman and others, 1978).

During the mining before WWII, the stopes along the vein averaged about 5 feet thick, the grade of the ore was typically a half ounce to two ounces per ton and the workings only went down to 500 feet or less below the surface (Stevens, 2010). The work since 2005 has revealed that there are much wider mineralization,

even if at lower grade, and that the mineralization extends well below and beyond the old workings. The mineralization at the Lucky Shot has been traced for more than 4,000 meters horizontally, has a vertical extent of at least a thousand meters and has an average width of about 400 meters (Stevens, 2010). Over the last half century or more there have been several estimates of the gold resources of the Lucky Shot Mine. Most are now of little more than historic interest in view of the recent exploration. A resource estimate on the Coleman Zone was completed by Miranda Gold Corp. in September 2014 (Linebarger, 2014).

In March 2016, Miranda and Gold Torrent announced an updated resource estimate for the Willow Creek project, including measured and indicated resources of 121,500 ounces of gold averaging 18.3 grams of gold per tonne and 12,100 ounces of silver averaging 1.8 grams of silver per tonne contained in 206,600 tonnes of material. Inferred mineral resources include 59,000 tonnes of material that contain 35,150 ounces of gold averaging18.5 grams of gold per tonne and 2,900 ounces of silver averaging 1.5 grams of silver per tonne (Black and others, 2016a).

Alteration:

The wall rocks are intensely altered near the veins. Adjacent to the veins, the wall rock is bleached white or gray-green, with much sericite, clay, and carbonates. There is an outer zone of propylitic alteration (Madden-McGuire and others, 1988; Harlan, 2003).

Age of mineralization:

Late Cretaceous or younger (66 Ma and 55 to 57 Ma); veins cut the Late Cretaceous Willow Creek Pluton (Madden-McGuire and others, 1988; Harlan, 2003).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; medium

Site Status: Active

Workings/exploration:

Gold was discovered in the Lucky Shot area in 1918 and mining began in 1922 (Stoll, 1997, is a detailed history of the mining at the Lucky Shot and other mines in the Willow Creek district.). Mining continued fairly regularly until 1942; the mine did not reopen after WWII. Ensearch Exploration Inc. obtained the property in 1979 and did considerable underground work and exploration drilling. A 100-ton-a-day mill was built and about 10,000 tons of ore was milled. Several companies continued exploration into the early 1990s and another 1,000 tons of ore was mined. In 2005, Full Metals Minerals Corp. began intensive exploration of the Lucky Shot (Full Metal Minerals Corp., 2010a). Through 2008, Full Metal Minerals diamond drilled 164 holes; sampled the old dumps and underground workings; rehabilitated, improved, and sampled the old underground workings; and mined a bulk sample for metallurgical testing. In 2009, they drilled another 27 holes with several notable intercepts with 24.14 to 102.00 grams of gold per tonne (Full Metal Minerals Corp., 2010b). In the late Fall of 2009, they finalized an option agreement with Harmony Gold Corporation to continue exploring the property (Full Metal Minerals Corp., 2009). In November 2013, Miranda Gold Corp. (Miranda) entered a lease agreement with Alaska Hardrock Inc. and the following year Miranda completed a resource estimate on the Coleman Zone (Linebarger, 2014).

Production notes:

The Lucky Shot Mine and the adjacent War Baby Mine (AN003) were combined prior to WWII and both mines were simultaneously operated by Willow Creek Mines. Stoll (1997) estimated that the total production to 1951 from the combined mines was about 252,000 ounces of gold.

Reserves:

A National Instrument 43-101 compliant resource estimate on the Coleman Zone was completed by Miranda Gold Corp. in September 2014. The resource was calculated using a 7 gram per tonne gold cutoff grade. The measured resource was calculated to be 11,500 tonnes at 28.5 grams per tonne gold, yielding 10,500 troy ounces. The indicated resource was calculated to be 67,200 tonnes at 23.9 grams per tonne gold, yielding 51,600 troy ounces. The inferred resource was calculated to be 5,300 tonnes at 24.2 grams per tonne gold, yielding 4,100 troy ounces (Linebarger, 2014).

In March 2016, Miranda and Gold Torrent announced an updated resource estimate for the Willow Creek project, including measured and indicated resources of 121,500 ounces of gold averaging 18.3 grams of gold per tonne and 12,100 ounces of silver averaging 1.8 grams of silver per tonne contained in 206,600 tonnes of material. Inferred mineral resources include 59,000 tonnes of material that contain 35,150 ounces of gold averaging18.5 grams of gold per tonne and 2,900 ounces of silver averaging 1.5 grams of silver per tonne (Black and others, 2016a). All estimated resources are based on a cutoff grade of 5.0 grams of gold per tonne, a long-term gold price of $1,265 per ounce, and assumed metallurgical recoveries of 80 percent. Improved understanding of the geologic controls on mineralization resulted in a significant increase in the mineral-resource estimate for the Willow Creek project. In total, mineral resources at the Willow Creek project include eight veins in the Coleman area and two veins in the Lucky Shot area (AN002), and are based on information from 174 drill holes. Potential exists to increase the mineral resources through drilling down-dip extensions of the Coleman and Lucky Shot area, and the exploration targets in the War Baby (AN 003) and Murphy areas along strike to the east (Athey and Werdon, 2017). In July 2016, a newly completed NI 43-101 preliminary feasibility study reported proven and probable mineral reserves of 93,274 ounces of gold contained in 207,000 tonnes of material grading an average of 14.0 grams of gold per tonne (Black and others, 2016b).

The Willow Creek project is currently being developed through a joint-venture partnership between Miranda Gold Corp. and Gold Torrent Inc., with Gold Torrent currently earning a 70 percent equity interest through the funding of the first $10 million in development costs (Athey and Werdon, 2017).

Additional comments:

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Full Metal Minerals Corp, 2010b, Full Metal intersects 36.38 g/t Au over 7.3 meters at Lucky Shot; underground exploration to commence: http://www.fullmetalminerals.com/s/NewsReleases.asp?ReportID=384752&_Type=News&_Title=Full-Metal-Intersects-36.38-gt-Au-over-7.3-Meters-at-Lucky-Shot-Underground.. (News release dated February 11, 2010; as of July 13, 2015, link no longer valid).

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Stoll, W.M., 1997, Hunting for gold in Alaska's Talkeetna Mountains 1897-1951--with a background sketch

Primary Reference: Stevens, 2010

Reporter(s): D.P. Bickerstaff (USGS); S.W. Huss (USGS); D.J. Grybeck (Contractor, U.S. Geological Survey); N.V. King (Alaska Earth Sciences); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): War Baby; Willow Creek Mines Inc.

Site type: Mine

ARDF no.: AN003

Latitude: 61.7811 **Quadrangle:** AN D-7

Longitude: 149.4016

Location description and accuracy:

The War Baby Mine is marked with an adit symbol and the label 'War Baby' on the Anchorage D-7 1:63,360-scale topographic map. It is on the northwest valley wall of Craigie Creek about 5,000 ft east of VABM Box, near the center of section 35, T. 20 N., R. 1 W. The adjacent Lucky Shot Mine (AN002) and the War Baby mine have long been consolidated into a single property which now is referred to as the Lucky Shot.

Commodities:

Main: Au

Other: Cu

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

Located in 1918, The War Baby Mine quickly saw the erection of a small mill. The first production from the mine occurred in 1919 after two short tunnels and a crosscut were driven. Willow Creek Mines took over the property in 1921. The War Baby was mined, with interruptions, from 1919 until 1940. There were over 2,000 ft of underground workings on 3 levels. Ray (1933) reported that production from 1922 through 1927 was from a single stope measuring 175 by 250 ft with a maximum width of 10 to 12 ft. The ore mined through 1927 averaged 2.18 ounces of gold per ton (Ray, 1933). There may have been some copper production. By 1950, the mine had long since closed and the workings were inaccessible (Ray, 1954).

Chapin (1920) reported that four or five parallel quartz veins at the War Baby Mine cut the Late Cretaceous Willow Creek Pluton. The pluton is zoned: the outer part consists of hornblende quartz diorite and lesser hornblende tonalite; the core consists of hornblende-biotite granodiorite, and lesser hornblende-biotite quartz monzodiorite and biotite quartz monzonite. Wallrock alteration is intense within a few inches of the veins but seldom extends more than 10 to 12 inches beyond the veins.

The veins at the War Baby Mine strike N 80 E, and dip 17 to 62 NW; they are found in a 33-feet-wide zone and vary in thickness from 1 to 15 inches. The veins appear to belong to a single system that locally branches in the hanging wall. The footwall is marked by slickensides that separate the lode from fresh country rock. Sericitization and carbonate alteration predominate, but there is some pyritization and chloritization occurs in the outer parts of the alteration zone (Ray, 1954). The veins are a continuation of those at the Lucky Shot mine (AN002) although offset 600 to 700 feet along a prominent fault. The ore mined through 1927 averaged 2.18 oz/ton Au (Ray, 1933).

The War Baby mine was consolidated with the Lucky Shot Mine (CH002) and mined by the same company before 1942. In 2005, Full Metal Minerals Corp. began a intensive exploration that included the Lucky Shot Mine, the War Baby Mine, and adjacent ground beyond either of them. The War Baby is now only a block within that larger deposit that retains the name Lucky Shot. See the description of the Lucky Shot Mine (AN002) for the status of the ground that was once the War Baby.

Alteration:

The wall rocks are intensely altered near the veins. Adjacent to the veins, the wall rock is bleached to a white or gray-green color, with much sericite, clay, and carbonates. There is an outer zone of propylitic alteration.

Age of mineralization:

Late Cretaceous or younger; veins cut the Late Cretaceous Willow Creek Pluton.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; medium

Site Status: Active

Workings/exploration:

Located in 1918, The War Baby Mine quickly saw the erection of a small mill. The first production from the mine occurred in 1919 after two short tunnels and a crosscut were driven. Willow Creek Mines took over the property in 1921. The War Baby was mined, with interruptions, from 1919 until 1940. There were over 2,000 ft of underground workings on 3 levels. Ray (1933) reported that production from 1922 through 1927 was from a single stope measuring 175 by 250 ft with a maximum width of 10 to 12 ft. By 1950, the mine had long since closed and the workings were inaccessible (Ray, 1954). The War Baby mine was consolidated with the Lucky Shot Mine (CH002) and mined by the same company before 1942. In 2005, Full Metal Minerals Corp. began a intensive exploration that included the Lucky Shot Mine, the War Baby Mine, and adjacent ground beyond either of them. The War Baby is now only a block within that larger deposit that retains the name Lucky Shot. See the description of the Lucky Shot (AN002) for the status of the ground that was once the War Baby.

Production notes:

The War Baby Mine and the adjacent Lucky Shot Mine (AN002) were combined prior to WWII and both mines were simultaneously operated by Willow Creek Mines. Stoll (1997) estimated that the total production of the combined mines to 1951 was 252,000 ounces of gold.

Reserves:

See the Lucky Shot Mine (AN002) for the current status of the reserves.

Additional comments:

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Primary Reference: Stevens, 2010

Reporter(s): D.P. Bickerstaff (Contractor, U.S. Geological Survey); S.W. Huss (U. S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Gold Bullion; New Bullion; Ready Bullion; Willow Creek Mines Inc.

Site type:

Mine

ARDF no.: AN004

Latitude: 61.7898

Quadrangle: AN D-7

Longitude: 149.3292

Location description and accuracy:

Marked by adit symbols and the label 'Gold Bullion Mine' on the Anchorage D-7 1:63,360-scale topographic map. The mine is near the top of the northwestern flank of Bullion Mountain, on the divide between Willow and Craigie Creeks. It is near the southwest corner of section 29, T. 20 N., R. 1 E. of the Seward Meridian.

Commodities:

Main: Au

Other: Cu, Hg

Ore minerals: Chalcopyrite, cinnabar, pyrite, secondary copper minerals

Gangue minerals: Quartz

Geologic description:

The Gold Bullion Mine was developed on one or more quartz veins 1.5 to 14 feet thick that are intermittently exposed over 3,000 feet of strike length and have an average grade of about 1.7 ounces of gold per ton (Capps, 1915). The nearly horizontal quartz veins at the Gold Bullion contain gold, small amounts of pyrite, chalcopyrite, other sulfides, and are stained by copper carbonates. The veins cut tonalite and quartz diorite of the Willow Creek pluton, which has been dated at 73-74 Ma (Stevens, 2010; Madden-Mcguire and others, 1988). At least three normal faults are known to displace the veins (Stevens, 2010). Visible slickensides and gouge are along the vein walls (Katz, 1911). Capps (1915) reported cinnabar along cracks in quartz in one tunnel. According to Chapin (1920), most mining was on one vein that strikes N 10 E, and dips 14 NW. The ore averaged about 1.7 ounces of gold per ton (Ray, 1954). A K-Ar age from muscovite in a quartz-sericite selvage adjacent to a gold-bearing vein nearby was 56 Ma, early Paleocene (Silberman and others, 1978). Wall rock alteration is intense within a few inches of the veins, but seldom extends more than 10 to 12 inches beyond the quartz vein. Sericitization and carbonate alteration predominate, but there is some pyritization, and in the outer parts of the alteration zone the wall rock is chloritized (Ray, 1954).

An adjacent property, the Ready Bullion vein was discovered during mining at the Gold Bullion Mine. Workings were extended to it from the Ready Bullion in 1937 (Roehm, 1938; Stevens, 2010). The Ready Bullion vein was 12 to 18 inches thick and could be traced for three claims. It was considered to be the down-dip extension of the Gold Bullion.

In early 2010, the Gold Bullion Mine was part of a large block of claims that was being explored by the Harmony Gold Corporation (Stevens, 2010). In 2014 Miranda Gold Corp. collected soil samples and vein samples that identified significant anomalies potentially extending the fault limit of the Gold Bullion vein and provided new targets for vein segments between the Murphy and Bullion Mountain veins (Linebarger, 2014).

Alteration:

Probably similar to that at the nearby Lucky Shot Mine (AN002), where the wall rocks are intensely altered near the veins. Adjacent to the veins, the wall rock is bleached white or gray-green, with much sericite, clay, and carbonates. There is an outer zone of propylitic alteration (Ray, 1954).

Age of mineralization:

Early Paleocene based on a 56 Ma K-Ar date frommuscovite in a quartz-sericite selvage adjacent to a gold-bearing vein nearby (Silberman and others, 1978).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The Gold Bullion Mine was staked by William Bartholf in 1907 (Capps, 1915). From 1909 to 1927, mine was the second largest producer in the district (Ray, 1933). The first ore from the property was from an open cut on a vein outcrop. The ore was carried by pack horse to the mill 1,600 ft below on Craigie Creek. The 2-stamp mill with a capacity of six tons a day was built in 1909 (Stoll, 1997). A 5-stamp mill was added to the property in 1911, increasing the mill capacity to 21 tons of ore per day. By 1915, a cyanide plant, five tunnels, numerous open cuts, several aerial trams, and other surface improvements were reported (Capps, 1915). According to Capps (1919), there was a total of 5,220 feet of underground workings. The old tailings were cyanided in 1939-1940 and several thousand dollars of gold was recovered (Ray, 1954).

The Ready Bullion was also mined in the mid-1970s by Dan Renshaw (personal communication, 1998). He mined from surface pits along the ridge above the Ready Bullion adits from frozen, near-surface portions of the vein that had been left in place during early mining to protect the underground workings. Several hundred tons were mined that ran 3 to 4 ounces of gold per ton. The ore was trucked to the Gold Cord mill (AN007) on upper Fishhook Creek, where the last of it was milled in 1977. Mining stopped with additional ore in sight when the property was folded into a consolidation of a number of properties when gold was approaching $800 per ounce. Subsequently, the price of gold retreated to a level that curtailed the effort and there was no additional production from the Ready Bullion. Access to the property during this work was by a steep, zigzag road upward from the head of Little Willow Creek.

In early 2010, the Gold Bullion Mine was part of a large block of claims that was being explored by the Harmony Gold Corporation (Stevens, 2010). In November 2013, Miranda Gold Corp. (Miranda) entered a lease agreement with Alaska Hardrock Inc. and collected 234 soil samples and three vein samples in the summer of 2014 that identified significant anomalies potentially extending the fault limit of the Gold Bullion vein and provided new targets for vein segments between the Murphy and Bullion Mountain veins (Linebarger, 2014).

Production notes:

The Gold Bullion Mine produced about 77,000 ounces of gold to 1951, most of it from 1911 to 1927, and it is the 3rd largest gold mine in the Willow Creek district (Stoll, 1997). Dan Renshaw's production is estimated to be about 30 to 40 ounces.

Reserves:

None.

Additional comments:

References:

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Stoll, W.M., 1997, Hunting for gold in Alaska's Talkeetna Mountains 1897-1951--with a background sketch of Alaska's great gold-lode camps: Greensburg, Pennsylvania, Henry Printing, 301 p.

Primary Reference: Stevens, 2010

Reporter(s): D.P. Bickerstaff (Contractor, U.S. Geological Survey; S.W. Huss (U. S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey); N.V. King (Alaska Earth Sciences)

Last report date: 2016-03-15

Site name(s): Golden Top; Gold Top; Gold Top Mining Co; Kempf

Site type:

ARDF no.: AN014

Latitude:

Quadrangle: AN

Longitude:

Location description and accuracy:

Because of ambiguities, name changes over time, and the limited information in several source documents, in the initial record for this this site, it and the nearby Gray Eagle property were done individually as different deposits on different veins. Newer information has made it obvious that there is a single deposit on a single vein that has gone through several changes of ownership. The deposit is now the 'Gold Top, Gray Eagle' Mine,ARDF site AN015 and information from this record has been integrated into that record. The ARDF number in this record has been preserved only for accounting purposes.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-03-04

Site name(s): Gold Top, Gray Eagle

Site type: Mine

ARDF no.: AN015

Latitude: 61.7984 **Quadrangle:** AN D-7

Longitude: 149.3776

Location description and accuracy:

The center of the Gold Top/Gray Eagle vein is about 2.1 miles northeast of VABM Box, near the top of the ridge on the northwest side of Craigie Creek. It is about 0.4 mile north-northwest of the center of section 25, T. 20 N., R. 1 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

The Gray Eagle and Gold Top veins are mentioned in Ray (1954) and Stoll (1997) but the information is limited. Stevens (2010) describes the vein, which probably probably was described previously under different names, in some detail. It has about the same orientation as the veins at the Lucky Shot Mine (AN002) and geologically is probably similar. Free gold is visible in the vein. The vein can be traced in trenches for at least 2,500 feet. It trends N 80 W to S 80 W and dips 50 to 60N. It is 12 inches to 8 feet wide and averages about 4 feet. The Smith tunnel that was driven sometime before 1940, intersected the vein and the workings follow it for about 850 feet. Forty samples were taken; the assays varied from low to 0.7 ounces of gold per ton (Stevens, 2010). In 1940, open cuts exposed the vein, the older trenches were cleaned out, and 2 short adits were driven to reach the vein. The rocks in the area are tonalite to quartz diorite of the Willow Creek pluton, dated at 73-74 Ma (Madden-Mcguire and others, 1989).

Before 1940, Milo Kelly of Knik, Alaska recovered about 60 ounces of gold from a few hundred pounds of ore mined from shallow workings on the Gray Eagle property (Vinal, 1940). The mine is now part of the property being explored by the Harmony Gold Corporation (Stevens, 2010) but in early 2010, there is no indication of any recent work on the Gold Top/Gray Eagle vein.

Alteration:

Probably similar to that at the nearby Lucky Shot Mine (AN002). There the wall rocks are intensely altered near the veins. Adjacent to the veins, the wall rock is bleached white or gray-green, with much sericite, clay, and carbonates. There is an outer zone of propylitic alteration.

Age of mineralization:

Late Cretaceous or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
36a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:
Sometime prior to 1940, there was considerable trenching and an adit intersected the Gold Top/Gray Eagle vein. About 850 feet of drifts exposed the vein. In 1940, more trenches were dug, the old trenches were rehabilitated, and two short adits were driven to the vein. Since 2005, the property has been part of a large block of claims that is being explored by Harmony Gold Corporation, but as of early 2010, there was no evidence of work work on the Gray Eagle/Gold Top vein.

Production notes:
Before 1940, Milo Kelly of Knik, Alaska recovered about 60 ounces of gold from a few hundred pounds of ore mined from shallow workings on the Gray Eagle property.

Reserves:
None.

Additional comments:

References:
Cohen, K.K., 1982, Independence mine and the Willow Creek mining district: Alaska Division of Parks Miscellaneous Publications, History of Archaeology series, No. 32, 169 p.

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Stoll, W.M., 1997, Hunting for gold in Alaska's Talkeetna Mountains 1897-1951--with a background sketch of Alaska's great gold-lode camps: Greensburg, Pennsylvania, Henry Printing, 301 p.

Vinal, E.L., 1940, Gold Top-Gray Eagle group of claims, Craigie Creek basin, Wasilla mining district, Alaska: Report prepared for Alaska-Pacific Consolidated Mining Company. W.M. and J.A. Stoll collection, Archives and Manuscripts Department, University of Alaska, Anchorage, Alaska.

Primary Reference: Stevens, 2010

Reporter(s): D.P. Bickerstaff (Contractor, U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Nippon; Jap

Site type: Mine

ARDF no.: AN030

Latitude: 61.7903 **Quadrangle:** AN D-7

Longitude: 149.3124

Location description and accuracy:

The Nippon Mine is at elevation of about 4,200 feet in the cirque at the head of Upper Willow Creek. It is about 0.9 mile north-northwest of VABM Pass on Skyscraper Mountain and about 0.4 mile south-southeast of the center of section 29, T. 20 N., R. 1 E. The location is accurate.

Commodities:

Main: As, Au, Cu, Pb

Other:

Ore minerals: Arsenopyrite, galena, gold, pyrite

Gangue minerals: Quartz

Geologic description:

At the Nippon Mine (the Jap Mine in early reports), there are two parallel veins 6 inches to 2 feet thick and about 300 feet apart (Roehm, 1938; Stoll, 1997; Stevens, 2010). Five tunnels exposed the veins in several places for a total length of more than 700 feet. The upper vein is exposed in two short tunnels; the lower vein is exposed in two other tunnels. There is little detailed geologic information about the Nippon veins. But they are probably similar to the other veins in the Willow Creek district and consist of low-sulfide quartz veins with a few percent pyrite, arsenopyrite, and galena; follow shear zones; and free gold is often visible. Elsewhere in the district and probably here, wallrock alteration is intense within a few inches of the veins, but seldom extends more than 10 to 12 inches beyond the quartz. Sericitization and carbonate alteration predominate, but there is some pyritization and chloritization (Ray, 1954). The veins cut tonalite to quartz diorite of the Willow Creek pluton which has been dated at 73-74 Ma (Stevens, 2010, Madden-Mcguire and others, 1988).

The Nippon Mine was discovered between 1909 and 1914 (Roehm, 1938; Stoll, 1997). A single stamp mill was installed before 1915 and there may have been some minor production. According to Brooks (1925), no attempt was made to mine ore that contained less than 4.85 ounces of gold per ton. In 1937, a miner was milling 200 to 300 pounds of high-grade ore from a 10-inch vein. Three vertical diamond drill holes were drilled in 1941; samples contained up to 1.88 ounces of gold per ton.

In the early 1980s, Ensearch Exploration Inc. drilled the upper and lower veins from the old underground workings Stevens, 2010). The work was suspended when the veins to found to be highly fractured. Ensearch's best intercept contained 3.32 ounces of gold per ton. As a result of this limited drilling, Hawley and Visconty (1982) outlined a 6,000-ton block of high grade ore. Yongue (1989) thought there may have been a reserve of 17,100 tons of material in the upper vein with a grade of 0.380 ounce of gold per ton and 2,272 tons of of material in the lower vein with a grade of 0.9 ounce per ton.

Alteration:

Elsewhere in the district and probably here, wallrock alteration is intense within a few inches of the veins, but seldom extends more than 10 to 12 inches beyond the quartz. Sericitization and carbonate alteration predominate, but there is some pyritization and chloritization (Ray, 1954).

Age of mineralization:

Late Cretaceous or younger; veins cuts the Late Cretaceous Willow Creek Pluton.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The workings include five adits and more than 700 feet of drifts on two veins. A small mill was installed in 1915 and there may have been some gold produced. (Capps, 1916). There was minor production in 1937 by one miner and 3 holes were diamond drilled in 1941. Ensearch Exploration Ltd. drilled 7 holes in the early 1980s and sampled and mapped the property.

Production notes:

There was probably a small amount of ore milled in a 2-stamp mill about the time of WWI. A miner produced 200 to 300 pounds of ore a day in 1937 and probably recovered a small amount of gold from it.

Reserves:

As a result of limited diamond drilling in the early 1980s by Ensearch Development Ltd., Hawley and Visconty (1982) outlined a 6,000-ton block of high grade ore. Yongue (1989) thought there may have been a reserve of 17,100 tons of material in the upper vein with a grade of 0.380 ounce of gold per ton, and 2,272 tons of of material in the lower vein with a grade of 0.9 ounce per ton.

Additional comments:

References:

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1903, 134 p.

Ray, R.G., 1954, Geology and ore deposits of the Willow Creek Mining district, Alaska: U.S. Geological Survey Bulletin 1004, 86 p.

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Stoll, W.M., 1997, Hunting for gold in Alaska's Talkeetna Mountains 1897-1951--with a background sketch of Alaska's great gold-lode camps: Greensburg, Pennsylvania, Henry Printing, 301 p.

Yongue, D., 1989, Independence Mine Report: Unpublished Solomon Resources Internal Report. (in files of Full Metal Minerals)

Primary Reference: Stevens, 2010

Reporter(s): D.P. Bickerstaff (Contractor, U.S. Geological Survey); S.W. Huss (U. S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Nugget; Willow Creek Mines Co.

Site type:

ARDF no.: AN031

Latitude: **Quadrangle:** AN

Longitude:

Location description and accuracy:

As originally compiled for this record, there was little information on this prospect and its location was uncertain. Further work has indicated that this prospect is the Nippon prospect which is ARDF site AN030, and that record already included much of the information that was originally in this record. This ARDF number is retained only for accounting purposes.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-03-04

Site name(s): Bornite; Ruby Creek

Site type: Prospect

ARDF no.: AR018

Latitude: 67.0624 **Quadrangle:** AR A-2

Longitude: 156.948

Location description and accuracy:

The Bornite prospect is near the Bornite locality shown on the 1:63,360-scale topographic map. The prospect is near the center of section 8, T. 19 N., R. 9 E., of the Kateel River Meridian, and about 1.6 miles north-northeast of Bannock Mountain. The location is well known and accurate within 500 feet.

Commodities:

Main: Co, Cu

Other: Ag, Au, Ge, Pb, U, Zn

Ore minerals: Bornite, carrollite, chalcocite, chalcopyrite, cymrite, galena, germanite, marcasite, pyrite, pyrrhotite, renierite, sphalerite, tennantite-tetrahedrite

Gangue minerals: Barite, dolomite

Geologic description:

The mineralization at the Bornite prospect consists of sulfide minerals in a matrix of brecciated, intensely folded and faulted dolomite and limestone of the Devonian Bornite marble, a 3000-ft.-thick unit of carbonate rocks (Hitzman and others, 1986). The main ore minerals are bornite and chalcopyrite but carrollite, chalcocite, galena, germanite, renierite, sphalerite, and tennantite-tetrahedrite also occur in smaller amounts. The deposit is structurally and stratigraphically confined to the Devonian dolomite, limestone, and calcareous phyllite along the fault (?) -controlled margin of a carbonate bank adjacent to a shale-filled graben. Hitzman and others believed the deposit to have formed along a rifted continental margin in Late Devonian time. Rigby and others (2011), however, describe Bornite as a copper-cobalt deposit with Mississippi Valley and Olympic Dam affinities.

From the 1950s and into the 1980s, Kennecott Exploration Co. explored the Bornite deposit underground from a shaft and workings on two levels and also extensive surface drilling. In 2011 NovaGold Resources Inc. and the NANA Native Corporation, who owns the land, reached an agreement to explore the deposit (Petsel and others, 2011). NovaGold drilled 6 holes in 2011 totaling about 2,600 meters to verify Kennecott's earlier work and 9 other exploration holes totaling 3,500 meters (NovaGold Resources Inc., 2011a, 2011b). The NovaGold drilling not only verified the earlier data in several high-grade intercepts, it also identified a new South Reef zone that significantly increases the the size of the deposit. Some notable intercepts were: 1) four intervals that totaled 111.3 meters in one hole that averaged 2.1 percent copper; 2) 26.3 meters that averaged 6.7 percent copper; 3) 93.2 meters that averaged 2.1 percent copper, 4) 31.9 meters that averaged 5.4 percent copper; 5) 110.6 meters that averaged 2.6 percent copper; 6) 153.1 meters that averaged 1.2 percent copper, and 7) 178 meters that averaged 4.0 percent copper and this included 59.2 meters that averaged 12.0 percent copper.

Hitzman (1986) estimated Bornite to have a resource of 90 million tons with a grade of 1.2 percent copper.

As reported in 2014, the Bornite Project is estimated to contain 2.16 billion pounds of copper (6.8 million tonnes grading 1.19 percent copper) in the indicated category and 3.3 billion pounds of copper (90.8 million tonnes grading 1.64 percent copper) in the inferred category (Davis and others, 2014).

Alteration:

Dolomitization (Davis and others, 2014).

Age of mineralization:

Late Devonian by analogy with other deposits in the Ambler mineral belt (Davis and others, 2014).

Generic deposit model:

Deposit model:

Mississippi Valley or Olympic Dan similarities? Kipushi Cu-Co deposit? (Cox and Singer, 1986, model 32c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

32c?

Production Status: None

Site Status: Active

Workings/exploration:

From the 1950s into the 1980s, Kennecott Exploration Co. explored the Bornite deposit underground from a shaft and workings on two levels and also by extensive surface drilling. In 2011 NovaGold Resources Inc. and the NANA Native Corporation who own the land reached an agreement to explore the deposit (Petsel and others, 2011). NovaGold drilled 6 holes in 2011 totaling about 2,600 meters to verify the Kennecott's earlier work and 9 other exploration holes totaling 3,500 meters (NovaGold Resources Inc., 2011a, 2011b).

The NovaGold drilling not only verified the earlier data in several high-grade intercepts, it also identified a new South Reef zone that significantly increases the the size of the deposit. Some notable intercepts were: 1) 4 intervals that totaled 111.3 meters in one hole that averaged 2.1 percent copper; 2) 26.3 meters that averaged 6.7 percent copper; 3) 93.2 meters that averaged 2.1 percent copper, 4) 31.9 meters that averaged 5.4 percent copper; 5) 110.6 meters that averaged 2.6 percent copper; 6) 153.1 meters that averaged 1.2 percent copper, and 7) 178 meters that averaged 4.0 percent copper and this included 59.2 meters that averaged 12.0 percent copper.

In 2012, NovaCopper captured extensive physical property data at Bornite including resistivity, chargeability, specific gravity, and magnetic susceptibility data for use in modeling the existing ground induced polarity (IP) and gravity surveys, and the airborne electromagnetic (EM) and magnetic surveys. In general, some broad comments can be made concerning geophysical domains in and around mineralization at Bornite. Mineralization is characterized by low resistivity, less than 20 ohms, ambiguous but elevated, often irregular chargeability highs (greater than 35 milliradians) marginal to the mineralization, and 3 to 5 milligal gravity anomalies. Mineralization appears to lie along the flanks of 20 to 150 nanoteslas long wave magnetic anomalies (Davis and others, 2014).

As reported in 2014, the Bornite Project is now estimated to contain 2.16 billion pounds of copper (6.8 million tonnes grading 1.19 percent copper) in the indicated category and 3.3 billion pounds of copper (90.8 million tonnes grading 1.64 percent copper) in the inferred category (Davis and others, 2014).

Production notes:

None.

Reserves:

As reported in 2014, the Bornite Project is now estimated to contain 179 million pounds of copper (6.8 million tonnes grading 1.19 percent copper) in the indicated category and 3.3 billion pounds of copper (90.8 million tonnes grading 1.64 percent copper) in the inferred category (Davis and others, 2014).

The historic resource estimate from Hitzman (1986) was 90 million tons with an average of 1.2 percent copper (Hitzman and others, 1986).

On April 19, 2016, Trilogy Metals Inc. released an updated resource estimate, and on May 16, 2016, filed

a NI 43-101 technical report for the Bornite deposit (Davis and others, 2016). The updated resource resulted in contained copper in indicated resources increasing from 334 to 913 million pounds, constituting a 173 percent increase in contained metal over the previous resource estimate. Total contained copper in inferred resources decreased from 5,696 to 5,450 million pounds copper (1,768 million pounds in-pit at 0.5 percent copper cut-off grade; 3,683 million pounds below-pit at 1.5 percent copper cut-off grade), which constitutes a 4 percent decrease in contained metal due principally to moving in-pit inferred resources to the indicated category. The resource update incorporated a new, 3D lithology, alteration, and structural model for the Bornite deposit, as well as results from previously un-sampled or partially sampled historical Kennecott drill core. Trilogy continued environmental baseline data collection, but no exploration or drilling was conducted in 2016 at Bornite (Athey and Werdon, 2017).

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Davis, B., Sim, R., Austin, J., 2014, NovaCopper Inc., NI 43-101 technical Report on the Bornite Project, Northwest Alaska, USA, 152 p. (posted on www.sedar.com, on April 1, 2014) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00033050&fileName=/csfsprod/data149/filings/02188430/00000002/t%3A%5CNovaCopper%5CSEDAR%5CTechnical_Report_novacopper.pdf (as of December 16, 2014).

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Hitzman, M.W., Profett, J.M., Jr., Schmidt, J.M., and Smith, T.E., 1986, Geology and mineralization of the Ambler district, northwestern Alaska: Economic Geology, v. 81, p. 1592-1618.

NovaGold Resources Inc., 2011a, NovaGold reports important drill results at the Bornite deposit in its recently consolidated Ambler District, Alaska: http://www.novagold.com/upload/news_releases/2011/2011-11-10_NGPR_Bornite-Drill-Result.pdf (News release, November 10, 2011).

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Rigby, N., Michael, N., and Raffield, M., 2011, NI 43-101 preliminary economic assessment, Ambler project, Kobuk, Alaska: Internal company report for NovaGold Resources Inc., 209 p. (posted on www.sedar.com, May 10, 2011) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00000880&fileName=/csfsprod/data118/filings/01743319/00000001/v%3A%5CNovaGoldResources%5CSEDAR%5C0012479_tech_May10_2011%5Cfiled%5CNovaGold_TRmay10.pdf (as of December 16, 2014).

Primary Reference: Davis and others, 2014

Reporter(s): J.M. Schmidt (USGS); S.W. Nelson (USGS retired); D.J. Grybeck (Contractor, USGS); A. Angel (Alaska Earth Sciences, Inc.); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Arctic

Site type: Prospect

ARDF no.: AR025

Latitude: 67.174 **Quadrangle:** AR A-1

Longitude: 156.3875

Location description and accuracy:

The Arctic prospect is about 1.2 miles east of VABM 3725 'Riley' on a ridge above the Kogoluktuk River in the Ambler district. The property is shown as a group of prospect symbols on the USGS 1:63,360-scale topographic map in the southeast quarter of section 34, T. 21 N., R. 11 E., of the Kateel River Meridian. The location is well-known and accurate to within 500 feet.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other: Sb

Ore minerals: Arsenopyrite, barite, bornite, chalcocite, chalcopyrite, galena, pyrite, pyrrhotite, sphalerite, stibnite, tennantite-tetrahedrite

Gangue minerals: Calcite, quartz, talc

Geologic description:

Arctic is one of several volcanogenic deposits in the Ambler schist belt along the south flank of the Brooks Range. The deposits may be part of a rifted continental margin (Schmidt, 1981). Arctic is a syngenetic deposit hosted in the Ambler Schist Belt, a thick sequence of Devonian or Mississippian, low to medium-grade metamorphosed basaltic and rhyolitic rocks, submarine ash flow tuffs, volcaniclastic and minor plutonic rocks, and pelitic, carbonaceous, and calcareous metasedimentary rocks. These rocks are part of a large fold structure termed the Kalurivik arch. A Devonian or Mississippi age of mineralization is based both on fossil evidence and on U-Pb radiometric dating (Hitzman and others, 1986).

The Arctic polymetallic, stratabound, volcanogenic deposit consists of tabular bodies of banded massive and disseminated sulfides, one foot to more than 55 feet thick, composed of 20 percent to 90 percent pyrite, chalcopyrite and sphalerite, along with lesser amounts of pyrrhotite, chalcocite, bornite, galena, tennantite-tetrahedrite, arsenopyrite and stibnite (Schmidt, 1988). The sulfides are enclosed in calcareous talcose to quartzose lenses within a metavolcanic (rhyolitic) unit. The deposit is about 3,000 feet by 2,200 feet in area and about 270 feet thick. The massive sulfide occurrences are covered by a small gossan cap 9 to 15 feet deep.

Alteration:

Chlorite-rich rocks in the footwall and surrounding the sulfides form an alteration zone containing a complex assemblage of barium fluorphlogopite, talc, Mg-chlorite, barite, phengite, quartz, and calcite (Schmidt, 1988).

Age of mineralization:

Devonian-Mississippian, the age of the host rocks (Hitzman and others, 1986).

Generic deposit model:

Deposit model:
Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
28a

Production Status: None

Site Status: Active

Workings/exploration:

Kennecott completed 70 drill holes in the Arctic deposit in the 1970s and defined an inferred resource of 36.3 million tons of ore.

NovaGold Resources, Inc. (2007) reached an earn-in agreement with Kennecott Exploration Company and Kennecott Arctic Company (subsidiaries of Rio Tinto PLC) in March 2004. The agreement covers a 35,000 acre area in the Ambler district. Initial exploration by NovaGold in 2004 focused on the Arctic deposit and included new descriptions of existing core, structural geology studies, and drilling 11 infill holes totaling 9,768 feet. These holes confirmed previous drill results and helped refine the three-dimensional geologic model for the Arctic deposit. Some 2004 drill intercepts reported by NovaGold include: 1) hole AR04-80 had 6.5 meters with 3.36 percent copper, 0.91 gram of gold per tonne, 1.90 percent lead, and 7.93 percent zinc; 2) hole AR04-86 had 12.5 meters with 3.76 percent copper, 0.91 gram of gold per tonne, 52.4 grams of silver per tonne, 0.58 percent lead, and 6.01 percent zinc, or an 8.0 percent copper equivalent; 3) hole AR04-87 had 7.4 meters with 9.65 percent copper, 0.73 grams of gold per tonne, 108.2 grams of silver per tonne, 1.64 percent lead, and 10.35 percent zinc, or 16.9 percent copper equivalent.

In 2005, NovaGold drilled about 3,000 meters of core hole and carried out district-scale surface geology, geochemistry, and geophysical surveys (NovaGold Resources, Inc., 2007). In 2006, NovaGold drilled 12 holes to test geophysical anomalies near the Arctic deposit and outlined additional mineralization. They also carried out extensive detailed surface geologic mapping and geochemical surveying. As of May 2011, the deposit has been explored by 119 core holes totaling about 25,000 meters, 96 of which are in mineralization. In 2011, NovaGold commissioned a comprehensive NI 43-101 preliminary economic assessment of the deposit that included a statement of its resources (Rigby and others, 2011).

Assuming a net smelter return of $75 per ton, the deposit has an indicated resource of 16.845 million tons with an average grade of 4.14 percent copper, 6.03 percent zinc, 0.94 percent lead, 0.83 gram of gold per tonne, and 59.62 grams of silver per ton. It has an addition inferred resource of 12.087 million tons with an average grade of 3.53 percent copper, 4.94 percent zinc, 0.79 percent lead, 0.067 grams of gold per tonne, and 48.04 grams of silver per tonne.

In 2016, Trilogy Metals Inc. (formerly NovaCopper Inc.) drilled a total of 3,058 meters in 13 holes at their Arctic volcanogenic massive sulfide deposit. Significant results include: hole AR16-0155, which intersected 3 mineralized intervals, including 36.36 meters of 2.27 percent copper, 0.27 gram of gold per tonne, 25.3 grams of silver per tonne, 0.36 percent lead, and 2.54 percent zinc, and 8.48 meters of 6.14 percent Cu, 1.32 grams of gold per tonne, 96.6 grams of silver per tonne, 1.93 percent lead, and 8.27 percent zinc; hole AR16-0148, which intersected 4 mineralized intervals, including 21.22 meters of 3.79 percent copper, 0.85 gram of gold per tonne, 69.1 grams of silver per tonne, 0.99 percent lead, and 5.78 percent zinc; hole AR16-0150, which intersected 5 mineralized intervals, including 16.60 meters of 5.40 percent copper, 0.20 gram of gold per tonne, 46.0 grams of silver per tonne, 1.23 percent lead, and 6.69 percent zinc; and hole AR16-0153, which intersected 12.59 meters of 2.49 percent copper, 0.86 gram of gold per tonne, 56.6 grams of silver per tonne, 2.17 percent lead, and 9.64 percent zinc. Trilogy plans to complete a prefeasibility study and update the resource estimates for the Arctic deposit in 2017 (Athey and Werdon, 2017).

Production notes:
None.

Reserves:

Kennecott completed 70 drill holes in the Arctic deposit in the 1970s and estimated an inferred resource of 36.3 million tons grading 4.0 percent copper, 5.5 percent zinc, 0.8 percent lead, 0.7 gram of gold per tonne,

and 54.9 grams of silver per tonne, or 8.0 percent copper equivalent (Eakins and others, 1985).

In 2011, NovaGold commissioned a comprehensive NI 43-101 preliminary economic assessment of the deposit that included a statement of its resources (Rigby and others, 2011). Assuming a net smelter return of $75 per ton, the deposit has an indicated resources of 16.845 million tonnes with an average grade of 4.14 percent copper, 6.03 percent zinc, 0.94 percent lead, 0.83 grams of gold per tonne, and 59.62 grams of silver per tonne. It has an addition inferred resource of 12.087 million tons with an average grade of 3.53 percent copper, 4.94 percent zinc, 0.79 percent lead, 0.067 grams of gold per tonne, and 48.04 grams of silver per tonne.

In 2013, NovaGold commissioned a comprehensive Preliminary Economic Assessment report (43-101 compliant). Using a constant net smelter return of $35.01 per tonne milled, they report 1) 23.848 million tonnes indicated with an average grade of 3.26 percent copper, 4.45 percent zinc, 0.76 percent lead, 0.71 gram of gold per tonne, and 53.2 grams of silver per tonne; and 2) 3.368 million tonnes inferred with an average grade of 3.22 percent copper, 3.84 percent zinc, 0.58 percent lead, 0.59 percent gold, and 41.5 percent silver (Wilkins and others, 2013).

As of 2016, the Arctic deposit has a total indicated and inferred resource of 27.2 million tonnes with 3.25 percent copper, 4.37 percent zinc, an in situ lead grade of 0.74 percent, 0.02 ounce of gold per tonne, and 1.51 ounces of silver per tonne, for contained metals of 1,952 million pounds of copper, 2.623 million pounds of zinc, 444 million pounds of lead, 610,000 ounces of gold, and 45.3 million ounces of silver (Wilkins and others, 2013).

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

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Eakins, G.R., Bundtzen, T.K., Lueck, L.L. Green, C.B., Gallagher, J.L., and Robinson, M.S., 1985, Alaska mineral industry, 1984: Alaska Division of Geological and Geophysical Surveys Special Report 38, 57 p.

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Schmidt, J.M., 1981, Volcanogenic massive sulfide deposition in a rifted continental margin--The Arctic Camp deposit, southwestern Brooks Range, Alaska [abs.]: Geological Society of America Annual Meeting, Program with Abstracts, v. 13, no. 7, p. 548.

Schmidt, J.M., 1988, Mineral and whole-rock compositions of seawater-dominated hydrothermal alteration at the Arctic volcanogenic massive sulfide prospect, Alaska: Economic Geology, v. 83, p. 822-842.

Wilkins, Graham, Stoyko, H.W., Ghaffari, Hassan, DiMarchi, Jack, Huang, John, Silva, Marvin, O’Brien, M.F., Chin, Michael, and Hafez, S.A., 2013, NovaCpooer Inc., Preliminary Economic Assessment Report on the Arctic Project, Ambler Mining District, Northwest Alaska, 546 p. https://trilogymetals.com/upper-

kobuk-mineral-projects/project-overview (last accessed 8/25/2017)

Primary Reference: Wilkins and others, 2013

Reporter(s): J.M. Schmidt (USGS), S.W. Nelson (USGS retired); Travis Hudson (Applied Geology, Inc.); D.J. Grybeck (Contractor, USGS); A. Angel (Alaska Earth Sciences, Inc.); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Horse Creek; Cliff; Dh; Lost

Site type: Prospect

ARDF no.: AR029

Latitude: 67.31 **Quadrangle:** AR B-2

Longitude: 156.7

Location description and accuracy:

Located north of VABM Ruby on ridge between Ambler and Shungnak Rivers in Sec. 17, T. 22 N., R. 10 E., of the Kateel River Meridian. Shown as locality 39 in Mayfield and Grybeck (1978) and accurate to within 1000 ft. (600m).

Commodities:

Main: Cu, Pb, Zn

Other: Ag

Ore minerals: Bornite, chalcopyrite, galena, pyrite, sphalerite

Gangue minerals: Calcite, muscovite, quartz, sericite

Geologic description:

Pyrite, chalcopyrite, bornite, galena and sphalerite form lenses, stringers, disseminations, and locally massive pods in metamorphosed Devonian-Mississippian volcanic, volcaniclastic, and sedimentary rocks. Sulfide lenses are complexly folded and faulted. Country rocks are interbedded porphyroblastic quartz-muscovite-calcite schist, graphitic schist, greenstone, (some have pillow structure, and some occur as plugs and sills throughout the section), and weakly metamorphosed semischistose graywacke (Nana Development Corp., written communication, 1997). Deposit is reported similar to Arctic deposit (AR025). Horse Creek it is a highly complex deformed sequence of predominantly country rock schists and greenstones. Exposures are found along a prominent north-south trending cliff. Two inter-layered sequences of 'package' rocks have been identified; and contain the Cliff North/Horse Creek mineral showings. The Horse Creek occurrence is on the north limb of an overturned syncline and the Cliff North (described in more detail separately) occurrence is on the south limb (Ellis, 1980).

Alteration:

Quartz, chlorite, calcite, and sericite alteration is associated with mineralization; there is also sericite-altered quartz -muscovite-schist (Ellis, 1980).

Age of mineralization:

Devonian, based on age of host rock (Ellis, 1980).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Initial exploration efforts started in the early 1970s. Exploration efforts include geochemical surveys such as rock, soil, and stream sediment sampling, hand trenching, geologic mapping, geophysical surveys that included induced polarity (IP) and electromagnetic (EM) surveys, and diamond core drilling of eight drill holes. The majority of this work was completed between 1976 and 1980 (Ellis, 1980).

Production notes:

None.

Reserves:

None.

Additional comments:

This massive sulfide prospect is in the Ambler schist belt. Nana Development Corporation information based on a 1984 unpublished Bear Creek Exploration report.

Cliff North and Cliff South are referred to in this record generally as 'Cliff'. In 2014, Cliff North and Cliff South were created as a separate records from Horse Creek since both are on separate parts of a large overturned syncline and the prospects are separated by about a mile from Horse Creek (W.T. Ellis, Vice President, Alaska Earth Sciences, Inc., oral commun., 2014).

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Degenhart, C.E., Griffis, R.J., McQuat, J.F., and Bigelow, C.G., 1978, Mineral studies of the western Brooks Range performed under contract to the U.S. Bureau of Mines, Contract #JO155089: U.S. Bureau of Mines Open-File Report 103-78, 529 p., 11 sheets.

Ellis, W.T., 1980, Ambler River Project, Alaska, Project Memorandum No. 7, Summary Report of Past Field Investigations and 1980 Field Investigations, Sunshine Mining Company, 114 p. (Report held at Alaska Earth Sciences, Inc., Anchorage, AK).

Hitzman, M.W., Smith, T.E., and Proffett, J.M., Jr., 1982, Bedrock geology of the Ambler district, southwestern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 75, 2 sheets, scales 1:125,000, and 1:166,667.

Mayfield, C.F., and Grybeck, D., 1978, Mineral occurrences and resource map of the Ambler River quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-120-I, 1 sheet, scale 1:250,000.

Sicherman, H.A., Russell, R.H., and Fikkan, P.R., 1976, The geology and mineralization of the Ambler district, Alaska: Spokane, Wash., Bear Creek Mining Company, 22 p.

Primary Reference: Ellis, 1980

Reporter(s): K.R. Leonard (USGS), R.L. Elliott (USGS), J.M. Schmidt (USGS), S.W. Nelson (USGS retired); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-03-11

Site name(s): Smucker; Charlie; Patti; Puzzle; Ambler 4-B

Site type: Prospect

ARDF no.: AR033

Latitude: 67.298 **Quadrangle:** AR B-3

Longitude: 157.1609

Location description and accuracy:

Located on ridge east of VABM Sleet in NW1/4 NW1/4, 0.6 mile from the center of section 20, T. 22 N., R. 8 E., of the Kateel River Meridian. Prospect at approximately 1,400 ft in elevation. Accurately located to within 300 ft.

Commodities:

Main: Ag, Cu, Pb, Zn

Other: Au

Ore minerals: Chalcopyrite, galena, owyheeite, pyrite, sphalerite

Gangue minerals: Calcite, chlorite, muscovite, quartz, sericite

Geologic description:

Layered sulfide zone 9 ft to 27 ft. (3 m to 9 m) thick, continuos for at least 6000 ft (2000 m) along strike, consists of banded, fine to medium grained pyrite, sphalerite, galena, chalcopyrite and minor owyheeite in a silica-calcite-pyrite matrix. The country rocks are characteristic of the Devonian-Mississippian Ambler sequence and consist dominantly of well-foliated porphyroblastic quartz-feldspar-muscovite-chlorite schist interlayered with quartz-muscovite-chlorite phyllite, graphitic phyllite, calcite-mica schist and marble. Mineralized zone is repeated by complex folding (Nana Development Corp., written communication, 1997).

Alteration:

No hydrothermal alteration of wall rock evident (Hitzman and others, 1986).

Age of mineralization:

Devonian (Hitzman and others, 1986).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Active?

Workings/exploration:

Surface geologic mapping, geochemical sampling (soil grids), electromagnetic measurements, magnetometer measurements, and eight drill holes by 1984 (Nana Development Corp., written communication, 1997). According to Mayfield and Grybeck (1978) two drill samples 2400 ft (820 m) apart intersected layered sulfide zones 9 ft. to 27 ft. (3 m to 9 m) thick assaying 100 g/ton Ag, 2-8 percent Zn and 1-1.6 percent Pb. Grades from drill samples indicated 3.8 percent Zn, 1.2 to 1.6 percent Pb, 69-514 g/ton Ag.

Production notes:

None.

Reserves:

Hitzman and others (1986) report greater than eight million metric tons grading 0.8 percent Cu, 6.8 percent Zn, 2.3 percent Pb, 200 g/ton Ag. Bundtzen (1996) reported 'significant' tonnage grading 1.5 percent Pb, 5 percent-10 percent Zn, 103-343 g/ton Ag, and minor Au.

Additional comments:

Excellent example of stratiform volcanogenic sulfide deposit typical of the Ambler sequence in the southern Brooks Range. This is the westernmost known occurrence of this type deposit in the southern Brooks Range. All available data suggest Smucker to be relatively significant in size (Hitzman and others, 1986).

This location was changed in 2014 from the 1997 version of this record. The 1997 version was mislocated (W.T. Ellis, Vice President, Alaska Earth Sciences, Inc., oral commun., 2014).

References:

Bundtzen, T.K., Swainbank, R.C., Clough, A.H., Henning, M.W., and Charlie, K.M., 1996, Alaska's mineral industry, 1995: Alaska Division of Geological and Geophysical Surveys Special Report 50, 72 p.

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Eakins, G.R., Bundtzen, T.K., Lueck, L.L. Green, C.B., Gallagher, J.L., and Robinson, M.S., 1985, Alaska mineral industry, 1984: Alaska Division of Geological and Geophysical Surveys Special Report 38, 57 p.

Hitzman, M.W., Profett, J.M., Jr., Schmidt, J.M., and Smith, T.E., 1986, Geology and mineralization of the Ambler district, northwestern Alaska: Economic Geology, v. 81, p. 1592-1618.

Hitzman, M.W., Smith, T.E., and Proffett, J.M., Jr., 1982, Bedrock geology of the Ambler district, southwestern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 75, 2 sheets, scales 1:125,000, and 1:166,667.

Mayfield, C.F., and Grybeck, D., 1978, Mineral occurrences and resource map of the Ambler River quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-120-I, 1 sheet, scale 1:250,000.

Primary Reference: Hitzman and others, 1986

Reporter(s): K.R. Leonard (USGS), R.L. Elliott (USGS), J.M. Schmidt (USGS), S.W. Nelson (USGS retired); A. Angel (Alaska Earth Sciences, Inc.); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-03-11

Site name(s): Kogo

Site type: Prospect

ARDF no.: AR066

Latitude: 67.241 **Quadrangle:** AR A-1

Longitude: 156.411

Location description and accuracy:

The prospect is equidistant between the Shungnak and Kogoluktuk Rivers in the NW1/4 Section 10, T. 21 N., R. 11 E., of the Kateel River Meridian. The prospect is at an approximate elevation of 2,600 ft. The location is accurate within 1000 feet.

Commodities:

Main: Ag, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, pyrite, pyrrhotite, sphalerite

Gangue minerals: Calcite, graphite, quartz, sericite, talc

Geologic description:

The Kogo prospect can be divided into two distinct sequences. The north and east rocks consist predominantly of metasediments and metavolcanics (greenstone). To the south and west a sequence exists consisting of metasediments, carbonate schists, black schists, white schists, marbles, rhyolites. The mineralized occurrence is semi-massive to disseminated sulfides in the metavolcanic schists. The greenstone host rock has been complexly folded and faulted (Ellis, 1980).

The deposit was first discovered in 1974 as a hydrogeochemical anomaly; a copper-precipitating spring was reported to Sunshine Mining Company by R.R. Walters. A white precipitate coated rocks downstream from the spring (Ellis, 1980).

Alteration:

Quartz, sericite, and pyrite alteration is associated with mineralization (Ellis, 1980).

Age of mineralization:

Devonian, based on age of host rock (Ellis, 1980).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Inactive

Workings/exploration:

Initial exploration efforts started in the mid-1970s. Exploration efforts included geochemical surveys such as rock, soil, and stream sediment sampling, mapping, geophysical induced polarity (IP) survey, and two shallow exploration diamond core holes. This work was done to determined the cause of the anomalous stream sediments, which was speculated to derive from a deeply buried metalized source. Despite the geophysical work, a mineralized source was not found. A 50 foot mineralized drill section averaged about 0.02 percent silver, 0.05 percent zinc, 0.1 percent copper, and 0.4 percent lead in hole Kogo-1. The majority of this work was completed between 1976 and 1980 by Sunshine Mining Company (Ellis, 1980).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Ellis, W.T., 1980, Ambler River Project, Alaska, Project Memorandum No. 7, Summary Report of Past Field Investigations and 1980 Field Investigations, Sunshine Mining Company, 114 p. (Report held at Alaska Earth Sciences, Inc., Anchorage, AK).

Hitzman, M.W., Profett, J.M., Jr., Schmidt, J.M., and Smith, T.E., 1986, Geology and mineralization of the Ambler district, northwestern Alaska: Economic Geology, v. 81, p. 1592-1618.

Hitzman, M.W., Smith, T.E., and Proffett, J.M., Jr., 1982, Bedrock geology of the Ambler district, southwestern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 75, 2 sheets, scales 1:125,000, and 1:166,667.

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Sicherman, H.A., Russell, R.H., and Fikkan, P.R., 1976, The geology and mineralization of the Ambler district, Alaska: Spokane, Wash., Bear Creek Mining Company, 22 p.

Primary Reference: Ellis, 1980

Reporter(s): A. Angel (Alaska Earth Sciences, Inc.); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-03-11

Site name(s): Cliff North

Site type: Prospect

ARDF no.: AR067

Latitude: 67.295 **Quadrangle:** AR B-2

Longitude: 156.706

Location description and accuracy:
Located equidistant between the Ambler and Shunghak Rivers, section 22 T. 22 N., R. 10 E., of the Kateel River Meridian at approximately 3,500 ft in elevation. The coordinates are accurate to within 500 ft.

Commodities:

Main: Ag, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, pyrite, sphalerite

Gangue minerals: Calcite, quartz, sericite

Geologic description:
The Cliff South prospect is in a highly complex deformed sequence of predominantly country rock schists and greenstones. Exposures are found along a prominent north-south trending cliff. Two inter-layered sequences of metamorphosed Devonian-Mississippian volcanic, volcaniclastic, and sedimentary rocks have been identified; these contain the Cliff North/Horse Creek and Cliff South mineral showings. The structure is very complicated and all three prospects are different parts of a larger structure. The Horse Creek (AR029) occurrence is on the north limb of an north-dipping overturned syncline, the Cliff North occurrence is on the south limb of the overturned syncline, while Cliff South is on the open south limb of a corresponding overturned anticline between Cliff South and Cliff North (Ellis, 1980).
Mineralization is characterized by copper, lead, zinc, and silver occurring as massive, semi-massive, and disseminates sulfide found in outcrop and by diamond drilling. Detailed mapping of this zone indicated that the mineral horizons contain widespread mineralization, with locally calcareous lenses of massive sulfides up to 8 feet thick (Ellis, 1980).

Alteration:
Strong sulfide oxidation. Quartz, chlorite, calcite, and sericite alteration is associated with mineralization; there is also sericite-altered quartz -muscovite-schist (Ellis, 1980).

Age of mineralization:
Devonian, based on age of host rock (Ellis, 1980).

Generic deposit model:

Deposit model:
Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
28a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Initial exploration efforts started in the early 1970s. Exploration efforts to date includes geochemical surveys such as rock, soil, and stream sediment sampling, hand trenching, geophysical surveys that included induced polarity (IP) and electromagnetic (EM) surveys, and diamond core drilling. Most of the drill holes contained two mineralized zones that averaged 8 to 14 feet thick. They averaged from 0.3 to 1.4 percent copper, 0.6 to 1.9 percent lead, 2.5 to 5.5 percent zinc, and 0.5 to 2.0 ounces per ton silver. Rock chip samples have assayed as high as 2.7 percent copper, 3.9 percent lead, 8,4 percent zinc, and 4.6 ounces per ton silver. A high conductive geophysical anomaly correlates with anomalous geochemical samples. The majority of this work was completed between 1976 and 1980 by Sunshine Mining Company (Ellis, 1980).

Production notes:

None.

Reserves:

In 1980, Sunshine Mining Company estimated a geologic reserve of 6.5 million tons ore grading 0.5 percent Cu, 1.0 opt Ag, 0.9 percent Pb, and 2.5 percent Zn (ELlis, 1980).

Additional comments:

Cliff North is referred to under Horse Creek (AR029) generally as 'Cliff'. In 2014, Cliff North was created as a separate record from Horse Creek since both are on separate parts of a large overturned syncline and the prospects are separated by about a mile (W.T. Ellis, Vice President, Alaska Earth Sciences, Inc., oral communication, 2014).

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Ellis, W.T., 1980, Ambler River Project, Alaska, Project Memorandum No. 7, Summary Report of Past Field Investigations and 1980 Field Investigations, Sunshine Mining Company, 114 p. (Report held at Alaska Earth Sciences, Inc., Anchorage, AK).

Ellis, W.T., 1983, Ambler River Project, Alaska, Project Memorandum No. 10, 1983 Field Investigations, Sunshine Mining Company, 49 p. (Report held at Alaska Earth Sciences, Inc., Anchorage, AK).

Hitzman, M.W., Profett, J.M., Jr., Schmidt, J.M., and Smith, T.E., 1986, Geology and mineralization of the Ambler district, northwestern Alaska: Economic Geology, v. 81, p. 1592-1618.

Hitzman, M.W., Smith, T.E., and Proffett, J.M., Jr., 1982, Bedrock geology of the Ambler district, southwestern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 75, 2 sheets, scales 1:125,000, and 1:166,667.

Mayfield, C.F., and Grybeck, D., 1978, Mineral occurrences and resource map of the Ambler River quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-120-I, 1 sheet, scale 1:250,000.

Sicherman, H.A., Russell, R.H., and Fikkan, P.R., 1976, The geology and mineralization of the Ambler district, Alaska: Spokane, Wash., Bear Creek Mining Company, 22 p.

Primary Reference: Ellis, 1980

Reporter(s): A. Angel (Alaska Earth Sciences, Inc.); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-03-11

Site name(s): Cliff South

Site type: Prospect

ARDF no.: AR068

Latitude: 67.278 **Quadrangle:** AR B-2

Longitude: 156.683

Location description and accuracy:

Approximately 1.5 miles west of the Shunghak Rivers, section 29, T. 22 N., R. 10 E., of the Kateel River Meridian, at approximately 3,200 ft in elevation. The coordinates are accurate to within 500 feet.

Commodities:

Main: Ag, Cu, Pb, Zn

Other:

Ore minerals:

Gangue minerals: Calcite, quartz, sericite

Geologic description:

The Cliff South prospect is in a highly complex deformed sequence of predominantly country rock schists and greenstones. Exposures are found along a prominent north-south trending cliff. Two inter-layered sequences of metamorphosed Devonian-Mississippian volcanic, volcaniclastic, and sedimentary rocks have been identified; these contain the Cliff North/Horse Creek and Cliff South mineral showings. The structure is very complicated and all three prospects are different parts of a larger structure. The Horse Creek (AR029) occurrence is on the north limb of an north-dipping overturned syncline, the Cliff North occurrence is on the south limb of the overturned syncline, while Cliff South is on the open south limb of a corresponding anticline between Cliff South and Cliff North (Ellis, 1980).

Mineralization is characterized by copper, lead, zinc, and silver occurring as massive, semi-massive, and disseminates sulfide found in outcrop and by diamond drilling. Detailed mapping of this zone indicated that the mineral horizons contain widespread mineralization, with locally calcareous lenses of massive sulfides up to 8 feet thick (Ellis, 1980).

Alteration:

Age of mineralization:

Devonian, based on age of host rock (Ellis, 1980).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Initial exploration efforts started in the mid 1970s. Exploration efforts to date includes geochemical surveys such as rock, soil, and stream sediment sampling, geophysical surveys that included induced polarity (IP) and electromagnetic (EM) survey, and three diamond drill holes. Gossan samples assayed as high as 13,000 parts per million (ppm) Cu, 19,000 ppm Pb, 9,000 ppm Zn, and 220 ppm Ag. The mineralized zones in drill holes averaged 25 feet thick of 0.25 percent copper, 1.0 lead, 3.0 percent zinc and 1.0 ounce per ton silver. The majority of this work was completed between 1976 and 1983 by Sunshine Mining Company (Ellis, 1980, 1983).

Production notes:

None.

Reserves:

None.

Additional comments:

Cliff South is referred to under Horse Creek (AR029) generally as 'Cliff'. In 2014, Cliff South (and Cliff North) was created as a separate record from Horse Creek since both are on separate parts of a large overturned syncline and the prospects are separated by about a mile (W.T. Ellis, Vice President, Alaska Earth Sciences, Inc., oral communication, 2014).

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Ellis, W.T., 1980, Ambler River Project, Alaska, Project Memorandum No. 7, Summary Report of Past Field Investigations and 1980 Field Investigations, Sunshine Mining Company, 114 p. (Report held at Alaska Earth Sciences, Inc., Anchorage, AK).

Ellis, W.T., 1983, Ambler River Project, Alaska, Project Memorandum No. 10, 1983 Field Investigations, Sunshine Mining Company, 49 p. (Report held at Alaska Earth Sciences, Inc., Anchorage, AK).

Hitzman, M.W., Profett, J.M., Jr., Schmidt, J.M., and Smith, T.E., 1986, Geology and mineralization of the Ambler district, northwestern Alaska: Economic Geology, v. 81, p. 1592-1618.

Hitzman, M.W., Smith, T.E., and Proffett, J.M., Jr., 1982, Bedrock geology of the Ambler district, southwestern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 75, 2 sheets, scales 1:125,000, and 1:166,667.

Mayfield, C.F., and Grybeck, D., 1978, Mineral occurrences and resource map of the Ambler River quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-120-I, 1 sheet, scale 1:250,000.

Sicherman, H.A., Russell, R.H., and Fikkan, P.R., 1976, The geology and mineralization of the Ambler district, Alaska: Spokane, Wash., Bear Creek Mining Company, 22 p.

Primary Reference: Ellis, 1980

Reporter(s): A. Angel (Alaska Earth Sciences, Inc.); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-03-11

Site name(s): Bud

Site type: Prospect

ARDF no.: AR069

Latitude: 67.219 **Quadrangle:** AR A-2

Longitude: 156.68

Location description and accuracy:

The Bud prospect is located in section 16, T. 21 N., R. 10 E., of the Kateel River Meridian, at an elevation of approximately 2,600 ft. This location is accurate to within 1000 feet.

Commodities:

Main: Ag, Cu, Zn

Other: Au, Pb

Ore minerals: Chalcopyrite, galena, gold, pyrite, silver, sphalerite

Gangue minerals: Calcite, quartz, sericite

Geologic description:

The Bud Prospect hosted in Ambler sequence of metamorphosed Devonian and Mississippian volcanic, volcaniclastic, and sedimentary rocks. Ore minerals are concentrated in a felsic tuffaceous sedimentary section of rocks containing numerous basalt sills and flows immediately above a basal carbonate section (Hitzmann and others, 1986).

The local stratigraphy at Bud include over 700 feet of white-green quartz mica schist, non-porphyritic white rhyolite, button schist, porphyroblastic white schist, graphite schist, and varieties of mafic metacarbonate and greenstone. Both footwall and hanging wall units are composed of quartz-chlorite-muscovite schist. In general, the entire sequence has an average strike of on N 70 W, and dips southward at 35 to 50 degrees. The mineralized horizon at Bud is stratigraphically the same as the Sunshine Creek (AR028), prospect approximately 1 mile to the east (Ellis, 1984).

Alteration:

Quartz, chlorite, calcite, and sericite alteration is associated with mineralization (Ellis, 1980).

Age of mineralization:

Devonian, based on age of host rock (Ellis, 1984).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Active?

Workings/exploration:

Initial exploration efforts started in the mind 1970s and includes surveys such as soil, stream sediment, and rock sampling, hand trenching, geologic mapping, geophysical surveys, and 3,670 ft of diamond core drilling in seven holes. Exploration was completed by Sunshine Mining Company in 1974 and subsequent exploration through drilling was completed Anaconda Copper Company. The discovery gossan contains 0.05 to 0.25 ounces per ton gold. Drill hole Bud 87-03 assayed 1.7 percent copper, 0.41 percent lead, 1.5 percent zinc 2.0 ounce per tonne silver and 0.017 ounce per ton gold (Ellis, 1984).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Ellis, W.T., 1980, Ambler River Project, Alaska, Project Memorandum No. 7, Summary Report of Past Field Investigations and 1980 Field Investigations, Sunshine Mining Company, 114 p. (Report held at Alaska Earth Sciences, Inc., Anchorage, AK).

Hitzman, M.W., Smith, T.E., and Proffett, J.M., Jr., 1982, Bedrock geology of the Ambler district, southwestern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 75, 2 sheets, scales 1:125,000, and 1:166,667.

Hitzman, M.W., Profett, J.M., Jr., Schmidt, J.M., and Smith, T.E., 1986, Geology and mineralization of the Ambler district, northwestern Alaska: Economic Geology, v. 81, p. 1592-1618.

Mayfield, C.F., and Grybeck, D., 1978, Mineral occurrences and resource map of the Ambler River quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-120-I, 1 sheet, scale 1:250,000.

Sicherman, H.A., Russell, R.H., and Fikkan, P.R., 1976, The geology and mineralization of the Ambler district, Alaska: Spokane, Wash., Bear Creek Mining Company, 22 p.

Primary Reference: Ellis, 1980

Reporter(s): A. Angel (Alaska Earth Sciences, Inc.); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-03-11

Site name(s): Ambler

Site type: Prospect

ARDF no.: AR070

Latitude: 67.277 **Quadrangle:** AR B-3

Longitude: 157.048

Location description and accuracy:

The Ambler prospect is located 2.0 miles east of Kaluriuik Creek at an elevation of 1,900 feet; in section 26, T. 22 N., R. 8 E., of the Kateel River Meridian. The location is accurate to within 500 feet.

Commodities:

Main: Ag, Zn

Other: Au, Cu, Pb

Ore minerals: Galena, pyrite, silver, sphalerite

Gangue minerals: Calcite, quartz, sericite

Geologic description:

The Ambler prospect consists of a rhyolite dome approximately 1000 feet thick, overlain by 500 feet of layered schistose rhyolites and quartz latites, which include ignimbrites and sedimentary equivalents. The rhyolite dome footwall contact is with a calc mica schist sequence, with numerous marble and graphitic schist interbeds and thin cherty semi- to massive-sulfides. The footwall of the calc-schist unit consists of quartz-chlorite-muscovite schist, which extends for several miles to the north. The hanging wall of the rhyolite sequence consists of interbedded greenstone, calc-schist, black graphitic schist and gossanous quartz-muscovite schist. These rocks dip gently to the south and are overlain by massive greenstone and quartz-chlorite-muscovite country rock schist. At the top of the layered rhyolite sequence is a gossan vent about 40 feet thick, which has been interpreted to be an inactive degassing zone from a local fumarolic center, supported by a fragmental to vuggy rock texture and local silicification (Modroo,1983).

Mineralization consists of sulfide accumulations that are interpreted to be associated with the vent degassing area. They occur as banded base metal sulfides associated with massive chert units (Modroo, 1983).

Drill holes were completed on adjacent claims (to the south and east) by Cominco, which reported 3 to 15 feet thick silver bearing massive sulfides. Assays from an outcropping massive sulfide lens with cherty interbeds ran as high as 0.006 ounce of gold per ton, 4.96 ounces of silver per ton, 10 percent zinc, 0.78 percent lead, and 0.30 percent copper (Modroo,1983).

Alteration:

Quartz, chlorite, calcite, and sericite alteration is associated with mineralization (Modroo, 1983).

Age of mineralization:

Devonian, based on age of host rock (Modroo,1983).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Anaconda Minerals Company explored the Ambler prospect claims from 1975 to 1982; past work consisted of geologic mapping, geochemical and geophysical surveys, and 2,981 feet of diamond drilling in six holes by Anaconda Copper Company. Additional drill holes have been completed on adjacent claims (to the south and east) by Cominco, which reported 3 to 15 feet thick silver bearing massive sulfides. Assays from an outcropping massive sulfide lens with cherty interbeds ran as high as 0.006 ounce of gold per ton, 4.96 ounces of silver per ton, 10 percent zinc, 0.78 percent lead, and 0.30 percent copper (Modroo,1983).

Production notes:

None.

Reserves:

None.

Additional comments:

This record was created to give Ambler a separate record from Arctic (AR025). As of 2012, the two prospects were grouped together despite that they are separate prospects and Ambler is located 19 miles from the Arctic deposit. Both sites are in the Ambler district.

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Modroo, E.R., 1983, Ambler River Project, Alaska, Project Memorandum No. 10, 1983 Field Investigations, Sunshine Mining Company, 49 p. (Report held at Alaska Earth Sciences, Inc., Anchorage, AK).

Primary Reference: Modroo,1983

Reporter(s): A. Angel and V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): South Reef

Site type: Prospect

ARDF no.: AR071

Latitude: 67.065 **Quadrangle:** AR A-2

Longitude: 156.91

Location description and accuracy:

Approximately 3,500 feet east southeast of Bornite (AR018) at an elevation of 1,200 feet; section 9, T. 19 N., R. 9 E., of the Kateel River Meridian. This location is accurate to within 500 feet.

Commodities:

Main: Cu

Other: Ag, Co, Zn

Ore minerals: Bornite, chalcocite, chalcopyrite

Gangue minerals: Barite, dolomite

Geologic description:

The geology of the South Reef deposit is composed of alternating beds of carbonate rocks (limestone and dolostone) and calcareous phyllite. Limestone transitions laterally into dolostone, which hosts the majority of the mineralization and is considered to be hydrothermal in origin. Spatial relationships and petrographic work establish dolomitization as genetically related to early stages of the copper mineralizing system (Hitzman, 1986).

Copper mineralization in the South Reef zone consists of one to three mineralized intervals (at a 0.5 percent cut-off) coalescing into a crudely stratiform body hosted in secondary dolomite developed at or near the Iron Mountain structure. The body, which is 250 to 300 meters wide and 750 meters long varies in true thickness from roughly 10 meters to as much as 170 meters (Davis and others, 2014).

The South Reef deposit is located within the Arctic Alaska Terrane, a sequence of mostly Paleozoic continental margin rocks that make up the Brooks Range and North Slope of Alaska (Moore, 1992). It is within the Phyllite Belt geologic subdivision, which together with the higher-grade Schist Belt, stretches almost the entire length of the Brooks Range and is considered to represent the hinterland of the Jurassic Brooks Range orogeny. The southern margin of the Phyllite Belt is marked by melange and low angle faults associated with the Kobuk River fault zone, while the northern boundary is thought to be gradational with the higher-grade metamorphic rocks of the Schist Belt (Till and others, 2008).

Alteration:

Dolomitization (Davis and others, 2014).

Age of mineralization:

Sulfide mineralization (chalcopyrite, pyrite, and bornite) from Bornite (Ruby Creek) was dated by Re-Os techniques (Selby and others, 2009), producing an age of 384 ± 4.2 Ma for main stage copper mineralization.

Generic deposit model:

Deposit model:

Mississippi Valley or Olympic Dam similarities? Kipushi Cu-Co deposit? (Cox and Singer, 1986, model 32c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

32c?

Production Status: Undetermined

Site Status: Active

Workings/exploration:

South Reef was discovered during recent work (2006-2012) near the Bornite (AR018) prospect by NovaCopper. Twenty one drill holes have been completed at the South Reef deposit as of winter 2014. The 2012 drilling defined an approximately 250 to 300 meters wide by 750 meters long zone of mineralization at South Reef. Based on the drilling results, using a 1 percent copper cut-off, there is an inferred resource of 43.1 million tonnes of 2.54 percent copper (Davis and others, 2014).

Production notes:

None.

Reserves:

The 2012 drilling defined an approximately 250 to 300 meters wide by 750 meters long zone of mineralization at South Reef. Based on the drilling results, using a 1 percent copper cut-off, there is an inferred resource of 43.1 million tonnes of 2.54 percent copper (Davis and others, 2014).

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Davis, B., Sim, R., Austin, J., 2014, NovaCopper Inc., NI 43-101 technical Report on the Bornite Project, Northwest Alaska, USA, 152 p. (posted on www.sedar.com, on April 1, 2014) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00033050&fileName=/csfsprod/data149/filings/02188430/00000002/t%3A%5CNovaCopper%5CSEDAR%5CTechnical_Report_novacopper.pdf (as of December 16, 2014).

Hitzman, M.W., 1986, Geology of the Ruby Creek Copper Deposit: Economic Geology, 81, 1644-1674 p.

Moore, T.E., 1992, The Arctic Alaska superterrane, in Bradley, D.C. and Dusel-Bacon, C., ed., Geologic studies in Alaska by the U.S. Geological Survey, 1991: U.S. Geological Survey Bulletin 2041, p. 238-244.

Selby, D., Kelley, K., Hitzman, M., and Zieg, J., 2009, Re-Os sulfide (bornite-chalcopyrite, and pyrite) systematics of the carbonate-hosted copper deposits at Ruby Creek, southern Brooks Range, Alaska: Economic Geology, 104, 437-444 p.

Till, A.B., Dumoulin, J.A., Harris, A.G., Moore, T.E., Bleick, H.A., and Siwiec, B.R., 2008, Bedrock Geologic Map of the Southern Brooks Range, Alaska and Accompanying Conodont data: U.S. Geological Survey Open File Report 2008-1149.

Primary Reference: Davis and others, 2014

Reporter(s): A. Angel and V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Huff; Spud

Site type: Prospect

ARDF no.: BC001

Latitude: 56.4843 **Quadrangle:** BC B-6

Longitude: 131.9864

Location description and accuracy:

The mineralization at this prospect occurs for about 300 feet along a north-northwest trending band of gneiss and marble. The center of the mineralization is just east of the toe of the Nelson Glacier about 0.3 mile northeast of the center of section 21, T. 62 S., R. 86 E., of the Copper River Meridian. The location is accurate. Still and others (2002) include a detailed map of the prospect.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, pyrrhotite, sphalerite

Gangue minerals: Fluorite, quartz

Geologic description:

This prospect was first located by Bill Huff in 1963 (Race, 1963, Still and others, 2002). From 1965 to 1992 it was optioned to a succession of companies: Bunker Hill Mining Company; Humble Oil and Refining Company; Watts, Griffis, and McQuatt; AMAX Exploration Company, and El Paso National Gas Company who mapped and sampled the prospect, did a geophysical survey, and drilled two holes, 99 and 149 feet long.

The country rocks in the general area of this prospect are Mesozoic or Paleozoic pelitic schist and paragneiss, with subordinate amphibolite and marble (Koch, 1996, 1997, Gault and others, 1953; George and Wyckoff, 1973). The mineralization occurs in a marble bed about 30 feet thick that is mineralized for about 300 feet (Still and others, 2002). Irregular masses and bands of pyrrhotite, galena, sphalerite, and chalcopyrite 0.5 to 15 feet thick replace the marble in the hanging wall. These sulfides and the mineralized marble are cut by thin, cross fractures that pinch and swell and locally contain vuggy fluorite-quartz pods and lenses with some galena and sphalerite. These fractures may be the conduits for the fluids that formed the sulfide replacements in the marble. The mineralization is probably related to a nearby 16.2 Ma biotite granite (see PE040).

Still and others (2002) collected 5 samples across the massive, replacement mineralization. They contained 46.7 parts per million (ppm) to 4.6 ounces of silver per ton, 2.688 to 7,330 ppm copper, 3.28 to 20.08 percent lead, and 6.9 to 22.68 percent zinc. Three, 4- to 6-foot samples collected by El Paso across this mineralization contained 3.09 to 19.69 ounces of silver per ton, 0.7 to 1.2 percent copper, 15.9 to 24.9 percent lead, and 7.1 to 9.3 percent zinc (George and Wyckoff, 1973). A geophysical survey by El Paso identified a large conductor over the exposed mineralization that suggests more extensive mineralization at depth. A 149-foot hole into this anomaly cut 7 feet of mineralization at a depth of about 85 feet that contained 1.40 ounce of silver per ton, 0.3 percent copper, 7.40 percent lead, and 4.30 percent zinc. Still and others (2002) also collected several samples of the cross fractures with fluorite with vuggy fluorite and quartz from 150 to 2,400 feet away from the main galena-sphalerite replacement deposits in the marble. The best contained 2,166 ppm gold, 228.40 ounces of silver per ton, 6.24 percent lead, and 4.40 percent zinc.

Alteration:

Age of mineralization:

Probably related to a nearby 16.2 Ma biotite granite pluton as are other deposits in the Groundhog Basin area.

Generic deposit model:

Deposit model:

Lead-zinc replacement deposit in marble; cut by fractures with pods and lenses of vuggy fluorite and quartz with minor galena and sphalerite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

This prospect was first located by Bill Huff in 1963 (Race, 1963; Still and others, 2002). From 1965 to 1992 it was optioned to a succession of companies: Bunker Hill Mining Company; Humble Oil and Refining Company; AMAX Exploration Company; and El Paso National Gas Company. The El Paso National Gas Company who mapped and sampled the prospect, did geophysical surveys and drilled two holes, 99 and 149 feet long.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Elliott, R.L., and Koch, R.D., 1981, Mines, prospects, and selected metalliferous mineral occurrences in the Bradfield Canal quadrangle, Alaska: U.S. Geological Survey Open-File Report 81-728-B, 23 p., 1 sheet, scales 1:250,000 and 1:63,360.

Gault, H.R., Rossman, D.L., Flint, G.M., Jr., and Ray, R.G., 1953, Some lead-zinc deposits of the Wrangell district, Alaska: U.S. Geological Survey Bulletin 998-B, p. 15-58.

George, R.H., and Wyckoff, B.S., 1973, Whistlepig mineral exploration program, Alaska, Final report 1972 (with attached diamond drill hole logs and analyses): Unpublished El Pas National Gas Company report 109 p. 12 sheets (available at the Bureau of Land Management, Minerals Information Center, Juneau Alaska)

Koch, R.D., 1996 (in press), Reconnaissance geologic map of the Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report, 1 sheet, scale 1:250,000.

Koch, R.D., 1997 (in press), Metalliferous mineral resource potential in the Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report, 1 sheet, scale 1:250,000.

Race, W.H., 1963, Property examination report, J.W. Huff prospect, lower east side of Nelson Glacier,

Bradfield Canal (B6) quadrangle; Alaska Division of Mines and Minerals Property Examination 118-3, 7 p.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

U.S. Bureau of Mines, 1979, Claim map 118: Mines and prospects of the Bradfield Canal quadrangle, Alaska: U.S. Bureau of Mines Open-File Report 20-73, 1 sheet, scale 1:250,000.

Primary Reference: Still and others, 2002

Reporter(s): H. C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Copper King

Site type: Prospect

ARDF no.: BC002

Latitude: 56.4404 **Quadrangle:** BC B-6

Longitude: 131.9644

Location description and accuracy:

The Copper King prospect is 1.5 mile southeast of Berg Mountain at an elevation of about 1,300 feet about 0.6 mile northeast of the center of section 3, T 63 S., R, 80 E., of the Copper River Meridian. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Zn

Other:

Ore minerals: Chalcopyrite, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The country rocks in the general area of the Copper King prospect are Mesozoic or Paleozoic pelitic schist and paragneiss and subordinate amphibolite and marble (Koch, 1996, 1997). As mapped by George and Wyckoff (1973), the rocks have been metamorphosed to upper greenschist of lower amphibolite facies quartz-mica schists and hornblende-biotite-pyroxene-feldspar gneiss; rhyolite sills parallel the foliation.

The Copper King prospect was staked in 1906 and restaked in 1951 (Chapin, 1916; Chapin, 1918, Berg and Cobb, 1967). Williams (1957) described the deposit as a 4.5-foot-thick quartz vein with sulfides that is exposed for about 45 feet along a small creek and in a 9-foot-deep shaft. A sample from the dump of the shaft contained 3.3 percent zinc and a trace of copper. Still and others (2002) located a quartz vein in place that contains sphalerite, chalcopyrite, and pyrite. A 0.7-foot sample across the vein contained 18.9 parts per million (ppm) silver, 5,639 ppm copper, and 2.1 percent zinc. A sample from the dump of the shaft contained 12 ppm silver, 4,694 ppm copper, and 1.9 percent zinc. They also located a quartz vein about 750 feet northwest of the shaft along a small creek. A 1.6-foot sample contained 679 parts per billion gold.

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Quartz vein with sulfides.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

The Copper King prospect was staked in 1906 and restaked in 1951 (Chapin, 1916; Chapin, 1918, Berg and Cobb, 1967). Williams (1957) described the deposit as a 4.5-foot-thick quartz vein with sulfides that is exposed for about 45 feet along a small creek and in a 9-foot-deep shaft. Examined by Still and others (2002) as part of a regional mineral assessment by the Bureau of Land Management.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Chapin, Theodore, 1916, Mining developments in southeastern Alaska: U.S. Geological Survey Bulletin 642-B, p. 73-104.

Chapin, Theodore, 1918, Mining developments in the Ketchikan and Wrangell mining districts: U.S. Geological Survey Bulletin 662-B, p. 63-75.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Bradfield Canal quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-922, 98 p.

Elliott, R.L., and Koch, R.D., 1981, Mines, prospects, and selected metalliferous mineral occurrences in the Bradfield Canal quadrangle, Alaska: U.S. Geological Survey Open-File Report 81-728-B, 23 p., 1 sheet, scales 1:250,000 and 1:63,360.

George, R.H., and Wyckoff, B.S., 1973, Whistlepig mineral exploration program, Alaska Final report (1972) (with attached diamond drill hole logs, and analyses: Unpublished El Paso National Gas Company report, 109 p., 12 sheets (available at the Bureau of Land Management Minerals Information Center, Juneau, Alaska).

Koch, R.D., 1996 (in press), Reconnaissance geologic map of the Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report, 1 sheet, scale 1:250,000.

Koch, R.D., 1997 (in press), Metalliferous mineral resource potential in the Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report, 1 sheet, scale 1:250,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Williams, J.A., 1957, Copper King prospect, Bradfield Canal quadrangle, copper: Alaska Territorial Department of Mines Prospect Evaluation PE 118-2, 5. p.

Primary Reference: Still and others, 2002

Reporter(s): H. C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Berg

Site type: Prospect

ARDF no.: BC003

Latitude: 56.3967 **Quadrangle:** BC B-6

Longitude: 131.9435

Location description and accuracy:

This prospect is said to consist of claims that were staked as early as 1907 on the north side of Berg Basin somewhere between the mouths of Berg Creek and Aaron Creeks. The location is poorly known and the propect may easily be a mile or more from the coordinates in section 23, T. 65 S., R. 86 E., of the Copper River Meridian. However, there is little information about the Berg prospect. Early reports describing it (Chapin, 1916, p. 78; 1918, p. 75) include references to the Copper King prospect (BC002). Parts of some of the early descriptions of the Berg prospect are ambiguous and may actually refer to a deposit in Berg Basin to the west in the adjoining Petersburg quadrangle.

Commodities:

Main: Au?

Other:

Ore minerals: Gold?

Gangue minerals:

Geologic description:

The country rocks in the general area of the Berg prospect (Koch, 1996, 1997) are Mesozoic or Paleozoic pelitic schist and paragneiss, and subordinate amphibolite and marble. Ambiguous early descriptions suggest that the prospect is an auriferous lode deposit. No other geological information about this property has been made public. Still and others (2002) investigated the area and did some sampling but found no evidence of mineralization.

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

There is little evidence of workings in the vicinity other than claim records that date back to before WWI.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Chapin, Theodore, 1916, Mining developments in southeastern Alaska: U.S. Geological Survey Bulletin 642-B, p. 73-104.

Chapin, Theodore, 1918, Mining developments in the Ketchikan and Wrangell mining districts: U.S. Geological Survey Bulletin 662-B, p. 63-75.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Bradfield Canal quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-922, 98 p.

Elliott, R.L., and Koch, R.D., 1981, Mines, prospects, and selected metalliferous mineral occurrences in the Bradfield Canal quadrangle, Alaska: U.S. Geological Survey Open-File Report 81-728-B, 23 p., 1 sheet, scales 1:250,000 and 1:63,360.

Koch, R.D., 1996 (in press), Reconnaissance geologic map of the Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report, 1 sheet, scale 1:250,000.

Koch, R.D., 1997 (in press), Metalliferous mineral resource potential in the Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report, 1 sheet, scale 1:250,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): H. C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (near Cone Mountain)

Site type: Prospect

ARDF no.: BC004

Latitude: 56.514 **Quadrangle:** BC C-6

Longitude: 131.735

Location description and accuracy:

This prospect is about 1.0 mile south-southwest of Cone Mountain; it is at an elevation of about 3,000 feet near the northeast corner of T. 62 S., R. 88 E., of the Copper River Meridian. The location is probably accurate within about a quarter of a mile.

Commodities:

Main: U?

Other: Ce, La, Mo, Nd, Th

Ore minerals: Unspecified radioactive minerals

Gangue minerals:

Geologic description:

The country rocks in the general area of the Cone Mountain prospect are a Miocene (?) alkali feldspar granite stock and associated quartz-porphyritic rhyolite dikes (Koch, 1996, 1997). The prospect is on the western margin of the stock, which intrudes Eocene granodiorite and quartz monzonite plutons and Mesozoic or Paleozoic pelitic schist and paragneiss. A group of 145 claims was staked in 1976, presumably for uranium-bearing and related minerals (Elliott and Koch, 1981, loc. 4; Koch and others, 1981; U. S. Geological Survey, 1979). Geochemical surveys [(Koch and Elliott, 1981 (OFR 81-728C-K)] show high values of silver, beryllium, molybdenum, niobium, lead, tin, yttrium, rare earth elements, and zinc in rock, stream-sediment and heavy-mineral concentrate samples from the immediate area of the stock. Differentiation enrichment of these elements in such a highly-evolved silicic magma may account for most of the values reported, but a few high lead and zinc values suggest local sulfide deposition.

In 1976, Pacific Coastal Minerals staked 176 claims in the area; they held them several years and did some drilling. Still and others (2002) collected samples of granite at two localities between Cone Mountain and Black Crag; they contained up to 140 parts per million (ppm) cerium, 75 ppm lanthanum, 48 ppm neodymium, and 66.9 ppm thorium. They also collected 8 samples of a variety of felsic volcanic and intrusive rocks. The highest values were in a sample of molybdenite-bearing rhyolite breccia that contained 1,740 ppm cerium, 954 ppm lanthanum, 440 ppm neodymium, 60 ppm samarium, 72.6 ppm thorium, and 2,098 ppm molybdenum.

Alteration:

Age of mineralization:

Miocene?

Generic deposit model:

Deposit model:

Felsic plutonic uranium?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

In 1976, Pacific Coastal Minerals staked 176 claims in the area; they held them several years and did some drilling.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Elliott, R.L., and Koch, R.D., 1981, Mines, prospects, and selected metalliferous mineral occurrences in the Bradfield Canal quadrangle, Alaska: U.S. Geological Survey Open-File Report 81-728-B, 23 p., 1 sheet, scales 1:250,000 and 1:63,360.

Koch, R.D., 1996 (in press), Reconnaissance geologic map of the Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report, 1 sheet, scale 1:250,000.

Koch, R.D., 1997 (in press), Metalliferous mineral resource potential in the Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report, 1 sheet, scale 1:250,000.

Koch, R.D., and Elliott, R.L., 1981, Maps showing distribution and abundance of gold and silver in geochemical samples from Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 81-728-C, 2 sheets, scale l:250,000.

Koch, R.D., and Elliott, R.L., 1981, Maps showing distribution and abundance of copper in geochemical samples from Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 81-728-D, 4 sheets, scale l:250,000.

Koch, R.D., and Elliott, R.L., 1981, Maps showing distribution and abundance of lead in geochemical samples from Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 81-728-E, 4 sheets, scale l:250,000.

Koch, R.D., and Elliott, R.L., 1981, Maps showing distribution and abundance of zinc in geochemical samples from Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 81-728-F, 4 sheets, scale l:250,000.

Koch, R.D., and Elliott, R.L., 1981, Maps showing distribution and abundance of molybdenum in geochemical samples from Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 81-728-G, 2 sheets, scale l:250,000.

Koch, R.D., and Elliott, R.L., 1981, Maps showing distribution and abundance of tin in geochemical samples from Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report

81-728-H, 2 sheets, scale l:250,000.

Koch, R.D., and Elliott, R.L., 1981, Maps showing distribution and abundance of beryllium in geochemical samples from Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 81-728-I, 2 sheets, scale l:250,000.

Koch, R.D., and Elliott, R.L., 1981, Maps showing distribution and abundance of niobium in geochemical samples from Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 81-728-J, 2 sheets, scale l:250,000.

Koch, R.D., and Elliott, R.L., 1981, Maps showing distribution and abundance of yttrium in geochemical samples from Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 81-728-K, 2 sheets, scale l:250,000.

Koch, R.D., Elliott, R.L., O'Leary, R.M., and Risoli, D.A., 1981, Trace-element data for rock samples from the Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 80-910-A, 258 p., 1 sheet, scale l:250,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

U.S. Geological Survey, 1979, Aeroradioactivity map of Cone Mountain, Alaska: U.S. Geological Survey Open-File Report 79-830, 1 sheet, scale 1:63,360.

Primary Reference: Elliott and Koch, 1981; Still and others, 2002

Reporter(s): H. C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): North Bradfield River; Ptarmigan

Site type: Prospect

ARDF no.: BC009

Latitude: 56.4012 **Quadrangle:** BC B-5

Longitude: 131.4084

Location description and accuracy:

The coordinates mark the approximate center of a group of pods and lenses of mineralization that are scattered along a northwest-trending belt about 2 miles long and 0.5 mile wide. The center of the prospect is near the northeast corner of section 29, T. 63 S., R. 90 E., of the Copper River Meridian, about 9 miles southwest of Mount Pounder. Figure 33 of Still and others (2002) is a map of the deposit. The location is accurate.

Commodities:

Main: Cu, Fe

Other: Ag, Au, Mo, Zn

Ore minerals: Chalcopyrite, hematite, magnetite, malachite, pyrrhotite

Gangue minerals: Calcite, calc-silicate minerals

Geologic description:

The North Bradfield Canal prospect was discovered by Ken Eichner in 1955 and by 1958 was covered by 41 claims (Eichner, 2002; Still and other, 2002). Takahashi, C.T., and Co. optioned the property until 1959; they mapped it, flew a aeromagnetic survey over it, and drilled 14 shallow holes. From 1960 to 1962, it was held by Utah Construction who did more surface work and drilled at least 460 feet of hole (Utah Construction, 1962). MacKevett and Blake (1963) of the U.S.G.S. mapped the geology in detail and Still and others (2002) of the U.S. Bureau of Land Management did some additional surface and geochemical sampling. Still and others (2002) revisited the prospect as part of a regional mineral assessment and did some sampling that largely confirmed the earlier work.

The North Bradfield River prospect (MacKevett and Blake, 1963, p. D1-D21) consists chiefly of metasomatic, magnetite-skarn deposits at the northwest end of a large roof pendant of gneiss, granulite, schist, marble, and skarn in quartz monzonite of the Coast Range Batholith, which in turn is cut by dikes of quartz diorite, aplite, and alaskite. The metamorphic bedded rocks are complexly folded. MacKevett and Blake interpret the general structure of the pendant as an overturned syncline that probably extends for many miles to the southeast. Sonnevil (1981, p. B117), on the other hand, interprets the dominant structure in the area as a homocline that dips northwest to northeast. Koch (1997, p. 24) reports that the pendant is marked by an aeromagnetic trough that roughly parallels its outcrop (U. S. Geological Survey, 1979). The deposit is in marble layers of the roof pendant and consists of calc-silicate skarn that is partly replaced by massive magnetite with interstitial pyrrhotite; the magnetite is cut by veinlets of chalcopyrite. This ore contains subordinate amounts of hematite, limonite, and malachite. The orebodies, of which at least 15 are exposed, are crudely stratiform and apparently discontinuous; they range in strike length from 50-350 feet and in thickness from 2-40 feet. They occur in a belt about 2 miles long and 0.5 mile wide. Koch (1997, p. 24-25) suggests that at least some of the metal concentration in these deposits is related to the emplacement of an Eocene quartz monzonite and granodiorite stock, near the contact with the Mesozoic or Paleozoic metamorphic bedded rocks that host the deposits (Elliott and Koch, 1981; Koch, 1996). Koch (1997, p. 24, 25) and Elliott and Koch (1981, p. 8, loc. 9) also report anomalous amounts of silver, gold, molybdenum, and zinc in rock samples collected at and near the North Bradfield River deposits.

As a result of their surface work and drilling, Utah Construction (1962) estimated that the 9 magnetite-copper bodies that they identified contain about 1,000,000 tons of proven and probable resources and 4,481,000 tons of possible resources with a estimated grade of 35 to 40 percent iron, 0.2 to 0.3 percent copper, and 3 to 4 percent sulfur.

Alteration:

Calc-silicate skarn is developed in marble units adjacent to the orebodies.

Age of mineralization:

Probably Eocene based on a nearby intrusive that probably is genetically related to the deposit.

Generic deposit model:

Deposit model:

Cu-Fe skarn (Cox and Singer, 1986; model 18d).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18d

Production Status: None

Site Status: Probably inactive

Workings/exploration:

The Bradfield Canal prospect was discovered by Ken Eichner in 1955 and by 1958 was covered by 41 claims (Eichner, 2002; Still and other, 2002. Takahashi, C.T., and Co. optioned the property until 1959; they mapped it, flew an aeromagnetic survey over it, and drilled 14 shallow holes. From 1960 to 1962, it was held by Utah Construction who did more surface work and drilled at least 460 feet of hole (Utah Construction, 1960). MacKevett and Blake (1963) of the U.S.G.S. mapped the geology in detail and Still and others (2002) of the U.S. Bureau of Land Management did some additional surface and geochemical sampling.

Production notes:

None.

Reserves:

As a result of their surface work and drilling, Utah Construction (1962) estimated that the 9 magnetite-copper bodies that they identified contain about 1,000,000 tons of proven and probable resources and 4,481,000 tons of possible resources with a estimated grade of 35 to 40 percent iron, 0.2 to 0.3 percent copper, and 3 to 4 percent sulfur.

Additional comments:

Elliott and Koch (1981) also apply the name 'Ptarmigan' to the North Bradfield River prospect. Still and others (2002) indicated that there were no active claims on the property at the time of their work.

References:

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Bradfield Canal quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-922, 98 p.

Eichner, Ken, 2002, Nine lives of an Alaska bush pilot: Bellingham, Washington, Taylor Press, 349 p.

Elliott, R.L., and Koch, R.D., 1981, Mines, prospects, and selected metalliferous mineral occurrences in the Bradfield Canal quadrangle, Alaska: U.S. Geological Survey Open-File Report 81-728-B, 23 p., 1 sheet,

scales 1:250,000 and 1:63,360.

Koch, R.D., 1996 (in press), Reconnaissance geologic map of the Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report, 1 sheet, scale 1:250,000.

Koch, R.D., 1997 (in press), Metalliferous mineral resource potential in the Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report, 1 sheet, scale 1:250,000.

MacKevett, E.M., Jr., and Blake, M.C., Jr., 1963, Geology of the North Bradfield River iron prospect, southeastern Alaska: U.S. Geological Survey Bulletin 1108-D, p. D1-D21.

Sonnevil, R.A., 1981, New data concerning the geology of the North Bradfield River iron prospect, southeastern Alaska, in Albert, N.R.D., and Hudson, Travis, eds., The United States Geological Survey in Alaska--Accomplishments during 1979: U.S. Geological Survey Circular 823-B, p. B117-B119.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

U.S. Geological Survey, 1979, Aeromagnetic map of the Petersburg area, Alaska: U.S. Geological Survey Open-File Report 79-832, 1 sheet, scale 1:250,000.

Utah Construction, 1960, North Bradfield River copper-magnetite prospect, Wrangell, southeastern Alaska: Unpublished Territorial Department of Mines, Mineral Report 118-3, 165 p. (Available at the Bureau of Land Management Minerals Information Center, Juneau Alaska).

Utah Construction, 1962, Diamond drill-hole logs and sample results of North Bradfield River copper magnetite skarn: Unpublished report, 41 p. (Available at the Bureau of Land Management Minerals Information Center, Juneau Alaska).

Primary Reference: MacKevett and Blake, 1963; Still and others, 2002

Reporter(s): H. C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Craig

Site type: Prospect

ARDF no.: BC010

Latitude: 56.4652 **Quadrangle:** BC B-4

Longitude: 131.2605

Location description and accuracy:

This prospect consists of about 60 claims staked in 1977 about 4 miles west-northwest of Mt. Pounder. Their location is not well known and somewhat arbitrarily, the center of the claims is plotted about 0.5 mile east of the center of section 30, T. 62 S., R. 91 E., of the Copper River Meridian. This location may be a mile or more from the center of the claims.

Commodities:

Main: Cu

Other:

Ore minerals: Chalcopyrite, magnetite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

Sixty 'Craig' claims were staked here in 1977 but were allowed to lapse after two years; there apparently has been no activity since.

The country rocks in the general area of the Craig occurrence are Mesozoic or Paleozoic metasedimentary rocks, locally including marble, and subordinate metavolcanic rocks (Elliott and Koch, 1981; Koch, 1996).

As described by Elliott and Koch (1981), the mineralization consists of chalcopyrite, pyrite, and pyrrhotite disseminated in the metasedimentary rocks; the chalcopyrite also occurs in thin veinlets. Skarn float at or near the prospect contains magnetite and minor chalcopyrite. Still and others (2002) sampled rubblecrop from talus in the area. Several samples contained layered and disseminated sulfides, mainly pyrite; with disseminated chalcopyrite. A sample of hornblendite (skarn?) with 25 percent sulfides, mainly pyrite and pyrrhotite, contained 5,706 parts per million (ppm) copper and 3.1 percent zinc. Sample with layered and disseminated pyrite contained negligible base metal values and the highest gold value in the 7 samples that were selected for analysis was only 30 parts per billion gold.

Alteration:

Age of mineralization:

Mesozoic or Paleozoic (?).

Generic deposit model:

Deposit model:

Layered and disseminated sulfides in metamorphic rocks and skarn.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Sixty 'Craig' claims were staked here in 1977 but were allowed to lapse after two years; there apparently has been no activity since. Limited sampling by the U.S.G.S. and Bureau of Land Management.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Elliott, R.L., and Koch, R.D., 1981, Mines, prospects, and selected metalliferous mineral occurrences in the Bradfield Canal quadrangle, Alaska: U.S. Geological Survey Open-File Report 81-728-B, 23 p., 1 sheet, scales 1:250,000 and 1:63,360.

Koch, R.D., 1996 (in press), Reconnaissance geologic map of the Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report, 1 sheet, scale 1:250,000.

Koch, R.D., 1997 (in press), Metalliferous mineral resource potential in the Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report, 1 sheet, scale 1:250,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

U.S. Bureau of Mines, 1979, Claim map 118: Mines and prospects of the Bradfield Canal quadrangle, Alaska: U.S. Bureau of Mines Open-File Report 20-73, 1 sheet, scale 1:250,000.

Primary Reference: Still and others, 2002

Reporter(s): H. C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (near Black Crag)

Site type: Prospect

ARDF no.: BC090

Latitude: 56.5367 **Quadrangle:** BC C-6

Longitude: 131.6992

Location description and accuracy:

This unnamed site is about a mile southeast of Black Crag near the Alaska-British Columbia boundary in section 36, T. 61 S., R. 88 E., of the Copper River Meridian. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Mo, Zn

Other: Ce, La, Nd, Sm, Th, U

Ore minerals: Chalcopyrite, molybdenite, pyrite

Gangue minerals:

Geologic description:

Still and others (2002) found possible evidence of claim staking here and were told of drilling for molybdenum in the 50s but there is no information about exploration here prior to their work. They briefly examined the area and collected several mineralized samples as part of a regional mineral assessment for the Bureau of Land Management. The site might be part of the prospect several miles to the southwest (BC004) that was explored in the 1970s.

The country rocks in the general area of Black Crag are a Miocene (?) alkali-feldspar granite stock and associated quartz-porphyritic rhyolite dikes (Koch, 1996). The prospect is near the margin of the stock, which intrudes Eocene granodiorite and quartz monzonite plutons and Mesozoic or Paleozoic pelitic schist and paragneiss.

On the east side of the valley, Still and others (2002) collected several samples of float that consisted of: 1) quartz porphyry with molybdenite along fractures; 2) fine-grained silicified felsite cut by a 0.1-foot-thick seam of molybdenite; and 3) silicified granite with pyrite and chalcopyrite. Samples of the molybdenite-bearing rocks contained 735 and 1,348 parts per million (ppm) molybdenum and the copper-bearing sample contained 1,508 ppm copper. A sample of silicified breccia cemented by pyrrhotite contained 93 parts per billion gold, 43.5 ppm silver, and 558 ppm zinc. At the head of the valley under a hanging glacier, volcanic rock with molybdenite along fractures is abundant. Samples contained 23 to 2,529 ppm molybdenum, 119 to 713 ppm zinc, and up to 1,740 ppm cerium, 954 ppm lanthanum, 440 ppm neodymium, 60 ppm samarium, 72.6 ppb thorium, and 16 ppm uranium.

Alteration:

Mineralized rocks are silicified.

Age of mineralization:

Tertiary or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Porphyry Cu-Mo (Cox and Singer, 1986; model 21a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
21a

Production Status: None

Site Status: Undetermined

Workings/exploration:

Still and others (2002) found possible evidence of claim staking here and were told of drilling for molybdenum in the 1950s but there is no information about exploration here prior to their work. They briefly examined the area and collected several mineralized samples as part of a regional mineral assessment for the Bureau of Land Management. The site might be part of the prospect several miles to the southwest (BC004) that was explored in the 1970s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Koch, R.D., 1996, Reconnaissance geologic map of the Bradfield Canal quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 81-728A, 1 sheet, scale 1:250,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (west of the terminus of Nelson Glacier)

Site type: Occurrence

ARDF no.: BC091

Latitude: 56.4788 **Quadrangle:** BC B-6

Longitude: 131.999

Location description and accuracy:

This occurrence is just west of the terminus of the Nelson Glacier near the center of section 21, T. 62 S. R. 86 E., of the Copper River Meridian. The location is accurate.

Commodities:

Main: Ag, As, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

This occurrence is in an area that was covered by a large blocks of claims that were variously held from 1965 to 1981 by Bunker Hill Mining Company, Humble Oil and Refining Company, El Paso Natural Gas Company, and AMAX Exploration (Still and others, 2002). There apparently was no exploration of these particular occurrences by these companies beyond areal mapping and sampling, or at least there is no notable record of any.

The country rocks in the area of the prospects include Tertiary to Cretaceous biotite schist, biotite-garnet-quartz schist, quartzofeldspathic gneiss, and minor marble and calc-silicate gneiss metamorphosed from Mesozoic to Paleozoic protoliths (George and Wyckoff, 1973; Brew, 1997). The metamorphic rocks near the prospect are cut by several large Tertiary felsic dikes and sills that have been dated nearby at about 16.2 Ma (see PE043), and by a large Cretaceous tonalite pluton that intrudes the metamorphic section just to the east.

Still and others (2002) briefly examined the ridge west of the terminus of the Nelson Glacier and identified a 2-foot-wide vuggy, silicified zone that cuts gneiss. The silicified zone extends for about 80 feet and locally contains pyrite, chalcopyrite, galena, and sphalerite. A 0.2-foot-thick chip sample across what appeared to be the most mineralized section of the zone contained 4.39 ounces of silver per ton, 2.70 percent lead, 9, 577 parts per million (ppm) zinc, and 8.63 ppm arsenic. (The mineralization is similar to or an extension of the mineralization in the prospect about 0.3 mile to the northeast across the terminus of the Nelson Glacier (BC001)).

Alteration:

Age of mineralization:

Probably related to a nearby 16.2 Ma biotite granite as are other deposits in the Groundhog Basin area.

Generic deposit model:

Deposit model:

Vuggy silicified zone in gneiss.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

This occurrence is on a large block of claims that were variously held from 1965 to 1981 by Bunker Hill Mining Company, Humble Oil and Refining Company, El Paso Natural Gas Company, and AMAX Exploration (Still and others, 2002). There apparently was no exploration of these occurrences by these companies beyond areal mapping and sampling. Still and others (2002) examined these occurrences as part of a regional mineral assessment by the Bureau of Land Management.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg B-1 quadrangle, Southeastern Alaska, U.S. Geological Survey Open-File Report 97-156-C, 20 p., 1 sheet, scale 1:63,360.

George, R.H., and Wyckoff, B.S., 1973, Whistlepig mineral exploration program, Alaska, Final report 1972 (with attached diamond drill hole logs and analyses): Unpublished El Pas National Gas Company report 109 p. 12 sheets (available at the Bureau of Land Management, Minerals Information Center, Juneau Alaska).

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 1992

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (Near Mt. Lewis Cass)

Site type: Occurrence

ARDF no.: BC092

Latitude: 56.3895 **Quadrangle:** BC B-4

Longitude: 131.1119

Location description and accuracy:

This occurrence is about 1.5 miles southwest of Mt. Lewis Cass; the mineralization appears to extend from about 2,400 to 4,100 feet in elevation and was sampled in outcrop at about 2,500 feet. It is about 0.2 mile southeast of the center of section 19, T 63 S., R. 92 E., of the Copper River Meridian. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Mo

Other:

Ore minerals: Chalcopyrite, magnetite, molybdenite, pyrite, pyrrhotite

Gangue minerals: Quartz

Geologic description:

The Mount Lewis Cass occurrence was discovered by Still and others (2002). The mineralization is near the contact of Eocene granodiorite and Mesozoic and/or Paleozoic metasedimentary and metavolcanic rocks and marble. The granodiorite contains molybdenite in narrow quartz stringers, in knots, and as disseminations. Several samples contained 1,240 and 1,558 parts per million (ppm) molybdenum. Iron-stained silicified metasedimentary and metavolcanic rocks in float on the south side of the valley contain pyrrhotite, pyrite, and chalcopyrite. Chalcopyrite-bearing samples contained 1.832 ppm to 1.35 percent copper, 289 parts per billion gold, and 17.6 ppm silver.

Alteration:

Silicification.

Age of mineralization:

At least some is Eocene or younger based on the age of the granodiorite host rock.

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Discovered by Still and others (2002) during a regional mineral assessment for the Bureau of Land Management.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Elliott, R.L., and Koch, R.D., 1981, Mines, prospects, and selected metalliferous mineral occurrences in the Bradfield Canal quadrangle, Alaska: U.S. Geological Survey Open-File Report 81-728B, 23 p., 1 sheet.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (east of Upper Marten Lake)

Site type: Occurrence

ARDF no.: BC093

Latitude: 56.2889 **Quadrangle:** BC B-6

Longitude: 131.7921

Location description and accuracy:

This occurrence is in a saddle at an elevation of 2,600 feet; it is about 1.1 mile east-southeast of the southeast end of Upper Marten Lake near the center of section 26, T. 64 S., R. 86 E., of the Copper River Meridian. The location is accurate.

Commodities:

Main: Ag, Au, Pb

Other:

Ore minerals: Pyrite, pyrrhotite

Gangue minerals: Quartz

Geologic description:

This occurrence was first described by Still and others (2002) in an area with little previous indication of mineralization. It is along a fault zone that strikes 330 degrees and dips 75 degrees to the northeast. The fault cuts Mesozoic and/or Paleozoic schist and paragneiss near the contact with Cretaceous diorite (Elliot and Koch, 1981). The occurrence is about 2 miles west of the Coast Range megalineament (Brew and Ford, 1978), and the 'Great Tonalite Sill' (Brew and Morrell, 1983). Quartz stringers and clay gouge are common in the fault zone. Some of the quartz stringers contain pyrite, pyrrhotite, and other sulfides. Four samples of iron-stained quartz were collected along the fault; one contained 475 parts per billion gold, 86.9 part per million (ppm) silver, and 1,218 ppm lead.

Another quartz vein about 0.2 to 1 foot thick about 2 miles north of the main occurrence contains only minor pyrite and assayed 517 ppb gold.

Alteration:

No information other than along a fault zone with clay gouge.

Age of mineralization:

Generic deposit model:

Deposit model:

Gold-quartz veinlets along a regional fault.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Only a few samples collected by Still and others (2002) during a regional mineral assessment by the Bureau of Land Management.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., and Ford, A.B., 1978, Megalineament in southeastern Alaska marks southwest edge of Coast Range batholithic complex: Canadian Journal of Earth Sciences, v. 15, p. 1763-1772.

Brew, D.A., and Morrell, R.P., 1983, Intrusive rocks and pluton belts of southeastern Alaska, Geologic Society of America Memoir, 159, p. 171-193.

Elliott, R.L., and Koch, R.D., 1981, Mines, prospects, and selected metalliferous mineral occurrences in the Bradfield Canal quadrangle, Alaska: U.S. Geological Survey Open-File Report 81-728B, 23 p., 1 sheet.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (near mouth of Harding River)

Site type: Prospect

ARDF no.: BC094

Latitude: 56.2025 **Quadrangle:** BC A-5

Longitude: 131.6379

Location description and accuracy:

This prospect is at an elevation of about 40 feet on the west side of a small bight about 0.7 mile west-southwest of the mouth of the Harding River on Bradfield Canal. It is about 0.3 mile southwest of the center of section 27, T. 69 S., R. 89 E., of the Copper River Meridian. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Zn

Other:

Ore minerals: Chalcopyrite, pyrite, pyrrhotite

Gangue minerals: Quartz

Geologic description:

As first described by Roehm (1942) and sampled by Still and others (2002), this prospect is an old opencut and probably the best mineralization in the several shear zones along Bradfield Canal in this area. The prospect is near the contact zone between the Eocene Coast Mountains batholith and metamorphic rocks. As described by Roehm (1942), the shear zone at this open cut has a hanging wall of mica schist or gneiss and a footwall of marble. A quartz vein about 0.5 to 1 foot thick occurs along the shear for about 20 feet of the opencut. The vein contains 1 to 2 percent sulfides, mainly pyrrhotite with pyrite and chalcopyrite. Still and others (2002) collected several samples; the highest values were 17 parts per billion gold, 1.8 part per million (ppm) silver, 197 ppm copper, and 235 ppm zinc.

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Quartz vein with low values of gold, silver, copper, and zinc.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

A short opencut was dug before 1942 and there was limited sampling by government geologists about 2000.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Blue Lead; Blue Lead Extension; Rob

Site type: Mines

ARDF no.: BD003

Latitude: 64.3603 **Quadrangle:** BD B-1

Longitude: 144.20323

Location description and accuracy:

The Blue Lead and Blue Lead Extension Mines are about 2 miles north of the north peak '5080' of Black Mountain. They are at an elevation of about 3,790 feet at the head of Johnson Creek, near the southeast corner of section 29, T. 6 S., R. 17 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au, Sb

Other: Cu, Pb, Te, W

Ore minerals: Arsenopyrite, covellite, digenite, gold, jamesonite, pyrite, stibnite

Gangue minerals: Quartz

Geologic description:

The Goodpaster region was first explored for placer gold in 1915. In the early 1930s, gold-bearing quartz veins were discovered in the upper Tibbs Creek area. By the winter of 1936, the first underground workings were begun. A 450-foot tunnel was driven following a small vein, termed the Blue Lead Extension. After disappointing results, the work was stopped. In the summer of 1936, five men drove a 300-foot tunnel at the outcrop of the Blue Lead vein (Reed, 1937). During the winter of 1937, a 300-foot tunnel was driven at the nearby Grizzly Bear Mine (BD018) and a 50-ton mill was constructed. In the summer of 1938, the mill was moved to the Blue Lead Mine and operated for a year and a half until the fall of 1939 (Joesting, 1938). The Blue Lead and Blue Lead Extension have approximately 775 feet of underground workings. There was limited exploration in the 1970s.

From 1995 to 1999, The Stone Boy Joint Venture (Sumitomo Metal Mining and WGM Inc.) spent more than $1.3 million exploring in the area; they did extensive surface mapping and sampling, surface and airborne geophysics, and 16,215 feet of diamond drilling in 26 holes. The location of the holes is vague but they drilled at least 3 holes at the Blue Lead prospect (Flanders, 2010). In 2002, Freegold Ventures optioned a large block of claims that covered the Blue Lead and several other nearby deposits that are described separately: the Grizzly Bear (BD003), Michigan Lode (BD025), Gray Lead (BD017), Wolverine (BD057), Upper Trench, Lower Trench (BD058) and O'Reely (BD059). Freegold has continued the exploration through early 2012 as the Rob project (Flanders, 2010; Freegold Ventures Ltd., 2012). The work has included extensive geologic mapping, surface sampling, and geochemical and geophysical surveys. Freegold commissioned a comprehensive NI 43-101 report that summarized their and previous work (Freeman, 2004). The report was updated in 2010 (Flanders, 2010).

The Blue Lead Mine produced 132 ounces of gold and 25 ounces of silver from approximately 150 tons of ore (Thomas, 1970).

As interpreted by Bailey (2001), Freeman (2004), and Flanders (2010) this and the several other similar deposits in the area are near the contact of a large Cretaceous biotite granodiorite pluton and a mixed unit of Paleozoic biotite gneiss, feldspar-biotite augen gneiss, and quartzite that form a large gneiss dome. Locally the granodiorite is cut by hornblende, andesite porphyry dikes. The rocks are locally intensely sheared and this and the nearby Gray Lead (BD017), Grizzly Bear (BD018) and Michigan Lode (BD025) Mines are aligned along the northeast-trending Gray Lead fault. This shearing is observed in the underground

workings and also at the surface where it is marked by pronounced saddle-like depressions across the spurs separating the westward-flowing tributaries of Tibbs Creek.

The lode deposits in the area are gold-bearing quartz veins in shear zones in the metamorphic and igneous rocks. The quartz veins contain gold +/- base metal +/- silver and a variable combination of sulfides, including arsenopyrite, covellite, digenite, jamesonite, pyrite, and stibnite. Typically, the gold content decreases as sulfides increase. The veins are commonly 2 to 3 feet in width but some are as wide as 8 feet (Thomas, 1970). When gold is present, it is usually extremely fine grained. However, veins at the nearby Grizzly Bear Mine (BD018) contain relatively coarse gold, which is easily visible in hand specimen. The Blue Lead Mine is centered on a 2.5-foot-wide quartz vein with jamesonite and minor pyrite (Menzie and Foster, 1979). In the underground workings, the vein is nearly flat lying or dips gently to the north (Reed, 1937). Glover (1950) reports a range in gold fineness of 724.4 to 773.7 for the Blue Lead Mine. Freeman (2004) and Flanders (2010) classified the Blue Lead as a 'intrusion-hosted, probably intrusion-related gold vein with variable silver, tungsten, and bismuth'.

Freeman (2004) indicated the nine holes have been drilled on the Blue Lead, Blue Lead Extension, and Grizzly Bear (BD018) deposits, presumably during the joint-venture exploration from 1995 to 1999. The highest gold value was a 1.0-foot interval that contained 0.92 ounce of gold per ton, 28.2 parts per million (ppm) silver, and 4,650 ppm arsenic.

Alteration:

Not described in detail but alteration is associated with the veins.

Age of mineralization:

Probably genetically related to a nearby Cretaceous granodiorite intrusive.

Generic deposit model:

Deposit model:

Silver-gold-quartz veins and stockwork, +/- arsenic, copper, lead, antimony, tellurium, and tungsten (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The Goodpaster region was first explored for placer gold in 1915. In the early 1930s, gold-bearing quartz veins were discovered in the upper Tibbs Creek area. By the winter of 1936, the first underground workings were begun. A 450-foot tunnel was driven following a small vein, termed the Blue Lead Extension. After disappointing results, the work was stopped. In the summer of 1936, five men drove a 300-foot tunnel at the outcrop of the Blue Lead vein (Reed, 1937). During the winter of 1937, a 300-foot tunnel was driven at the nearby Grizzly Bear Mine (BD018) and a 50-ton mill was constructed. In the summer of 1938, the mill was moved to the Blue Lead Mine and operated for a year and a half until the fall of 1939 (Joesting, 1938). The Blue Lead and Blue Lead Extension have approximately 775 feet of underground workings. There was limited exploration in the 1970s.

From 1995 to 1999, The Stone Boy Joint Venture (Sumitomo Metal Mining and WGM) spent more than $1.3 million exploring in the area; they did extensive surface mapping and sampling, surface and airborne geophysics, and 16,215 feet of diamond drilling. In 2002, Freegold Ventures optioned a large block of claims that covered the Blue Lead and several other nearby deposits that are described separately: the Grizzly Bear (BD003), Michigan Lode (BD025), Gray Lead (BD017), Wolverine (BD057), Upper Trench, Lower Trench (BD058) and O'Reely (BD059); and explored them as the Rob project. Through early 2012, Freegold has continued to explore them (Flanders, 2010; Freegold Ventures Inc., 2012).

Freeman (2004) states that 9 holes have been drilled on the Blue Lead, Blue Lead Extension, and Grizzly Bear (BD018) deposits, apparently during the 1995-1999 joint venture.

Production notes:

The Blue Lead Mine produced 132 ounces of gold and 25 ounces of silver from approximately 150 tons of ore (Thomas, 1970).

Reserves:

None.

Additional comments:

References:

Bailey, R.O., 2001, ROB Claim Group, Tibbs Creek, Alaska, Goodpaster Mining District: Unpublished report, 137 p.

Cobb, E.H., 1972, Metallic mineral resources map of the Big Delta quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-388, 1 sheet, scale 1:250,000.

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Joesting, H.R., 1938, Mining and prospecting in the Goodpaster region: Alaska Territorial Department of Mines Miscellaneous Report 90-02, 2 p.

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Thomas, B.I., 1970, Reconnaissance of the gold-bearing quartz veins in the Tibbs Creek area, Goodpaster River, Big Delta quadrangle, central Alaska: U.S. Bureau of Mines Open-File Report 14-70, 12 p., 3 sheets.

Weber, F.R., Foster, H.L., Keith, T.E.C., Dusel-Bacon, Cynthia, 1978, Preliminary geologic map of the Big Delta quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-529-A, 1 sheet, scale 1:250,000.

Primary Reference: Freeman, 2004; Flanders, 2010

Reporter(s): Cameron S. Rombach (ADGGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): May's Pit; Campbell-Monroe; Campbell

Site type: Mine

ARDF no.: BD007

Latitude: 64.3008 **Quadrangle:** BD B-5

Longitude: 146.3002

Location description and accuracy:

May's Pit, as the mine is now commonly known, is on a large flat, now-barren saddle on the divide between the head of Tenderfoot Creek and lower Buckeye Creek. It is about 1.6 miles northeast of Richardson on the Richardson Highway and near the center of the southern boundary of section 14, T. 7 S., R. 7 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

The Richardson District is characterized by gentle slopes and broad, alluvium-filled valleys (Prindle and Katz, 1913). The area is unglaciated and largely overlain by windblown silt, sand, and loess, locally up to 50 meters thick (Foster and others, 1979). The rocks consist of three structure-bounded units (Weber and others, 1978; Swainbank and others, 1984; Noyes and others, 2006; Freeman, 2011). There is a core that consists mainly of biotite-hornblende-feldspar-quartz gneiss and lesser amphibolite, quartzite, marble and calc-silicate hornfels. The core is bounded on the north and south by amphibolite-grade pelitic schist. The contacts between the units are probably low-angle faults; north-trending vertical faults occur widely. Weber and others (1978) assign the pre-metamorphic age of the rocks to the Precambrian or Paleozoic. They were metamorphosed in the Middle to Late Devonian and recrystallized in the Early Cretaceous (Dusel-Bacon and others, 2004; Freeman, 2011). The metamorphic rocks are intruded by 90 Ma, felsic to intermediate dikes and plugs, notable the mineralized quartz-feldspar porphyry dike at the nearby Democrat Mine (BD014).

The May's Pit residual placer was found in 1908 by Fred Campbell but mining was stymied for 40 years because of the lack of water. Campbell transported ore downhill to Hinkley Gulch for processing (Olson and others, 1985; May, 2005, Freeman, 2011). In 1948 or 1949, Campbell leased the ground to Gib Martin who mined the property as an open pit with a dozer. As related by Freeman (2011), another miner said that he had seen an estimated 4,500 ounces of gold that came from the final cleanup of Martin's mining. Subsequently, the ground was leased to Gil Monroe and Erick Erickson who mined the property until 1978. In 1979, Don May of Polar Mining acquire the property. He worked the property as an open pit with a dozer from 1979 to 1981 and recovered 8,000 ounces of gold.

In 1988, Asarco drilled a hole at least 330 feet deep in the center of May’s pit (Applegate, 1988). Most of the hole was in biotite-muscovite schist and biotite-feldspar-quartz gneiss; a quartz-feldspar-porphyry dike about 5 feet thick was cut and the hole bottomed in mylonite. The hole intersected a few thin quartz veins with pyrite selvages but no sample from the hole produced as much as 0.002 ounce of gold per ton. In 2005, an extensive soil sampling program that extended over the property into upper Tenderfoot Creek defined several areas that were anomalous in gold, silver, arsenic, bismuth, tin, tungsten, copper, lead, and zinc (Noyes and others, 2006). The anomalies were less pronounced over May’s Pit. Freeman (2011) suggests

that May’s Pit may be above a distal intrusion-related gold deposit similar to the one at the Democrat Mine (BD014).

Alteration:

Possible alteration of intrusive and/or schistose host rocks to kaolinite (Swainbank and others, 1984).

Age of mineralization:

Quaternary?

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Residual gold placer, possibly above or near an intrusion-related gold deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; medium

Site Status: Active

Workings/exploration:

The May's Pit residual placer was found in 1908 by Fred Campbell but mining was stymied for 40 years because of the lack of water. Campbell transported ore downhill to Hinkley Gulch for processing (Olson and others, 1985; May, 2005; Freeman, 2011). In 1948 or 1949, Campbell leased the ground to Gib Martin who mined the property as an open pit with a dozer. Subsequently, the ground was leased to Gil Monroe and Erick Erickson who mined the property until 1978. In 1979, Don May of Polar Mining acquired the property and he mined an open pit with a dozer from 1979 to 1981. In 1988, Asarco drilled a hole at least 330 feet deep in the center of May’s pit (Applegate, 1988). In 2005, an extensive soil sampling program covered the mine and extended into upper Tenderfoot Creek.

Production notes:

Production of 8,000 ounces of gold from 1979 to 1981 is documented. Another 4,500 ounces reportedly was produced and there may have been significantly more.

Reserves:

Unknown.

Additional comments:

References:

Applegate, L.M., 1988, Richardson Mining District, Alaska, Tri-Valley Corporation, ASARCO’s final report on exploration at the Democrat Mine prospect and in the May’s Pit areas: ASARCO Inc., Internal Report to Tri-Valley Corporation, 12 p.

Bundtzen, T.K., and Reger, R.D., 1977, The Richardson lineament--A structural control for gold deposits in the Richardson mining district, Alaska, in Short notes on Alaskan Geology, 1977: Alaska Division of Geological and Geophysical Surveys Geologic Report 55, p. 29-34.

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Olson, B.G., Burton, J., Wolff, E.N., and Swainbank, D., 1985, Mining and minerals in the golden heart of Alaska: Fairbanks North Star Borough Publication, 80 p.

Prindle, L.M., and Katz, F.J., 1913, Detailed description of the Fairbanks district, in Prindle, L.M., A geologic reconnaissance of the Fairbanks quadrangle, Alaska: U.S. Geological Survey Bulletin 525, p. 59-152.

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Primary Reference: Freeman, 2011

Reporter(s): Cameron S. Rombach (ADGGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Democrat; John Mitchell Lode; Camp Pit; Richardson project

Site type:

Mine

ARDF no.: BD014

Latitude: 64.3341 **Quadrangle:** BD B-5

Longitude: 146.3553

Location description and accuracy:

The Democrat Mine is located at the head of Banner Creek (BD001), which has been placer mined for several miles below the Democrat Mine. The mine is centered about 3.5 miles north of the town of Richardson and about 0.5 mile east-southeast of the center of section 4, T. 7 S., R. 7 E., of the Fairbanks Meridian. Several unimproved roads provide access to the mine. It consists of a open cut in the hillside along Banner Creek. Some contiguous workings that are usually described with the Democrat Mine are sometimes called the Camp Pit. The location is accurate.

Commodities:

Main: Ag, As, Au, Sb

Other: Cu, Bi, Hg, Mo, Pb, U, Zn

Ore minerals: Acanthite, boulangerite, enargite, freibergite, gold, owyheeite, pyrargyrite, stephanite, stibnite, stetefeldtite, tetrahedrite

Gangue minerals: Ankerite, carbonate, quartz

Geologic description:

The Richardson District is characterized by gentle slopes and broad, alluvium-filled valleys (Prindle and Katz, 1913). The area is unglaciated and largely overlain by windblown silt, sand, and loess, locally up to 50 meters thick (Foster and others, 1979). The rocks consist of three structure-bounded units (Weber and others, 1978; Swainbank and others, 1984; Noyes and others, 2006; Freeman, 2011). There is a core that consists mainly of biotite-hornblende-feldspar-quartz gneiss and lesser amphibolite, quartzite, marble and calc-silicate hornfels. The core is bounded on the north and south by amphibolite-grade pelitic schist. The contacts between the units are probably low-angle faults; north-trending vertical faults occur widely. Weber and others (1978) assign the pre-metamorphic age of the rocks to the Precambrian or Paleozoic. They were metamorphosed in the Middle to Late Devonian and recrystallized in the Early Cretaceous (Dusel-Bacon and others, 2004; Freeman, 2011). The metamorphic rocks are intruded by 90 Ma felsic to intermediate dikes and plugs, notably the quartz-feldspar porphyry at this site.

The Democrat Mine has been the focus of most of the recent work in the Richardson district (Freeman, 2011). The Democrat Mine was the first lode prospect discovered in the Richardson district in 1913. By 1921, three short adits, and two shafts had been driven on the property and a small arastra mill produced an unknown but probably small amount of gold (Brooks, 1923). Modern work in the area was initiated by Bundtzen and Reger (1977), and Swainbank and others (1984), who identified several areas of mineral potential and defined the general geology and geochemistry of the district. The first detailed work on the Democrat Mine was by John Mitchell in the late 1980s, and in 1987, the Tri-Valley Corporation (now Select Resources Corporation, Inc.) acquired the property and have retained it through the end of 2011.

Tri-Valley drilled one reverse circulation hole 101.5 feet deep in 1987 and collected many rock samples from the quartz-feldspar porphyry dike that hosts the mineralization; the hole averaged 0.013 ounce of gold per ton. In 1988, Tri-Valley and Asarco Inc. in a joint venture drilled 17 diamond drill holes that totaled 4,462 feet. The drilling was at 8 locations along about 3,400 feet of the quartz-feldspar porphyry dike. Some

notable intercepts were 85 feet that averaged 0.032 ounce of gold per ton, 130 feet that averaged 0.185 ounce of gold per ton, and 175 feet that averaged 0.032 ounce of gold per ton. The highest grades were near the surface. Many (most?) of the investigators who subsequently reviewed the drill data concluded that the gold values were underestimated. Asarco terminated their agreement in late 1988. Later in 1988 and in 1989, Tri-Valley collected several large bulk samples on the surface of the deposit to prove that the Asarco drilling had underestimated the grade of the deposit. As a result of one of these episodes of bulk sampling, Mitchell (1989) estimated that the zone from which a large bulk sample was taken contained 18,750 tons of material that averaged 0.439 ounce of gold per ton. From another bulk-sample, Stearns (1989) identified four areas within the quartz porphyry dike that was estimated to contain 250,000 tons of material that averaged 0.07 ounces of gold per ton, or about 17,500 ounces of gold. Some (Freeman, 2011) considered the bulk sampling to be flawed. The bulk-sampling at the Democrat Mine in the 1980s produced 2,357 ounces of gold, the only lode gold produced in the district.

In 1991, Tri-Valley began working with TSNIGRI (Research Center of the Institute for Geological Exploration of Base and Precious Metals), of the Russian Ministry of Geology, and carried out geologic mapping, geophysics, and geochemical surveys at and around the Democrat Mine; the work continued to 2001. In 1997, Tri-Valley drilled 7 reverse-circulation holes at the Democrat property, completed several ground-geophysical grids, dug at least one trench, and collected numerous rock samples. The drilling was in the same general area as the 1987 and 1988 drilling. A report by Bright (1998) using drilling, and 1997 channel sampling estimated that 4 blocks of material 80-feet thick contained 141,539 tons of material with an average grade of 0.106 ounce of gold per ton (15,074 ounces). Freeman (2011) reported that an area about 1,200 feet long, 300-600 feet wide, and 200 feet thick averaged 0.65 part per million gold. In 2005, Select Resources (a subsidiary of Tri-Valley) compiled the previous information, sampled soils, and drilled 8 holes that totaled 930 meters. In 2010, Select collected fifteen, 25-kilogram samples for analysis.

The gold mineralization at the Democrat Mine is concentrated in the Democrat dike, which is up to 600 feet thick in the mine area. The dike has intruded along a northwest-trending, steeply-northeast-dipping structure (Freeman, 2011). The hanging wall is paragneiss; the footwall is lower-greenschist-facies rocks. The gold mineralization does not extend into the wall rocks. Locally, the dike thickens at flexures and is disrupted by northeast trending faults. The mineralization commonly is in quartz veins but the ore minerals are also disseminated in the dike rock. Locally, the ore is very rich, with a diverse suite of minerals including acanthite, freibergite, pyrargyrite, stephanite, stetefeldite, and owyheeite, boulangerite, stibnite, and enargite (Bundtzen, 2004). A suite of rich samples contained up to 28.323 ounces of gold per ton, 2,450 parts per million (ppm) copper, 5,320 ppm arsenic, 10,200 ppm antimony, 15,600 ppm lead, 28.1 ppm mercury, 56 ppm molybdenum, 88 ppm uranium, and more than 1 percent zinc. There is some indication of supergene enrichment. Geochemically, the gold is closely associated with silver, arsenic, copper, molybdenum, tungsten, and tin (Freeman, 2011).

McCoy and others (1997) describe several stages of alteration at the Democrat Mine. An early stage of alteration consists of quartz-tourmaline-muscovite +/- biotite +/- K-spar +/- clinozoisite. The stage more commonly associated with gold is an assemblage of quartz-white mica +/- ankerite +/- carbonaceous material. Locally, the plagioclase and K-spar phenocrysts are weathered to montmorillonite and kaolinite, respectively (D.J. Szumigala, oral communication, 1998). Albite is present in veins with quartz (R.J. Newberry, oral communication, 1998). In addition, the surrounding gneiss displays evidence of hornfelsing (K. Ausburn, oral communication, 1998).

In a recent synthesis of the many years of work at the property, Freeman (2011) proposes that the Democrat Mine is part of a structurally controlled, pluton related, boron enriched, gold-silver-tin-polymetallic hydrothermal system. McCoy and others (1977) include the Democrat Mine in their comprehensive article on the plutonic-related gold deposits of Interior Alaska.

Alteration:

McCoy and others (1997) describe several stages of alteration at the Democrat Lode. An early stage of alteration consists of quartz-tourmaline-muscovite +/- biotite +/- K-spar +/- clinozoisite. The stage more commonly associated with gold is an assemblage of quartz-white mica +/- ankerite +/- carbonaceous material. Locally, the plagioclase and K-spar phenocrysts are weathered to montmorillonite and kaolinite, respectively (D.J. Szumigala, oral communication, 1998). Albite is present in veins with quartz (R.J. Newberry, oral communication, 1998). In addition, the surrounding gneiss displays evidence of hornfelsing (K. Ausburn, oral communication, 1998).

Age of mineralization:

Most of the mineralization is about 90 Ma (as are many of the intrusion-related gold deposits in central Alaska).

Generic deposit model:

Deposit model:

Intrusion-related gold deposit; part of a structurally controlled, boron-enriched, gold-silver-tin-polymetallic hydrothermal system.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The Democrat Mine has been the focus of most of the recent work in the Richardson district (Freeman, 2011). The Democrat Mine was the first lode prospect discovered in the Richardson district in 1913. By 1921, three short adits, and two shafts had been driven on the property and a small arrastra mill produced an unknown but probably small amount of gold (Brooks, 1923). Modern work in the area was initiated by Bundtzen and Reger (1977), and Swainbank and others (1984), who identified several areas of mineral potential and defined the general geology and geochemistry of the district. The first detailed work on the Democrat Mine was by John Mitchell in the late 1980s, and in 1987, the Tri-Valley Corporation (now Select Resources Corporation, Inc.) acquired the property and have retained it through the end of 2011.

Tri-Valley drilled one reverse circulation hole 101.5 feet deep in 1987 and collected many rock samples from the quartz-feldspar porphyry dike that hosts the mineralization. In 1988, Tri-Valley and Asarco Inc. in a joint venture drilled 17 diamond drill holes that totaled 4,462 feet. The drilling was at 8 locations along about 3,400 feet of the quartz-feldspar porphyry dike. Asarco terminated their agreement in late 1988. Later in 1988 and in 1989, Tri-Valley collected several large bulk samples on the surface of the deposit to prove that the Asarco drilling had underestimated the grade of the deposit.

In 1991, Tri-Valley began working with TsNIGRI (Research Center of the Institute for Geological Exploration of Base and Precious Metals), of the Russian Ministry of Geology, and carried out geologic mapping, geophysics, and geochemical surveys at and around the Democrat Mine; the work continued to 2001. In 1997, Tri-Valley drilled 7 reverse-circulation holes at the Democrat property, completed several ground-geophysical grids, dug at least one trench, and collected numerous rock samples. The drilling was in the same general area as the 1987 and 1988 drilling. In 2010, Select collected fifteen, 25-kilogram samples for analysis.

In 2016, Northern Empire Resources Corp. conducted exploration on their Richardson property, which hosts multiple intrusion-related as well as low- and high-angle fault-hosted lode gold prospects with gold ± silver ± arsenic ± antimony ± bismuth geochemical signatures. The project area includes the historical Democrat lode gold mine. In 2016, Northern Empire Resources Corp. collected rock chip-channel samples at 1-m intervals across 130 meters of the exposed face at Democrat. One 32-meter-long sample returned 5.73 grams of gold per tonne and 29.8 grams of silver per tonne, including 6 meters of 18.33 grams of gold per tonne and 48.95 grams of silver per tonne. Another sample collected about 61 meters away returned 2.57 grams of gold per tonne and 39.3 grams of silver per tonne across 6 m. Northern Empire also collected 1,298 geochemical samples across the Richardson property and conducted trenching, prospecting, 277 line-km of ground-magnetic geophysical surveys, identified structures in airborne geophysics, re-logged historical core holes, and delineated future drill targets. Work to date has identified a 2,000-meter-long, north–northeast-trending, gold-in-soil anomaly with a coincident geophysical structural signature. Additionally, 2,000 meters of the geophysical signature is poorly covered by soil data. A second northwest-trending mineralized structure was identified, with coincident elevated gold-in-soils over a 1,000-m strike length, with an additional 1,000 meters remaining to be evaluated by geochemical sampling (Athey and

Werdon, 2017).

Production notes:

There probably was a small but undocumented amount of gold produced from 1913 to 1922 from a small arrastra mill. The only other production was 2,357 ounces of gold that was recovered in 1988 and 1989 during the processing of several large bulk samples collected at the surface.

Reserves:

Since 1988, there have been several attempts to estimate the gold resources of the Democrat Mine. However, different criteria have been used, there has been some uncertainty about the accuracy of the data, and the samples do not necessarily overlap geographically. Mitchell (1989) estimated that a zone from which a large bulk sample was taken contained 18,750 tons of material that averaged 0.439 ounce of gold per ton. In another bulk-sampling effort, Stearns (1989) identified four areas in the quartz-feldspar porphyry dikes that were estimated to contain 250,000 tons of material that averaged 0.07 ounce of gold per ton, or about 17,500 ounces of gold. Based mainly on drilling and surface sampling to 1998, Bright (1998) estimated that 4 blocks of material 80-feet thick contained 141,539 tons of material with an average grade of 0.106 ounce of gold per ton (15,074 ounces). Freeman (2011) estimated that an area about 1,200 feet long, 300-600 feet wide, and 200 feet thick averaged 0.65 part per million gold.

Additional comments:

In his synthesis of more than 25 years of the work on the Democrat Mine and the surrounding area, Freeman (2011) lists and cites data that he had access to from a voluminous body of unpublished, internal reports done for the Tri-Valley Corporation and other companies. Some of Freeman's references not included in the reference list that follows may only peripherally relate to this deposit and most are not available publicly.

This site is part of the Richardson project (as of 2016).

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Primary Reference: Freeman, 2011

Reporter(s): Cameron S. Rombach (ADGGS); D.J. Grybeck (Contractor, USGS); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Gray Lead; Grey Lead; Hilltop; Rob

Site type: Prospect

ARDF no.: BD017

Latitude: 64.3445 **Quadrangle:** BD B-1

Longitude: 144.2523

Location description and accuracy:

The Gray Lead prospect is along a ridge at an elevation of about 4,070 feet, about 1.3 mile northwest of the north peak (5080) of Black Mountain. It is about 0.5 mile south of the center of section 31, T. 6 S., R. 18 E., of the Fairbanks Meridian. The location is accurate, though degree of accuracy not reported.

Commodities:

Main: Ag, As, Au, Sb

Other: Cu, Pb, Te, W

Ore minerals: Arsenopyrite, bismuthinite, covellite, digenite, gold, jamesonite, pyrite, stibnite

Gangue minerals: Quartz, sericite

Geologic description:

The Goodpaster region was first explored for placer gold in 1915. In the early 1930s, gold-bearing quartz veins were discovered in the upper Tibbs Creek area. The first underground workings were driven in the winter of 1936. A 450-foot tunnel was driven following a small vein, termed the Blue Lead Extension (BD003). After disappointing results, the work was stopped. In the summer of 1936, five men drove a 300-foot tunnel at the outcrop of the Blue Lead vein (Reed, 1937). During the winter of 1937, a 300-foot tunnel was driven at the nearby Grizzly Bear Mine (BD018) and a 50-ton mill was constructed. In the summer of 1938, the mill was moved to the Blue Lead Mine and operated for a year and a half until the fall of 1939 (Joesting, 1938). The Gray Lead prospect was also probably discovered about this time. From 1939 to 1941, approximately 1,300 feet of surface and subsurface workings were completed at the Gray Lead prospect (Thomas, 1970). Over 300 feet of the vein was traced at the surface (Joesting, 1938). There was limited exploration reported in the 1970s.

From 1995 to 1999, The Stone Boy Joint Venture (Sumitomo Metal Mining and WGM Inc.) spent more than $1.3 million exploring in the area; they did extensive surface mapping and sampling, surface and airborne geophysics, and 16,215 feet of diamond drilling in 26 holes. The details of the drilling are vague but at least 4 holes were drilled at the Gray Lead prospect. Surface rock samples contained up to 4.93 ounces of gold per ton. The best intercept in the drilling was 13.5 feet that averaged 0.92 ounce of gold per ton (Flanders, 2010).

In 2002, Freegold Ventures Ltd. optioned a large block of claims that covered the Gray Lead land several other nearby deposits that are described separately: the Grizzly Bear (BD018), Michigan Lode (BD025), Wolverine (BD057), Upper Trench, Lower Trench (BD058), and O'Reely (BD059). Freegold has continued the exploration through early 2012 as the Rob project. (Flanders, 2010; Freegold Ventures Ltd., 2012). The work has included extensive geologic mapping, surface sampling, and geochemical and geophysical surveys. In 2004, Freegold commissioned a comprehensive NI 43-101 report (Freeman, 2004) that summarized their and previous work. The 2004 report was updated by Flanders (2010) No ore has been mined from the Gray Lead prospect although 20 holes have been drilled on it since 1995.

As interpreted by Bailey (2001), Freeman (2004), and Flanders (2010), this and the several other similar deposits in the area are near the contact of a large Cretaceous biotite granodiorite stock with a mixed unit of Paleozoic biotite gneiss, feldspar-biotite augen gneiss, and quartzite that form a large gneiss dome. The

granodiorite is cut by hornblende, andesite porphyry dikes. The rocks are locally intensely sheared and Grizzly Bear (BD018) and Michigan Lode (BD025) are aligned along the northeast-trending Gray Lead fault. This fault is observed in the underground workings of the Gray Lead prospect and also at the surface where it is marked by pronounced saddle-like depressions across the spurs separating the westward-flowing tributaries of Tibbs Creek.

The lode deposits in the area are gold-bearing quartz veins in shear zones in the metamorphic and igneous rocks. The quartz veins contain gold +/- base metal +/- silver and a variable combination of sulfides, including arsenopyrite, covellite, digenite, jamesonite, pyrite, and stibnite. Typically, the gold content decreases as sulfides increase. Veins are commonly 2 to 3 feet in width but some are as wide as 8 feet (Thomas, 1970). When gold is present, it is usually extremely fine grained. However, veins at the nearby Grizzly Bear mine (BD018) contain relatively coarse gold which is easily visible in hand specimen (Freeman, 2004).

The Gray Lead prospect is on a quartz vein 2 feet in width. In the underground workings, the vein dips steeply west (Joesting, 1938). Freeman (2004) cites numerous grab samples from veins at the Gray Lead prospect that contain up to 2.105 ounces of gold per ton, up to 43.50 parts per million (ppm) silver, more than 1 percent arsenic, up to 1,610 ppm bismuth, up to 415 ppm lead, more than 1 percent antimony, up to 180.50 ppm tellurium, and up to 97.2 ppm tungsten. The many surface samples of veins and altered granite collected in subsequent years varied greatly in their relative and specific metal content but they essentially have the same association of metals. Freeman (2004) classifies the Gray Lead deposit as a quartz vein hosted in gneiss and/or high-grade schist near an intrusion that was the source of the mineralization.

In 2007, Freegold Ventures Ltd. (2007) drilled 8 holes on the Gray Lead vein that totaled 1,529 feet. All of the holes intersected the vein which is in biotite, augen paragneiss. The mineralization consisted of sugary textured quartz with fine-grained bismuthinite and arsenopyrite. The width of the vein varies but probably averages more than 10 feet thick.

Alteration:

Alteration has been reported as pervasive quartz- sericite- sulfide alteration occurring adjacent to veins and extending for up to one mile from the source structure (Flanders, 2010).

Age of mineralization:

Genetically related to a nearby Cretaceous granodiorite intrusive.

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active?

Workings/exploration:

The Goodpaster region was first explored for placer gold in 1915. In the early 1930s, gold-bearing quartz veins were discovered in the upper Tibbs Creek area. The first underground workings were driven in the winter of 1936. A 450-foot tunnel was driven following a small vein, termed the Blue Lead Extension (BD003). After disappointing results, the work was stopped. In the summer of 1936, five men drove a 300-foot tunnel at the outcrop of the Blue Lead vein (Reed, 1937). During the winter of 1937, a 300-foot tunnel was driven at the nearby Grizzly Bear Mine (BD018) and a 50-ton mill was constructed. In the summer of 1938, the mill was moved to the Blue Lead Mine and operated for a year and a half until the fall of 1939 (Joesting, 1938). The Gray Lead vein was also probably discovered about this time. From 1939 to 1941, approximately 1,300 feet of surface and subsurface workings were completed at the Gray Lead prospect

(Thomas, 1970). Over 300 feet of the vein could be traced at the surface (Joesting, 1938). There was limited exploration reported in the 1970s. From 1995 to 1999, The Stone Boy Joint Venture (Sumitomo Metal Mining and WGM) spent more than $1.3 million exploring in the area; they did extensive surface mapping and sampling, surface and airborne geophysics, and 16,215 feet of diamond drilling in 26 holes. The details of the drilling are vague but one or more probably was drilled at the Gray Lead prospect.

In 2002, Freegold Ventures optioned a large block of claims that covered the Gray Lead lode and several other nearby deposits that are described separately: the Grizzly Bear (BD003), Michigan Lode (BD025), Wolverine (BD057), Upper Trench, Lower Trench (BD058) and O'Reely (BD059). Freegold has continued the exploration through early 2012 as the Rob project. (Flanders, 2010; Freegold Ventures Ltd., 2012). The work has included extensive geologic mapping, surface sampling, and geochemical and geophysical surveys. In 2007, Freegold Ventures Ltd. (2007) drilled 8 holes on the Gray Lead prospect that totaled 1,529 feet. Some of the notable intercepts in these holes were: 16.5 feet that contained 0.197 ounce of gold per ton, 13.5 feet that contained 0. 586 ounce of gold per ton, 13.0 feet that contained .841 ounces of gold per ton, 14.0 feet that contained 0.230 ounce of gold per ton, and 6.5 feet that contained 0.677 ounce of gold per ton. In 2008, they drilled 12 more holes that totaled 3,144.2 feet. In addition, 14 grab rock samples were submitted for geochemical analysis, and IP and resistivity surveys were conducted (Flanders, 2010). Highlights of the results of 2008 drilling are 4.5 meters of 18 g/t gold and 2. meters of 62 g/t gold (Freegold Ventures Ltd, 2008).

Production notes:

None.

Reserves:

None.

Additional comments:

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Primary Reference: Freeman, 2004; Flanders, 2010

Reporter(s): Cameron S. Rombach (ADGGS); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Grizzly Bear; Yellow Jacket

Site type: Mine

ARDF no.: BD018

Latitude: 64.3512 **Quadrangle:** BD B-1

Longitude: 144.2093

Location description and accuracy:

The Grizzly Bear mine is situated on a ridge of Black Mountain separating the headwaters of Antimony Creek, a tributary of Tibbs Creek (BD040), and Summit Creek, a tributary of Boulder Creek (BD004). The mine is about 0.3 mile east of the center of section 32, T. 6 S., R. 18 E., of the Fairbanks Meridian. The Yellow Jacket deposit is nearby (The Grizzly Bear Mine is misplaced on the USGS 1:63,360-scale topographic map.).

Commodities:

Main: Ag, As, Au, Sb

Other: Cu, Pb, Te, W

Ore minerals: Arsenopyrite, covellite, digenite, gold, jamesonite, pyrite, stibnite

Gangue minerals: Quartz

Geologic description:

The Grizzly Bear mine and Yellow Jacket deposit are situated the ridge of Black Mountain that is largely underlain by Cretaceous granodiorite (Weber and others, 1978). Augen gneiss, gneissic schist, and schist are the west of Black Mountain. There is intense shearing and faulting in the contact between the metamorphic and intrusive rocks. This shearing is observed in the underground workings and at the surface as pronounced saddle-like depressions across the spurs separating the westward-flowing tributaries of Tibbs Creek. This shear zone trends roughly N 15 E and dips 65 degrees NW. The lode deposits in the area are mostly gold-bearing quartz veins in the shear zone, although some are in the granodiorite. The veins contain gold and a variable assemblage of sulfides, including arsenopyrite, covellite, digenite, jamesonite, pyrite, and stibnite. Typically, gold content decreases as sulfides increase. Veins are commonly 2 to 3 feet in width, with some as wide as 8 feet (Thomas, 1970). When gold is present, it is usually extremely fine grained. However, other near veins such as in the Blue Lead Mine (BD003) contain relatively coarse gold, which is easily visible in hand specimen.

The Grizzly Bear Mine was developed on an 18-inch-wide quartz vein. Based on underground workings, the vein dips steeply to the south (Reed, 1937). Much of the ore is on the hanging wall (Thomas, 1970). Thomas (1970) shows the Yellow Jacket prospect as a vein exposed at the surface approximately one third of a mile southwest of the Grizzly Bear Mine. Glover (1950) reported a range in gold fineness of 766 to 780 for the Grizzly Bear Mine.

The Goodpaster region was first explored for placer gold in 1915. In the early 1930s, gold-bearing quartz veins were discovered in the upper Tibbs Creek area. By the winter of 1936, the first underground workings were being installed. A 450-foot tunnel was driven following a small vein, termed the Blue Lead Extension (BD003). After disappointing results, the work was stopped. In the summer of 1936, five men drove a 300-foot tunnel at the outcrop of the Blue Lead vein (Reed, 1937). During the winter of 1937, a 300-foot tunnel was driven at the Grizzly Bear Mine (BD018) and a 50-ton mill was constructed. In the summer of 1938, the mill was moved to the Blue Lead Mine and operated for a year and a half until the fall of 1939 (Joesting, 1938). There was limited exploration in the 1970s. The mill was still on site and the mine shaft was accessible in 1970, but blocked by ice (Thomas, 1970). It is reported that 350 tons of ore was produced from

the Grizzly Bear mine and processed at the mill at the Blue Lead mine. Another 150 tons was produced from the Blue Lead mine (Reed, 1937). No ore was mined from the Yellow Jacket vein (Thomas, 1970).

From 1995 to 1999, The Stone Boy Joint Venture (Sumitomo Metal Mining and WGM) spent more than $1.3 million exploring in the area; they did extensive surface mapping and sampling, surface and airborne geophysics. They drilled 26 holes in the area that totaled 16,215 feet in 26 holes. The location of the holes is vague but one or more of these holes was at the Grizzly Bear Mine.

In 2002, Freegold Ventures optioned a large block of claims that covered the Grizzly Bear Mine and several others deposits nearby that are described separately: the Blue Lead (BD003), Michigan Lode (BD025), Gray Lead (BD017), Wolverine (BD057), Upper Trench/ Lower Trench (BD058) and O'Reely (BD059). Freegold has continued the exploration through early 2012 as the Rob project. (Flanders, 2010; Freegold Ventures Ltd., 2012). The work has included extensive geologic mapping, surface sampling, and geochemical and geophysical surveys.

Freeman (2004) and Flanders (2010) consider the deposit to be Au ± base metal, ± Ag ± W ± Bi intrusion-hosted mineralization with a possible genetic relationship between the precious metal mineralization and the emplacement of the intrusion.

Alteration:

Age of mineralization:

Probably genetically related to a nearby Cretaceous granodiorite intrusive.

Generic deposit model:

Deposit model:

Silver-gold-quartz veins and stockwork, +/- arsenic, copper, lead, antimony, tellurium, and tungsten (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

The Goodpaster region was first explored for placer gold in 1915. In the early 1930s, gold-bearing quartz veins were discovered in the upper Tibbs Creek area. By the winter of 1936, the first underground workings were driven. A 450-foot tunnel was driven following a small vein called the Blue Lead Extension. After disappointing results, the work was stopped. In the summer of 1936, five men drove a 300-foot tunnel at the outcrop of the Blue Lead vein (Reed, 1937). During the winter of 1937, a 300-foot tunnel was driven at the Grizzly Bear Mine (BD018) and a 50-ton mill was constructed. In the summer of 1938, the mill was moved to the Blue Lead Mine and operated for a year and a half until the fall of 1939 (Joesting, 1938). The mill was still on site and the mine shaft openings were accessible in 1970, but blocked by ice (Thomas, 1970).

From 1995 to 1999, The Stone Boy Joint Venture (Sumitomo Metal Mining and WGM) spent more than $1.3 million exploring in the area; they did extensive surface mapping and sampling, surface and airborne geophysics, and 16,215 feet of diamond drilling. They drilled 26 holes; one or more of these hole may have been at the Grizzly Bear Mine but the details are obscure. In 2002, Freegold Ventures optioned a large block of claims that covered the Grizzly Bear and several other nearby deposits that are described separately: the Blue Lead (BD003), Michigan Lode (BD025), Gray Lead (BD017), Wolverine (BD057), Upper Trench/ Lower Trench (BD058) and O'Reely (BD059). They continued to explore them as a unit as the Rob project through early 2012 (Flanders, 2010; Freegold Ventures Ltd., 2012). The work has included extensive geologic mapping, surface sampling, and geochemical and geophysical surveys.

Production notes:

The Grizzly Bear Mine has produced 350 tons of ore and processed them at the mill at the Blue Lead mill (Reed, 1937). No ore was mined from the Yellow Jacket vein (Thomas, 1970).

Reserves:

None.

Additional comments:

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Primary Reference: Freeman, 2004; Flanders, 2010

Reporter(s): Cameron S. Rombach (ADGGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Hinkley Gulch

Site type: Mines

ARDF no.: BD019

Latitude: 64.3061 **Quadrangle:** BD B-5

Longitude: 146.313

Location description and accuracy:

Hinkley Gulch is a small northwest flowing tributary to lower Banner Creek. The gulch is not labeled on the USGS topographic maps but 'Hinkley Gulch' has long been used locally and in various mining-related publications. The mine is about 1.6 miles north-northeast of Richardson on the Richardson Highway, in the southwest corner of section 14, T. 7 S., R. 7 E., of the Fairbanks Meridian.

Commodities:

Main: Au

Other: Ag, As, Bi, Cu, Pb, Sb, Sn, U, W, Zn

Ore minerals: Gold

Gangue minerals:

Geologic description:

The Richardson District is characterized by gentle slopes and broad, alluvium-filled valleys (Prindle and Katz, 1913). The area is unglaciated and largely overlain by windblown silt, sand, and loess, locally up to 50 meters thick (Foster and others, 1979). The rocks consist of three structure-bounded units (Weber and others, 1978; Swainbank and others, 1984; Noyes and others, 2006; Freeman, 2011). There is a core that consists mainly of biotite-hornblende-feldspar-quartz gneiss and lesser amphibolite, quartzite, marble and calc-silicate hornfels. The core is bounded on the north and south by amphibolite-grade pelitic schist. The contacts between the units are probably low-angle faults; north-trending vertical faults occur widely. Weber and others (1978) assign the pre-metamorphic age of the rocks to the Precambrian or Paleozoic. They were metamorphosed in the Middle to Late Devonian and recrystallized in the Early Cretaceous (Dusel-Bacon and others, 2004; Freeman, 2011). The metamorphic rocks are intruded by 90 Ma, felsic to intermediate dikes and plugs, notable the mineralized quartz-feldspar porphyry dike at the nearby Democrat Mine (BD014).

Placer gold was discovered nearby on Tenderfoot Creek (BD039) in 1905 and Hinkley Gulch was probably mined soon after. Ellsworth and Parker (1911) noted mining in Hinkley Gulch in open cuts and by drifting. There was at least one episode of mining after WWII. Don May (oral communication, 1998) said that Terry Anderson recovered 3,000 ounces of gold from Hinkley Gulch, but details are lacking. In recent years, there has been considerable production from a residual gold placer at May's Pit (BD007) about a half mile to the southeast on the saddle at the head of Hinkley Gulch and there has been speculation that the gold in the placers at May's Pit and Hinkley Gulch share a common origin (Freeman, 2011). Glover (1950) reported that the gold from Hinkley Gulch was 677 to 680 fine and Bundtzen and Reger (1977) said it averaged 670 fine.

Since the late 1980s there has been intermittent but extensive exploration in the Richardson district for lode gold deposits and some of that work has overlapped or involved sampling and mapping along Hinkley Gulch. Swainbank and others (1984) mapped highly altered rocks exposed along Hiinkley Gulch. Intervals up to 60 feet wide consist of sheared and oxidized epidote-amphibolite and garnet-amphibole skarn. A breccia exposed along the gulch that consists of clasts of quartz-feldspar porphyry, schist, quartzite and gneiss could be traced northeast for about 1,500 feet. A chip sample of porphyry contained 0.30 parts per

million (ppm) gold, and low levels of copper, lead, zinc, antimony, and uranium. In 2005, an extensive soil sampling program defined several areas over or near Hinkley Gulch that were anomalous in gold, silver, arsenic, bismuth, tin, tungsten, copper, lead, and zinc (Noyes and others, 2006). In view of the altered rocks and the geochemical anomalies, Freeman (2011) suggests that the Hinkley Gulch may be over or near a distal intrusion-related gold deposit similar to the one at the Democrat Mine (BD014).

Alteration:

Rock in the vicinity of the placer on Hinkley Gulch are locally highly altered, sheared, oxidized, and brecciated.

Age of mineralization:

Quaternary placer and a 90 Ma intrusion-related gold deposit.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

Placer gold was discovered nearby on Tenderfoot Creek (BD039) in 1905 and Hinkley Gulch was probably mined soon after. Ellsworth and Parker (1911) noted mining in Hinkley Gulch in open cuts and by drifting. There was at least one episode of mining after WWII. Since the late 1980s there has been intermittent but extensive exploration in the Richardson district for lode gold deposits and some of that work has overlapped or involved sampling and mapping along Hinkley Gulch. In 2005, an extensive soil sampling program defined several anomalous areas over or near Hinkley Gulch.

Production notes:

There is little document production from Hinkley Gulch but 3,000 ounces of gold reportedly was produced some time after was WWII.

Reserves:

Unknown.

Additional comments:

References:

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Primary Reference: Freeman, 2011

Reporter(s): Cameron S. Rombach (ADGGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Junction Creek

Site type: Mines

ARDF no.: BD021

Latitude: 64.333 **Quadrangle:** BD B-5

Longitude: 146.403

Location description and accuracy:

Junction Creek, a tributary of Redmond Creek, is approximately 3.5 miles north of the town of Richardson on the Richardson Highway. This site is approximately at the center of the mining at the head of the creek in the lower half of section 5, T. 7 S., R. 7 E., of the Fairbanks Meridian. There was also drilling after WWII about 2 and 5 miles downstream; see the Geologic Description field for details.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

The Richardson District is characterized by gentle slopes and broad, alluvium-filled valleys (Prindle and Katz, 1913). The area is unglaciated and largely overlain by windblown silt, sand, and loess, locally up to 50 meters thick (Foster and others, 1979). The rocks consist of three structure-bounded units (Weber and others, 1978; Swainbank and others, 1984; Noyes and others, 2006; Freeman, 2011). There is a core that consists mainly of biotite-hornblende-feldspar-quartz gneiss and lesser amphibolite, quartzite, marble and calc-silicate hornfels. The core is bounded on the north and south by amphibolite-grade pelitic schist. The contacts between the units are probably low-angle faults; north-trending vertical faults occur widely. Weber and others (1978) assign the pre-metamorphic age of the rocks to the Precambrian or Paleozoic. They were metamorphosed in the Middle to Late Devonian and recrystallized in the Early Cretaceous (Dusel-Bacon and others, 2004; Freeman, 2011). The metamorphic rocks are intruded by 90 Ma, felsic to intermediate dikes and plugs, notable the quartz-feldspar porphyry dike at the nearby Democrat Mine (BD014).

There is little information on placer mining on Junction Creek although it was probably prospected soon after gold was discovered in the Richardson District in 1905. Metz (1991) described early drift mine and surface tailings in the Junction Creek. Most of the mining apparently took place at the head of Junction Creek in the lower half of section 5, T. 7 S., R. 7 E., but it may be more extensive. The Alaska Division of Mining Kardex file system records active claims on Junction Creek as recent as 1984.

Based on oral communications with Dan Cobin, a prospector in the area, Freeman (2011) notes that Cobin drilled one hole near the junction of Democrat Creek and Junction Creek, probably after WWII; only low gold values were found. Cobin also drilled another hole about 3 miles downstream, probably near the center of section 33, T. 6 S., R. 6 E.; no further work was done although 'good pay' was found.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

There is little information on placer mining on Junction Creek although it was probably prospected soon after gold was discovered in the Richardson District in 1905. Metz (1991) described early drift mine and surface tailings in the Junction Creek. Most of the mining apparently took place at the head of Junction Creek in the lower half of section 5, T. 7 S., R. 7 E., but it may be more extensive. The Alaska Division of Mining Kardex file system records active claims on Junction Creek as recent as 1984.

Based on oral communications with Dan Cobin, a prospector in the area, Freeman (2011) notes that Cobin drilled one hole near the junction of Democrat Creek and Junction Creek, probably after WWII; only low gold values were found. Cobin also drilled another hole about 3 miles downstream, probably near the center of section 33, T. 6 S., R. 6 E.; no further work was done although 'good pay' was found.

Production notes:

There is no record of the gold production from Junction Creek although it produced some gold from the early 1900s into at least the 1980s.

Reserves:

None.

Additional comments:

References:

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Primary Reference: Freeman, 2011

Reporter(s): Cameron S. Rombach (ADGGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Michigan; Michigan Lode; Michigan Lead; Rob

Site type: Prospect

ARDF no.: BD025

Latitude: 64.3624 **Quadrangle:** BD B-1

Longitude: 144.1979

Location description and accuracy:

The Michigan prospect about 2.1 miles north-northwest of the north(5080) peak of Black Mountain and about 0.4 mile southwest of the center of section 28, T. 6 S., R. 18 E, of the Fairbanks Meridian. Although sometimes described as a separate deposit, it may be a continuation of the mineralization at the Blue Lead prospect (BD003) and Grizzly Bear Mine (BD018) just to the south. The location is accurate within 500 feet.

Commodities:

Main: Ag, As, Au, Sb

Other: Bi, Cu, Pb, Te, W

Ore minerals: Arsenopyrite, covellite, digenite, gold, jamesonite, pyrite, stibnite

Gangue minerals: Quartz, sericite

Geologic description:

The Goodpaster region was first explored for placer gold in 1915. In the early 1930s, gold-bearing quartz veins were discovered in the upper Tibbs Creek area. By the winter of 1936, the first underground workings were begun. A 450-foot tunnel was driven following a small vein, termed the Blue Lead Extension (BD003). After disappointing results, the work was stopped. In the summer of 1936, five men drove a 300-foot tunnel at the outcrop of the Blue Lead vein (Reed, 1937). During the winter of 1937, a 300-foot tunnel was driven at the nearby Grizzly Bear Mine (BD018) and a 50-ton mill was constructed. In the summer of 1938, the mill was moved to the Blue Lead Mine and operated for a year and a half until the fall of 1939 (Joesting, 1938). The Michigan Lode was also probably discovered about that time. No ore has been mined from the Michigan Lode (Thomas, 1970) and the only workings are trenches.

From 1995 to 1999, The Stone Boy Joint Venture (Sumitomo Metal Mining and WGM) spent more than $1.3 million exploring in the area; they did extensive surface mapping and sampling, surface and airborne geophysics, and 16,215 feet of diamond drilling. The joint venture drilled 26 holes but details on their location is largely lacking. Apparently no holes were drilled on the Michigan prospect. In 2002, Freegold Ventures optioned a large block of claims that covered the Michigan Lode and several other nearby deposits that are described separately: Gray Lead (BD017), the Grizzly Bear (BD018), Wolverine (BD057), Upper Trench, Lower Trench (BD058) and O'Reely (BD059). Through early 2012, Freegold has been exploring them as a unit under the name Rob (Flanders, 2010; Freegold Ventures Inc., 2012). The work has included extensive geologic mapping, surface sampling, and geochemical and geophysical surveys. In 2004, Freegold commissioned a comprehensive NI 43-101 report (Freeman, 2004) that summarized their and previous work. That report was updated in 2010 (Flanders, 2010).

As interpreted by Bailey (2001), Freeman (2004), and Flanders (2010) this and several other similar prospects in the area are near the contact of a large Cretaceous biotite granodiorite pluton that intrudes a mixed unit of Paleozoic biotite gneiss, feldspar-biotite augen gneiss, and quartzite that forms a large gneiss dome. The granodiorite is cut by hornblende, andesite porphyry dikes. The rocks are intensely sheared locally and this and the nearby Gray Lead (BD017), Blue Lead (BD003), and Grizzly Bear (BD018) deposits are aligned along the northeast-trending Gray Lead fault. This shearing is observed in the

underground workings and at the surface as saddle-like depressions across the spurs separating the westward-flowing tributaries of Tibbs Creek.

The lode deposits in the area are gold-bearing quartz veins in shear zones in the metamorphic and igneous rocks. The quartz veins contain gold +/- base metal +/- silver and a variable combination of sulfides, including arsenopyrite, covellite, digenite, jamesonite, pyrite, and stibnite. Typically, the gold content decreases as sulfides increase. The veins commonly are 2 to 3 feet in width but some are as wide as 8 feet (Thomas, 1970). When gold is present, it is usually extremely fine grained. However, veins at the nearby Grizzly Bear mine (BD018) contain relatively coarse gold, which is easily visible in hand specimen.

Thomas (1970) describes the Michigan Lode as a vein. Samples from vein quartz with a blue hue contain 0.10 ounce of gold per ton; some Fe-stained quartz sampled contained 0.42 ounce of gold per ton and 0.08 ounce of silver per ton. A sample containing cryptocrystalline quartz with a blue cast contained 8.76 ounces of gold per ton and 3.26 ounces of silver per ton (Thomas, 1970). Freeman (2004) and Flanders (2010) classified the Michigan Lode as a 'stockwork-shear deposit with anomalous bismuth, tellurium, and tungsten, in a porphyritic, intermediate to felsic intrusion that may be genetically related to the deposit'. Flanders (2010) cites grab samples of vein and altered granite that contain up to 28.83 ounces of gold per ton, up to 9.50 parts per million (ppm) silver, more than 1 percent arsenic, up to 0.83 ppm bismuth, up to 40 ppm lead, up to 776 ppm antimony, up to 0.30 ppm tellurium, and up to 0.05 ppm tungsten.

Alteration:

Alteration varies from flood silica to intense sericite alteration that leaves the host rock soft and easily broken with bare hands (Flanders, 2010).

Age of mineralization:

Probably genetically related to a nearby Cretaceous granodiorite intrusive.

Generic deposit model:

Deposit model:

Silver-gold-quartz veins and stockwork, +/- arsenic, copper, lead, antimony, tellurium, and tungsten (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active?

Workings/exploration:

The Goodpaster region was first explored for placer gold in 1915. In the early 1930s, gold-bearing quartz veins were discovered in the upper Tibbs Creek area. By the winter of 1936, the first underground workings were begun. A 450-foot tunnel was driven following a small vein, termed the Blue Lead Extension. After disappointing results, the work was stopped. In the summer of 1936, five men drove a 300-foot tunnel at the outcrop of the Blue Lead vein (Reed, 1937). During the winter of 1937, a 300-foot tunnel was driven at the nearby Grizzly Bear Mine (BD018) and a 50-ton mill was constructed. In the summer of 1938, the mill was moved to the Blue Lead Mine and operated for a year and a half until the fall of 1939 (Joesting, 1938). The Michigan Lode was also probably discovered about this time. No ore has been mined from the Michigan Lode (Thomas, 1970).

From 1995 to 1999, The Stone Boy Joint Venture (Sumitomo Metal Mining and WGM) spent more than $1.3 million exploring in the area; they did extensive surface mapping and sampling, surface and airborne geophysics, and 16,215 feet of diamond drilling. In 2002, Freegold Ventures optioned a large block of claims that covered the Michigan Lode and several other nearby deposits that are described separately: the Grizzly Bear (BD003), Gray Lead (BD017), Wolverine (BD057), Upper Trench, Lower Trench (BD058) and O'Reely (BD059) and explored them as a unit under the name Rob. The work has included extensive

mapping, surface sampling, and geochemical and geophysical surveys. Through 2004, Ventures spent more than $1 million exploring the Rob property and in 2004 commissioned a comprehensive NI 43-101 report (Freeman, 2004); an update was done in 2010 (Flanders, 2010). Freegold drilled 3 holes in 2011.

The 2011 drilling was the first drilling done at Michigan; 2,984 feet was drilled in order to evaluate the bulk tonnage potential of the prospect. Highlights of the results of 2011 drilling are 57 gpt gold for over five feet, and 7 gpt gold for over 11.5 feet (Avalon Development Corporation, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

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Primary Reference: Flanders, 2010

Reporter(s): Cameron S. Rombach (ADGGS); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Pogo

Site type: Mine

ARDF no.: BD033

Latitude: 64.4526 **Quadrangle:** BD B-2

Longitude: 144.9136

Location description and accuracy:

The center of the Liese zone of the Pogo Mine that was the focus of mining as of early 2012 is just east of the Goodpaster River about 1.7 miles south of the mouth of Indian Creek. It is near the center of section 26, T. 5 S., R. 14 E, of the Fairbanks Meridian. Lamier and Puchlik (2011) have an image looking down on the mine and the zones of mineralization.

Commodities:

Main: Au

Other: Ag, As, Bi, Cu, Mo, Pb, Te, Zn

Ore minerals: Arsenopyrite, bismuth, bismuthinite, chalcopyrite, gold, loellingite, maldonite, pyrite, pyrrhotite, sphalerite, tetradymite

Gangue minerals: Biotite, dolomite, feldspar, quartz, sericite

Geologic description:

The Goodpaster region was first explored for placer gold in 1915. Thomas (1970) reports a stampede of prospectors that quickly ended when little gold was found. In 1991, a regional stream sediment sampling program identified gold, arsenic, and tungsten anomalies in Liese Creek and Pogo Creek. From 1991 to 1994, exploration consisted of soil sampling, minor prospecting, and geophysics. The Pogo deposit underlies a 1-square-mile area that contains more than 100 parts per billion (ppb) gold in soils. Three core drill holes were completed on Liese Creek in 1994; 13 additional core holes were drilled in 1995. These holes identified the Liese L1 zone. Work in 1996 consisted of 22 drill holes that further defined the zone. From 1991 to 1996, the exploration program drilled a total of 36,703 feet of core with 4,142 core samples and 3,520 geochemical samples. An additional 41 drill holes in 1997 enlarged the deposit and found the lower Liese L2 zone. Drilling in 1998 focused on better defining the L1 and L2 and the Liese L3 zone that was first identified in 1991. As of 1999, a total of 91,263 feet of drilling had been completed and 3,404 core samples and 1,500 geochemical samples were collected (M. Smith, oral communication, 1999). Extensive exploration continued through 2011 when three new ore bodies outside the Liese zone were announced (Lamier and Puchlik, 2011).

All the permits for the mine were received by the middle of 2004 (Szumigala and Hughes, 2005). By January 2006, the deposit had been fully developed with a large permanent camp, ore processing facilities, water treatment plant, power transmission lines, provisions for tailings disposal, and underground workings (Szumigala and Hughes, 2007). The first ore arrived at the mill on January 12, 2006 and the first gold pour was on February 12, 2006. Until 2009, the Pogo project was a joint venture of the Teck Resources Corporation, Sumitomo Metal Mining, and Sumitomo Corporation, with Teck as the operator. In July, 2009, Teck sold their interest in the mine and it is now fully owned by Sumitomo (Szumigala and others, 2011).

The rocks in the area are high grade gneiss intruded by Cretaceous granitic bodies. The area is cut by prominent northwest-trending high-angle faults but there are other high-angle faults with various orientations. To the north, the region is intruded by the Cretaceous Goodpaster batholith. At the Pogo deposit the host rock is predominantly amphibolite-grade biotite-quartz-feldspar gneiss. In the Liese Creek drainage, a series of granodiorite dikes intrude the gneiss. These dikes are interpreted to be apophyses of the

batholith. The youngest geologic unit in the area is a northwest-trending, steeply dipping, diorite dike situated in Liese Creek. This dike partly cuts off mineralization on the northeast edge of the deposit (Teck Resources Inc., 1998).

Geochronology studies have focused on the granodiorite and diorite dikes in the Liese Creek drainage. The diorite dike has an 40Ar/39Ar biotite age of 94 Ma, and a U-Pb zircon age of 94 Ma. The granodiorite dike has a 40Ar/39Ar biotite age of 91.7 Ma, a 40Ar/39Ar white mica age of 91.2 Ma, and a U-Pb monazite age of 107 Ma (M. Smith, oral communication, 1999). Lamier and Puchlik (2011) suggest similarities of the Pogo deposit to other intrusion-related gold deposits in interior Alaska, e.g., the Fort Knox Mine (ARDF FB112). The mineral assemblages suggest deposition from rapidly-changing pulses of magmatic fluids rather than from a metamorphic source.

As of early 2012, mining is centered on the Liese zone that consists of at least three flat-lying, subparallel, stacked tabular bodies of massive quartz, he L1, L2, and L3. The Pogo deposit is marked by a flexure point with an almost sinusoidal wave shape. The west portion of the deposit strikes northeast and dips northwest about 30 degrees. The east portion of the deposit strikes east and dips north about 30 degrees. The upper Liese zone (L1) is the largest and shallowest; it is at least 4,000 by 2,000 feet in area and varies from 0 to 65 feet thick. The lower Liese zone (L2) lies 300 to 500 feet below the L1. It is generally thinner, but higher grade than the L1. The L3 zone is approximately 800 feet below L1 (Smith, 1999). Although there are no mappable thrust faults, the Liese zones intersect the foliation of the host rock at an angle of about 5 degrees and apparently mark low angle structures.

The mineralized layers in the Liese zone are predominantly quartz with about 3 percent sulfides. The ore minerals in the quartz include arsenopyrite, bismuth, bismuthinite, chalcopyrite, gold, loellingite, maldonite, pyrite, pyrrhotite, sphalerite, and tetradymite (Smith, 1999). The gold occurs as 1 to 25 micron grains in arsenopyrite along fractures, and as inclusions in bismuth, tetradymite, and other gold-lead-bismuth-tellurium minerals. Geochemical data suggest a strong correlation between gold and bismuth, and a weaker correlation between gold and other lithophile elements (Smith, 1999).

The Liese zones are all display vein and replacement textures. The veining textures are characterized by two styles of quartz veins and alteration assemblages. The early veins are characterized by white quartz with arsenopyrite, chalcopyrite, pyrite, pyrrhotite and loellingite, and secondary biotite in selvages up to 1 meter wide (Smith, 1998). The later veins are characterized by gray quartz in stockwork veins and replacement selvages. They contain arsenopyrite and pyrite, with secondary disseminated sericite and dolomite that often overprints earlier secondary biotite. Some silica flooding is observed in the gneiss and intrusive rocks (M. Smith, oral communication, 1999).

Work in the late 2000s and into 2011 identified three other areas of mineralization peripheral to the Liese zone (Lamier and Puchlik (2011). A North zone consists of three, steeply dipping quartz veins that strike northwest. they intersect the Liese zone and radiate out from it; they may be the feeder to it. The East Deep zone about 1,000 feet northeast of the Liese zone was the main focus of drilling in 2011. A 95 Ma post-mineral dike separates it from the Liese zone which it resembles in orientation and mineral assemblages. The 4021 target is about 2.5 miles southeast of the Liese Zone. It consists of two, stacked, shallow-dipping quartz veins in granitic gneiss. It possibly is a distal extension of the Liese Zone.

In 2011, the Pogo Mine produced 385,000 ounces of gold (Puchlik and others, 2012).

In 2016, the Pogo Mine produced 269,342 ounces of gold from 1,515,117 tons of ore and waste materials mined; 941,856 tons were milled, and 12,812,069 cubic feet of paste fill was placed back in the underground workings (Athey and Werdon, 2017).

At least five high-grade gold zones (Liese, East Deep, North, Fun, and South Pogo) have been discovered within 1 mile of the mill; these zones are currently contributing ore to the mill, or are expected to in the near future (Athey and Werdon, 2017).

Alteration:

The Liese Zones all are associated with vein and replacement type textures. The veining textures are characterized by two styles of quartz veins and alteration assemblages. The early veins are typified by white quartz containing arsenopyrite, chalcopyrite, pyrite, pyrrhotite and loellingite with secondary biotite in selvages up to 1 meter in width. The later veins are typified by gray quartz as stockwork veins and replacement selvages containing arsenopyrite and pyrite, with secondary disseminated sericite and dolomite. It is common to find the sericite-dolomite alteration overprinted upon the earlier secondary biotite. Some silica flooding is observed in the gneiss and intrusive (M. Smith, oral communication, 1999).

Age of mineralization:

Mineralization at the Pogo deposit is thought to be plutonic-related. Geochronology studies have focused on the granodiorite and diorite dikes in the Liese Creek drainage. A diorite dike has an 40Ar/39Ar biotite age of 94 Ma, and a U-Pb zircon age of 94 Ma. A granodiorite dike has an 40Ar/39Ar biotite age of 91.7 Ma, an 40Ar/39Ar white mica age of 91.2 Ma, and a U-Pb monazite age of 107 Ma. (M. Smith, oral communication, 1999).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins? (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a?

Production Status: Yes; large

Site Status: Active

Workings/exploration:

The Goodpaster region was first explored for placer gold in 1915. Thomas (1970) reports a stampede of prospectors that quickly ended when little gold was found. In 1991, a regional stream sediment sampling program identified gold, arsenic, and tungsten anomalies in Liese Creek and Pogo Creek. From 1991 to 1994, exploration consisted of soil sampling, minor prospecting, and geophysics. The Pogo deposit underlies a 1-square-mile area that contain more than 100 parts per billion (ppb) gold in soils. Three core drill holes were completed on Liese Creek in 1994; 13 additional core holes were drilled in 1995. These holes identified the Liese L1 zone. Work in 1996 consisted of 22 drill holes that further defined the zone. From 1991 to 1996, the exploration program drilled a total of 36,703 feet of core with 4,142 core samples and 3,520 geochemical samples. An additional 41 drill holes in 1997 enlarged the deposit and found the lower Liese L2 zone. Drilling in 1998 focused on better defining the L1 and L2 and the Liese L3 zone that was first identified in 1991. As of 1999, a total of 91,263 feet of drilling had been completed and 3,404 core samples and 1,500 geochemical samples were collected (M. Smith, oral communication, 1999). Extensive exploration continued through 2011 when three new ore bodies outside the Liese zone were announced (Lamier and Puchlik, 2011).

All the permits for the mine were received by the middle of 2004 (Szumigala and Hughes, 2005). By January 2006, the deposit had been fully developed with a large permanent camp, ore processing facilities, water treatment plant, power transmission lines, provisions for tailings disposal, and underground workings (Szumigala and Hughes, 2007). The first ore arrived at the mill on January 12, 2006 and the first gold pour was on February 12, 2006. Until 2009, the Pogo project was a joint venture of the Teck Resources Corporation, Sumitomo Metal Mining, and Sumitomo Corporation, with Teck as the operator. In July, 2009, Teck sold their interest in the mine and it is now fully owned by Sumitomo (Szumigala and others, 2011).

In 2012, surface exploration included four surface drills. Underground drilling included four drills with over 100,000 feet drilled as of late 2012. The areas of focus were definition drilling of Liese Zone, and East Deep, the latter of which also had underground exploration drilling performed. Geotechical and hydrological drilling programs were also undertaken. Twenty more prospects were identified by gold geochemical anomalies, geophysical data, and quartz vein outcrops (Puchlik and others, 2012).

To ensure continued mining into the future, Sumitomo Metal Mining Pogo LLC invested $10 million in exploration at Pogo mine in 2016, following $15 million in 2015. At least five high-grade gold zones (Liese, East Deep, North, Fun, and South Pogo) have been discovered within 1 mile of the mill; these zones are currently contributing ore to the mill, or are expected to in the near future (Athey and Werdon, 2017).

Production notes:

In 2010, the Pogo Mine mined 900,585 tons of ore from which 383,434 ounces of gold was produced with a recovery rate of 89.6 percent (Szumigala and others, 2011). The total production of the Pogo Mine from

2006 when mining began to 2010 was 1,483,645 ounces of gold.
In 2011, the Pogo Mine produced 385,000 ounces of gold (Puchlik and others, 2012).
Pogo mine celebrated its 10th anniversary of production in 2016, producing 269,342 ounces of gold from 1,515,117 tons of ore and waste materials mined; 941,856 tons were milled, and 12,812,069 cubic feet of paste fill was placed back in the underground workings (Athey and Werdon, 2017).

Reserves:

As of December 31, 2011, the Pogo Mine has a total reserve and resource of 13.594 million tons with an average grade of 0.366 ounces of gold per ton (or 4.973 million ounces of gold) (Sumitomo Metal Mining Co., Ltd., 2012). This total included 1.283 million ounces of gold in the East Deep target that was identified in 2011.

Additional comments:

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Primary Reference: Lamier and Puchlik, 2011

Reporter(s): Cameron S. Rombach (ADGGS); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Shamrock; Shamrock/Buck; Buck

Site type: Prospects

ARDF no.: BD038

Latitude: 64.3816 **Quadrangle:** BD B-5

Longitude: 146.4323

Location description and accuracy:

The Shamrock prospect covers a considerable area on the west side of 'Buck Mountain', the hill under VABM 3026 'Buck'. But the coordinates are at the center of the considerable trenching on it about 1 mile west of the top of the hill. The prospect is about 7.2 miles northwest of Richardson on the Richardson Highway and about 0.1 mile northeast of the center of section 19, T. 6 S., R. 7 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Bi, Pb, Sb

Ore minerals: Arsenopyrite, bismuthinite, chalcopyrite, gold, pyrite, sphalerite, tetrahedrite

Gangue minerals: Ankerite, quartz, siderite

Geologic description:

The Richardson District is characterized by gentle slopes and broad, alluvium-filled valleys (Prindle and Katz, 1913). The area is unglaciated and largely overlain by windblown silt, sand, and loess, locally up to 50 meters thick (Foster and others, 1979). The rocks consist of three structure-bounded units (Weber and others, 1978; Swainbank and others, 1984; Noyes and others, 2006; Freeman, 2011). There is a core that consists mainly of biotite-hornblende-feldspar-quartz gneiss and lesser amphibolite, quartzite, marble and calc-silicate hornfels. The core is bounded on the north and south by amphibolite-grade pelitic schist. The contacts between the units are probably low-angle faults; north-trending vertical faults occur widely. Weber and others (1978) assign the pre-metamorphic age of the rocks to the Precambrian or Paleozoic. They were metamorphosed in the Middle to Late Devonian and recrystallized in the Early Cretaceous (Dusel-Bacon and others, 2004; Freeman, 2011). The metamorphic rocks are intruded by 90 Ma, felsic to intermediate dikes and plugs, notable the quartz-feldspar porphyry dike at the nearby Democrat Mine (BD014). The country rocks around the Shamrock prospect are mainly unaltered quartz-biotite-feldspar-hornblende gneiss (Freeman, 2011).

The Shamrock prospect was first identified in 1991 during regional reconnaissance exploration and geochemical surveys (Vartanyan and others, 1991; Freeman, 2011). Panned concentrate samples containing visible gold, as well as notable pyrite, tourmaline, biotite, pyroxene, and magnetite were found widely in the area west of VABM Buck. In 1992, the area was mapped, three long road cuts and trenches were dug west of VABM Buck, and 582 grab and channel samples were collected in them (Vartanyan and others, 1992; Freeman, 2011). The samples contained up to 6,351 parts per billion (ppb) gold, up to 364 parts per million (ppm) silver, up to more than 2,000 ppm arsenic, up to 379 ppm bismuth, up to 2,866 ppm lead, and up to more than 2,000 ppm antimony. Channel samples up to 15 meters long contained more than 500 ppb gold; the highest grade was 1.5 meters that averaged 6,351 ppb gold; the longest was 12 meters that averaged 1,997 ppb gold. Aushburn (1998 [Redstar]) check sampled some of the trenches but could not duplicate the high values of the 1997 work.

Freeman (2011) identified three types of mineralization: 1) quartz-limonite breccia, 2) pyrite-arsenopyrite-tourmaline-quartz veins, and pyrite-arsenopyrite-quartz veinlets. The quartz-limonite breccia is widespread.

The pyrite-arsenopyrite-tourmaline-quartz veins form linear zones up to 40 centimeters thick. They commonly also contain sphalerite, chalcopyrite, tetrahedrite, and rare bismuthinite. The pyrite-arsenopyrite-quartz veinlets are closely-spaced and feature cockscomb textures; fluid inclusion work indicates that they formed at 150-280 degrees C. These veins contain no silver, lead, bismuth, or antimony minerals but they average 1,201 ppb gold and 1,350 ppm arsenic. Pervasive quartz-sericite and quartz-sericite-muscovite flooding in the gneiss host rock form alteration envelopes around the gold-bearing zones. The alteration and mineralization trends north, varies from 20 to 50 meters wide, and extends for 200 to 4,000 feet along strike.

In 1997, the Tri-Valley Corporation collected more rock samples, drilled 4 core holes that totaled 641.5 meters, and dug or re-dug 12,950 feet of trenches (Aushburn, 1998 [Executive summary]). The best intercept in the drilling was 20 feet that averaged 1.77 grams of gold per tonne. Noyes and others (2006) reexamined the 1997 core with results that differed only in detail.

In 1999, Placer Dome (USA) sampled the soils on bedrock on a 200-meter grid and found that the gold is associated with arsenic and antimony (Rogers and others, 1999). They also collected 59 rock samples; they contained up to 2,200 ppb gold, 14.4 ppm silver, 10,000 ppm arsenic, 110 ppm bismuth, 46,600 ppm lead, and 10,000 ppm antimony.

After synthesizing the considerable analytical and geologic data on the Shamrock deposit, Freeman (2011) concluded that it is distal Intrusion-related gold deposit.

Alteration:

Pervasive quartz-sericite and quartz-sericite-muscovite flooding in the gneiss host rock form alteration envelopes around the gold-bearing zones.

Age of mineralization:

Probably about 90 Ma as are most of the gold deposits in the Richardson District and many in central Alaska.

Generic deposit model:

Deposit model:

Distal, intrusion-related gold deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The Shamrock prospect was first identified in 1991 during regional reconnaissance exploration and geochemical surveys (Vartanyan and others, 1991; Freeman, 2011). In 1992, the area was mapped, three long road cuts and trenches were dug west of VABM Buck, and 582 grab and channel samples were collected (Vartanyan and others, 1992; Freeman, 2011). In 1997, the Tri-Valley Corporation collected more rock samples, drilled 4 core holes that totaled 641.5 meters, and dug or re-dug 12,950 feet of trenches (Aushburn, 1998 [Executive summary]). Noyes and others (2006) reexamined the 1997 core. In 1999, Placer Dome (USA) sampled the soils on bedrock on a 200-meter grid over the prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

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Primary Reference: Freeman, 2011

Reporter(s): Cameron S. Rombach (ADGGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Tenderfoot Creek

Site type: Mines

ARDF no.: BD039

Latitude: 64.275 **Quadrangle:** BD B-5

Longitude: 146.2299

Location description and accuracy:

Tenderfoot Creek parallels the Richardson Highway from near its headwaters to its mouth on the Tanana River about 5 miles east-southeast of the the town of Richardson. About 4 miles of the creek above its mouth has been mined and the coordinates are at about the center of the mining in the southeast quarter of section 30, , T. 8 S., R. 8 E., of the Fairbanks Meridian.

Commodities:

Main: Ag, Au

Other: Pb

Ore minerals: Galena, gold

Gangue minerals:

Geologic description:

The Richardson District is characterized by gentle slopes and broad, alluvium-filled valleys (Prindle and Katz, 1913). The area is unglaciated and largely overlain by windblown silt, sand, and loess, locally up to 50 meters thick (Foster and others, 1979). The rocks consist of three structure-bounded units (Weber and others, 1978; Swainbank and others, 1984; Noyes and others, 2006; Freeman, 2011). There is a core that consists mainly of biotite-hornblende-feldspar-quartz gneiss and lesser amphibolite, quartzite, marble and calc-silicate hornfels. The core is bounded on the north and south by amphibolite-grade pelitic schist. The contacts between the units are probably low-angle faults; north-trending vertical faults occur widely. Weber and others (1978) assign the pre-metamorphic age of the rocks to the Precambrian or Paleozoic. They were metamorphosed in the Middle to Late Devonian and recrystallized in the Early Cretaceous (Dusel-Bacon and others, 2004; Freeman, 2011). The metamorphic rocks are intruded by 90 Ma, felsic to intermediate dikes and plugs, notable the mineralized quartz-feldspar porphyry dike at the nearby Democrat Mine (BD014).

Tenderfoot Creek has been the largest gold producer in the Richardson district. Placer gold was discovered in the Richardson District on Tenderfoot Creek in 1905 and mining has continued intermittently to 2010. The depth to bedrock along most of the creek that was mined before WWII varied from 30 feet to 155 feet near its mouth and the early mining was largely by underground drifting (Ellsworth and Parker, 1911). The peak year of early mining was 1908. Mining then declined until a bench on the north side of the creek was discovered that led to a resurgence of mining until 1916 (Olson and others, 1985). Mining probably continued now and then in subsequent years but documentation is sparse. Wedow and others (1954) reported that the only placer mine in operation on Tenderfoot Creek in 1946 was on 13 Below Discovery. In 2012, A large area of tailings barren of vegetation at the head of the creek can be easily seen on satellite imagery available on the internet; it probably represents fairly recent open-pit mining with earth-moving equipment. Szumigala and others (2011) reports that two miners produced gold from an open pits on Tenderfoot Creek in 2010.

There are several determinations of the fineness of the gold from Tenderfoot Creek. Bundtzen and Reger (1977) reported the gold to be 670 fine. Metz and Hawkins (1981) reported the gold to average 901 fine and Glover (1950) reported that the gold varies from 622 to 735 fine. Chapin (1914) reported that a piece of

gold-bearing galena float was recovered during mining operations; the source has not been found.
The Richardson District produced about 95, 000 ounces of gold and 24, 000 ounces of silver from 1905 to 1921 (Bundtzen and Reger, 1977). Much if not the great majority of that gold came from Tenderfoot Creek. No data is available for later production.

Alteration:

Age of mineralization:
Quaternary.

Generic deposit model:
Placer deposits (Garnett and Bassett, 2005)

Deposit model:
Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: Yes; medium

Site Status: Inactive

Workings/exploration:
Placer gold was discovered in the Richardson district in 1905. Mining initially occurred on Tenderfoot Creek and expanded to nearby Banner Creek (BD001) and associated tributaries. Because the depth to bedrock in the drainage is 30 to 155 feet, early mining on Tenderfoot Creek was largely by drifting methods (Ellsworth and Parker, 1911). In recent years, surface mining, utilizing earth moving equipment, has taken place at the head of Tenderfoot Creek.

Production notes:
From 1905 through 1921, the Richardson District produced about 95,000 ounces of gold and 24,000 ounces of silver (Bundtzen and Reger, 1977). Most of this was from placers on Tenderfoot Creek. Since 1980, the district has produced approximately 10,000 additional ounces of gold from intermittent mining; an unknown portion of this came from Tenderfoot Creek (Olson and others, 1985).

Reserves:
None.

Additional comments:

References:

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Wedow, Helmuth, Jr., Killeen, P. L., and others, 1954, Reconnaissance for radioactive deposits in eastern interior Alaska, 1946: U.S. Geological Survey Circular 331, 36 p.

Primary Reference: Freeman, 2011

Reporter(s): Cameron S. Rombach (ADGGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Wide Zone

Site type: Prospect

ARDF no.: BD046

Latitude: 64.3214 **Quadrangle:** BD B-5

Longitude: 146.3325

Location description and accuracy:

The Wide Zone prospect is about 2.6 miles north of Richardson on the Richardson Highway. It includes most of the section 10, T. 7 S., R. 7 E., of the Fairbanks Meridian, northeast of the mouth of Buckeye Creek and the coordinates are near the center of the section.

Commodities:

Main: Au

Other: Ag, As, Pb, Sb, Zn

Ore minerals: Arsenopyrite, galena, gold, pyrite, stibnite, lead-antimony sulfosalts

Gangue minerals: Quartz

Geologic description:

The Richardson District is characterized by gentle slopes and broad, alluvium-filled valleys (Prindle and Katz, 1913). The area is unglaciated and largely overlain by windblown silt, sand, and loess, locally up to 50 meters thick (Foster and others, 1979). The rocks consist of three structure-bounded units (Weber and others, 1978; Swainbank and others, 1984; Noyes and others, 2006; Freeman, 2011). There is a core that consists mainly of biotite-hornblende-feldspar-quartz gneiss and lesser amphibolite, quartzite, marble and calc-silicate hornfels. The core is bounded on the north and south by amphibolite-grade pelitic schist. The contacts between the units are probably low-angle faults; north-trending vertical faults occur widely. Weber and others (1978) assign the pre-metamorphic age of the rocks to the Precambrian or Paleozoic. They were metamorphosed in the Middle to Late Devonian and recrystallized in the Early Cretaceous (Dusel-Bacon and others, 2004; Freeman, 2011). The metamorphic rocks are intruded by 90 Ma, felsic to intermediate dikes and plugs, notable the quartz-feldspar porphyry dike at the nearby Democrat Mine (BD014).

The rocks at the Wide Zone prospect are mainly quartz- muscovite schist cut by faulted or pinched-out bodies of quartz-feldspar porphyry similar to the 90 Ma porphyry that is associated with the mineralization at the Democrat Mine (BD014) about a mile to the northwest. Reconnaissance geochemical sampling in 1991 and 2005 identified numerous areas anomalous in gold, arsenic, bismuth, lead, antimony, and tungsten (Vartanyan and others, 1991; Noyes, 2006). The geochemical data and the presence of the characteristic quartz-feldspar porphyry associated with mineralization in the area suggests that the prospect hosts a distal intrusion-related gold deposit (Freeman, 2011). The prospect may be in a down-dropped block of mineralized ground that fills the gap from the mineralization at the Democrat Mine (BD014) to the mineralization at Hinkley Gulch (BD019) and May's Pit (BD007).

Alteration:

Age of mineralization:

Probably 90 Ma as is other mineralization of the same type in the immediate area.

Generic deposit model:

Deposit model:
Intrusion-related gold deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Production notes:
None.

Reserves:
None.

Additional comments:

References:

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Primary Reference: Freeman, 2011

Reporter(s): Cameron S. Rombach (ADGGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Buckeye; Buckeye Pup

Site type: Prospects

ARDF no.: BD048

Latitude: 64.334 **Quadrangle:** BD B-5

Longitude: 146.253

Location description and accuracy:

The Buckeye prospect is on the hillside on the north side of Banner Creek about 3.5 miles above its mouth. It is about 4.2 miles northeast of Richardson on the Richardson Highway and about 0.6 mile west-southwest of the center of section 6, T. 7 S., R. 8 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Bi, Pb, Sb, Te

Ore minerals: Arsenopyrite, bismuth, galena, gold, lead-antimony sulfosalts, pyrite, pyrrhotite, stibnite

Gangue minerals: Limonite, quartz

Geologic description:

The Richardson District is characterized by gentle slopes and broad, alluvium-filled valleys (Prindle and Katz, 1913). The area is unglaciated and largely overlain by windblown silt, sand, and loess, locally up to 50 meters thick (Foster and others, 1979). The rocks consist of three structure-bounded units (Weber and others, 1978; Swainbank and others, 1984; Noyes and others, 2006; Freeman, 2011). There is a core that consists mainly of biotite-hornblende-feldspar-quartz gneiss and lesser amphibolite, quartzite, marble and calc-silicate hornfels. The core is bounded on the north and south by amphibolite-grade pelitic schist. The contacts between the units are probably low-angle faults; north-trending vertical faults occur widely. Weber and others (1978) assign the pre-metamorphic age of the rocks to the Precambrian or Paleozoic. They were metamorphosed in the Middle to Late Devonian and recrystallized in the Early Cretaceous (Dusel-Bacon and others, 2004; Freeman, 2011). The metamorphic rocks are intruded by 90 Ma, felsic to intermediate dikes and plugs, notable the quartz-feldspar porphyry dike at the nearby Democrat Mine (BD014).

The Buckeye prospect was discovered by the Tri-Valley Corporation during reconnaissance exploration in 1998 when they found 10 float samples of quartz that contained 0.35 to 1.54 ounces of gold per ton; the samples also contained up to 846 parts per million (ppm) bismuth and up to 127 ppm tellurium (Vantanyan and others, 1998). In late 1998, the Tri-Valley Corporation and Placer Dome (USA) formed a joint venture that initially concentrated on the headwaters of Banner Creek, an area that included the over the Buckeye prospect and the Bald Knob prospect (BD073) about a mile and a half to the north. In 1999, Placer Dome collected 1,037 soil samples on bedrock, collected 136 rock samples, and drilled three hole that totaled 516.5 meters (Rogers and others 1999). The soil samples defined a strong gold-bismuth-tellurium anomaly over the Buckeye and Bald Knob prospects. One drill hole was at the Buckeye prospect, the other two were at the Bald Knob prospect. Placer Dome did more soil and rock sampling in 2000 and drilled three more holes (Graham, 2002; Noyes and others, 2006). Intercepts with more than 100 parts per billion gold were seen in the six holes drilled in 1999 and 2000. The high gold values correlate with high bismuth and tellurium but the drill core showed no correlation of gold with such pathfinder elements as silver, arsenic, antimony, copper, lead, or zinc. The higher gold values are in narrow quartz veins that cut otherwise unaltered gneiss. Additional soil sampling in 2005 added little to the extent of the previous anomalies. The source of the rich gold-bismuth-tellurium-quartz samples found at the surface near the Buckeye prospect in 1998 remains unknown. In his synthesis of the previous work on the gold mineralization of the Richardson

district Freeman (2011) suggests that the mineralization at the Buckeye prospect is a distal intrusion-related gold deposit.

Alteration:

Notable lack of alteration in the gneiss host rock.

Age of mineralization:

Probably 90 Ma as are most of the gold deposits in the district.

Generic deposit model:

Deposit model:

Distal intrusion-related gold deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Three generations of sampling soil on bedrock from 1998 to 2005. Numerous rock samples collected and analyzed. Six holes were drilled on similar mineralization in 1999 and 2000 on this and the nearby Bald Knob prospect (BD073).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Dusel-Bacon, C., Wooden, J.L., and Layer, P.W., 2004, A Cretaceous Ion-Microprobe U-Pb zircon Age for the West Point Orthogneiss: Evidence for another Gneiss Dome in the Yukon-Tanana Upland in Galloway, J.P., ed., 2004, Studies by the U.S. Geological Survey in Alaska, 2001: U.S. Geological Survey Professional Paper 1678, p. 41 - 60.

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Primary Reference: Freeman, 2011

Reporter(s): Cameron S. Rombach (ADGGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Money Rock; Money-Rock; Rainbow; Aurora; Indian

Site type: Prospect

ARDF no.: BD054

Latitude: 64.4614 **Quadrangle:** BD B-2

Longitude: 145.0272

Location description and accuracy:

This property consists of three blocks of State of Alaska claims that are contiguous or close by; they cover much of sections 8-10, 16-17, 19-20, and 29-30 of T. 5 S., R. 14 E., of the Fairbanks Meridian. The coordinates are at about the center of the samples with the best gold values. The outlines of the claim boundaries are shown on figure 1 of Schaefer (2006) and Alix Resources Corp. (2010). The claims are about 3 miles northwest of the Pogo Mine (BD033) and about 3 miles west of the junction of Indian Creek and the Goodpaster River. The location is accurate to 500 feet.

Commodities:

Main: Au

Other: As, Bi, Te

Ore minerals: Arsenopyrite, gold, pyrite

Gangue minerals: Dolomite, quartz, sericite

Geologic description:

The rocks in the area consist primarily of pre-Mississippian paragneiss and orthogneiss and lesser schist and quartzite; the metamorphic rocks are intruded by several Cretaceous granitic plutons (Werdon and others, 2004). The Aurora claim block is underlain by paragneiss, schist, quartzite and minor orthogneiss that are cut by several Tertiary basaltic dikes. The Indian claim block is mainly underlain by orthogneiss similar to that at the nearby Pogo mine (BD033) and Cretaceous granodiorite of the Goodpaster Batholith to the north. The Rainbow claim block is mainly paragneiss in contact with Cretaceous (96.6-99 Ma) tonalite; hornfels is developed at the contact. The Rainbow claim block is cut by a small Cretaceous(?) granodiorite/quartz monzonite dike that is moderately altered to sericite and carbonate. Locally, the gneiss is moderately to strongly silicified with the development of sericite+/-carbonate (Schaefer, 2006). Airborne geophysical surveys (Burns and others, 2000; 2005) show a strong magnetic anomaly over the hornfels adjacent to the Cretaceous tonalite at the Rainbow claim block; a similar highly magnetic anomaly over the north half of the Aurora claim block suggests hornfels adjacent to a buried intrusive.

Quartz veins with disseminated arsenopyrite have been found in float on the Rainbow claim block near the contact between gneiss and the Cretaceous tonalite (Schaefer, 2006; Alix Resources Corp., 2010). Rock float samples contain up to 2.4 grams of gold per ton and more than 10,000 parts per million arsenic and anomalous bismuth. Scattered soil samples from the area are also generally anomalous in gold and arsenic, and locally anomalous in bismuth and tellurium.

The Rainbow, Aurora, and Indian claim blocks were first located by three prospectors, beginning in 1999. In 2002, they were leased to the Anglo-Gold Corporation who did only limited work, mainly soil sampling on the ridges, as part of a larger effort in the area. In 2006, the claims were leased to Tonogold Resources Inc. (2008). In 2010, the property was held by the Alix Resources Corp. (2010) and in the summer of 2010 they signed an option agreement with the Precious Metals Exploration Company to explore the property.

As of 2012, Alix refers to this property as Money Rock. In summer 2012, Alix performed a two-hole drill program designed to test the subsurface expression of a surface rock and soil gold anomaly. Both drillholes encountered alternating intervals of paragneiss and orthogneiss. Gold in both holes occurs in quartz-

arsenopyrite-pyrite veins associated with broad zones of patchy sericite-dolomite-silica alteration. Results from MR-12-01 are 0.48 gram of gold per tonne from 48.0 to 53.0 meters, 0.47 gram of gold per tonne from 111.0 to 112.4 meters, and 1.67 grams of gold per tonne from 199.0 to 200.6 meters. Results from MR-12-02 are 0.53 gram of gold per tonne from 395.3 to 396.8 meters (Alix Resources Corp., 2012a, 2012b).

Alteration:

Sericite-carbonate-silica alteration with arsenopyrite and other sulfides in veins and as disseminations (Alix Resources Corp., 2012a).

Age of mineralization:

May be related to nearby Cretaceous (96.6-99 Ma) plutons (Werdon and others, 2004).

Generic deposit model:

Deposit model:

Arsenopyrite-gold-quartz veins; polymetallic veins? (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active

Workings/exploration:

The Rainbow, Aurora, and Indian claim blocks were first located by three prospectors, beginning in 1999. In 2002, they were leased by the Anglo-Gold Corporation who did limited work, mainly soil sampling on the ridges, as part of a larger effort in the area. In 2006, the claims were leased to Tonogold Resources Inc. In 2010, the property was optioned by the Precision Metals Exploration Company from Alix Resources Corp. (2010).

As of 2012, Alix refers to this property as Money Rock. In summer 2012, Alix performed a two-hole drill program designed to test the subsurface expression of a surface rock and soil gold anomaly. Both drillholes encountered alternating intervals of paragneiss and orthogneiss. Gold in both holes occurs in quartz-arsenopyrite-pyrite veins associated with broad zones of patchy sericite-dolomite-silica alteration. Results from MR-12-01 are 0.48 gram of gold per tonne from 48.0 to 53.0 meters, 0.47 gram of gold per tonne from 111.0 to 112.4 meters, and 1.67 grams of gold per tonne from 199.0 to 200.6 meters. Results from MR-12-02 are 0.53 gram of gold per tonne from 395.3 to 396.8 meters (Alix Resources Corp., 2012a, 2012b). Money Rock is currently operated by Aurora Exploration Company (Wright, 2013).

In October 2016, Millrock Resources Inc. announced that, through a series of purchase and option agreements and claim staking, it has assembled a 39,159-acre land position covering high-potential gold targets (ARDF numbers BD054, BD055, and BD060) in the Goodpaster Mining District near the Pogo gold mine (BD033). The claims cover soil geochemical anomalies, many of which are untested. On several sites there are intersections obtained through drilling by prior operators that are anomalous in gold. Millrock conducted core re-logging, surface geologic mapping, and soil and rock sampling in 2016; this work defined a northeast–southwest-trending corridor of anomalous gold values and several east–west-trending quartz vein systems as well as a small low-angle, northwest-dipping quartz vein with similar characteristics to the tabular bodies at Pogo (BD033). Millrock also collected short-wave infrared spectra from both core and surface samples (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Alix Resources Corp., 2012a, Alix completes successful exploration program at the Money Rock/West Pogo Gold Project, Alaska in: http://www.alixresources.com/index.php?page=news&id=1113 (News release, August 24, 2012) (as of April 2, 2014).

Alix Resources Corp., 2012b, Alix receives positive drill results for the Money Rock/West Pogo Gold Project, Alaska in: http://www.alixresources.com/index.php?page=news&id=1114 (News release, September 18, 2012) (as of April 2, 2014).

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Wright, David, 2013, Money Rock Project, Goodpasture Mining District, East Central Alaska, 10 p. (Report held by Aurora Exploration Company, Fairbanks, Alaska).

Primary Reference: Wright, 2013

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): West Pogo; ER

Site type: Prospect

ARDF no.: BD055

Latitude: 64.4486 **Quadrangle:** BD B-3

Longitude: 145.0867

Location description and accuracy:

The West Pogo prospect consists of 17 square kilometers of State of Alaska claims. The coordinates are at about the center of the claims, about 5.1 miles west-southwest of the junction of the Goodpaster River and Indian Creek. The prospect is about 0.3 mile southwest of the center of section 27, T. 5 S., R. 13 E., of the Fairbanks Meridian. The prospect adjoins the claims of the Rainbow prospect (BD054); the location is accurate within 500 feet.

Commodities:

Main: Ag, Au, Bi, Te

Other:

Ore minerals: Arsenopyrite, gold, pyrite, silver

Gangue minerals: Dolomite, quartz, sericite

Geologic description:

In 2008, the West Pogo prospect was being explored by International Tower Hill Mines, Inc. (ITH) (2008) after they acquired it from AngloGold Ashanti (USA) Exploration, Inc. The rocks in the area are similar to those at the Pogo Mine (BD033) about 5 miles to the east, where biotite-quartz feldspar orthogneiss is intruded by a 100 Ma diorite. The West Pogo prospect is marked by an east-trending gold anomaly in the soils, which parallels a prominent fault zone. ITH drilled one hole in 2008 near the western margin of the pluton. The hole missed its intended target and remained in the pluton for its entire length; the best interval in the hole was 2 meters that contained 0.3 gram of gold per ton. The geochemistry suggests that the best mineralization is west of the hole.

First Star Resources optioned the property in 2010 and collected several 6-meter-long chip samples across 40 meters of mineralized rubble crop. The samples contained 3.79 to 6.53 grams of gold per tonne and 0.73 to 13.05 grams of silver per tonne (First Star Resources Inc., 2010).

Prior to 2010, ITH collected samples at the surface, mapped the geology, and completed a geochemical soil survey. In 2010, ITH formed a new company, Corvus Gold Inc., to take over many of their properties including West Pogo. They optioned the prospect to First Star Resources who did a 3D Induced Polarization survey, mapped the geology, and sampled in 2011. First Star returned the property to Corvus in December, 2011 and Corvus optioned the property to Alix Resources Corp. in March, 2012 (Corvus Gold Inc., 2012a, 2012b).

The mineralization at the West Pogo prospect occurs mainly as quartz veins similar to those at the Pogo Mine (BD033) about 5 miles to the east (Corvus Gold Inc., 2012b). The work in 2011 identified a new area of mineralization a kilometer long along a regional east-trending structure at the margin of the Cretaceous stock. Samples of altered granite and quartz veins contained up to 118 grams of gold per tonne and elevated bismuth and tellurium.

In summer 2012, Alix executed a discovery-phase drill program consisting of two NQ core drill holes of cumulative total length of 610 meters (2,002 feet). The purpose was to test the subsurface expression of a surface rock and soil gold anomaly, and both holes encountered orthogneiss with sericite-altered, iron-stained zones of brecciation and veining with arsenopyrite +/- pyrite that appeared to increase with depth

(Alix Resources Corp., 2012a).

The results for drill hole WP-12-01 are 0.67 gram of gold per tonne from 243.7 to 249.3 meters including a 2.4 meter interval containing 1.74 grams of gold per tonne. The results for drill hole WP-12-02 are 1.10 grams of gold per tonne from 74.5 to 77.7 meters. The gold intercepts lie within a 95 meter (311 feet) zone of dolomite-sericite alteration overprinted by iron oxides after sulfides. Gold occurs with quartz, surrounded by iron oxide alteration that occurs intermittently throughout the entire drillhole (Alix Resources Corp., 2012b).

Alteration:

Dolomite-sericite overprinted by iron oxides after sulfides (Alix Resources Corp., 2012a).

Age of mineralization:

100 Ma based on the diorite pluton at the center of the prospect (Alix Resources Corp., 2012a).

Generic deposit model:

Deposit model:

Gold-quartz veins that contain bismuth and tellurium (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

Prior to 2010, International Tower Hill (ITH) collected samples at the surface, mapped the geology, and completed a geochemical soil survey. As of 2010, ITH formed a new company, Corvus Gold Inc., to take over many of their properties including West Pogo. They optioned the prospect to First Star Resources who did a 3D Induced Polarization survey, mapped the geology, and sampled in 2011. First Star returned the property to Corvus in December, 2011 and Corvus optioned the property to Alix Resources Corp. in March, 2012 (Corvus Gold Inc., 2012a, 2012b).

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In October 2016, Millrock Resources Inc. announced that, through a series of purchase and option agreements and claim staking, it has assembled a 39,159-acre land position covering high-potential gold targets (ARDF numbers BD054, BD055, and BD060) in the Goodpaster Mining District near the Pogo gold mine (BD033). The claims cover soil geochemical anomalies, many of which are untested. On several sites there are intersections obtained through drilling by prior operators that are anomalous in gold. Millrock conducted core re-logging, surface geologic mapping, and soil and rock sampling in 2016; this work defined a northeast–southwest-trending corridor of anomalous gold values and several east–west-trending quartz vein systems as well as a small low-angle, northwest-dipping quartz vein with similar characteristics to the tabular bodies at Pogo (BD033). Millrock also collected short-wave infrared spectra from both core and surface samples (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Alix Resources Corp., 2012a, Alix completes successful exploration program at the Money Rock/West Pogo Gold Project, Alaska in: http://www.alixresources.com/index.php?page=news&id=1113 (News release, August 24, 2012) (as of April 2, 2014).

Alix Resources Corp., 2012b, Alix receives positive drill results for the Money Rock/West Pogo Gold Project, Alaska in: http://www.alixresources.com/index.php?page=news&id=1114 (News release, September 18, 2012) (as of April 2, 2014).

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

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Corvus Gold Inc., 2012b, West Pogo: http://www.corvusgold.com/projects/alaska/west_pogo/ (as of March 4, 2012).

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

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International Tower Hill Mines, Ltd., 2008, West Pogo: http://www.ithmines.com/s/WestPogo.asp (as of March 4, 2008).

Primary Reference: Alix Resources Corp., 2012a

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): LMS

Site type: Prospect

ARDF no.: BD056

Latitude: 64.2036 **Quadrangle:** BD A-4

Longitude: 145.5353

Location description and accuracy:

The LMS prospect is on a large block of 92 State of Alaska claims that cover about 25 square miles. The drilling on the prospect extends for about 2 miles along a north-northeast trending ridge that is southeast of the head of Progressive Creek in sections 22 and 27, T. 8 S., R. 11 E., Fairbanks Meridian. The center of the drilling is near VABM Liscum. The location is accurate within 400 m.

Commodities:

Main: Au

Other: As, Pb

Ore minerals: Arsenopyrite, galena, gold, pyrite

Gangue minerals: Quartz

Geologic description:

The LMS gold prospect was discovered by AngloGold Ashanti (USA) Exploration Company in the search for the source of stream sediment and soil anomalies. In 2005, they drilled 3200 meters at 17 locations with encouraging results. International Tower Hill Mines Ltd. (ITH) then explored the property in a joint venture with AngloGold (Klipfel and Giroux, 2008). In 2006, ITH drilled another 6,329 meters in 20 holes. and in 2008 published a comprehensive NI 43-101 report on the property (Klipfel and Giroux, 2008). Corvus Gold Inc. inherited the property from ITH and they optioned the property to First Star Resources in 2010 and 2011. The property reverted to Corvus in late 2011.

The gold mineralization is in a large accretionary complex of igneous and sedimentary rocks that have been metamorphosed to greenschist and amphibolite grade. There is little outcrop in the area and what rocks are exposed on the high ridges consist of middle to early Paleozoic and(or) Late? Proterozoic quartz and pelitic schist and Mississippi and(or) Devonian? augen gneiss (Wilson and others, 1998).

The gold mineralization usually is in strongly silicified and brecciated zones that are associated with low-angle faults marginal to schist units (Klipfel and Giroux, 2008). The ore contains abundant pyrite and minor galena, arsenopyrite, and graphite. The mineralization is accompanied by a silicified zone about 30 meters thick that dips gently west. The low-angle mineralized zones are cut by a series of high-angle, possibly mesothermal quartz veins along an east-west trend of foot- and hanging-wall stockworks.

The Camp zone is one of the better known mineralized targets drilled (Corvus Gold Inc., 2011). As known in early 2012, a gold-bearing, black breccia horizon extends for nearly a kilometer down dip, is 200 to 400 meters wide and continues to the limit of the drilling. The gold in the mineralized horizon appears to be related to a large, through-going sheared zone similar to a structures at the nearby Pogo Mine (BD033).

Some of the notable intercepts in the 2005, ITH drill holes are: 1) 30.48 meters that averaged 1.10 part per million (ppm) gold; 2) 3.04 meters that averaged 1.51 ppm gold; 3) 4.57 meters that averaged 1.12 ppm gold; 4) 25.91 meters that averaged 1.18 ppm gold; 5) 15.39 meters that averaged 3.43 ppm gold; 6) 3.38 meters that averaged 21.52 ppm gold; 7) 4.58 meters that averaged 4.00 ppm gold; 8) 1.53 meters that averaged 1.81 ppm gold; 9) 0.8 meters that averaged 1.95 ppm gold; and 10) 4.17 meters that averaged 1.95 ppm gold.

In 2010, First Star Resources optioned the LMS prospect and drilled three holes totaling 1,103 meters on

the Camp zone to intersect black gold-bearing graphitic quartzite breccia and to test a northeast-striking structure known to contain high grade gold mineralization (First Star, 2010 [LMS]; First Star, 2010 [High grade]). Some notable intercepts in the black, graphitic quartzite breccia were: 19.05 meters with 2.51 grams of gold per tonne and 9.84 grams of silver per tonne; and 9.14 meters with 1.65 grams of gold per tonne, and 15.38 grams of silver per tonne. The holes in the NE-striking structure intersected 0.76 meter with 43.9 grams of gold per tonne and 5.34 grams of silver per tonne; 1.68 meters with 6.12 grams of gold per tonne; 0.76 meter with 95.20 grams of silver per tonne; and 1.52 meters with 4.36 grams of gold per tonne and 9.26 grams of silver per tonne.

In 2011, First Star drilled 11 holes in the black breccia and feeder veins. Some notable intercepts were: 1) 2.9 meters that averaged 12.5 grams of gold per tonne; 2) 13.4 meters that averaged 2.5 grams of gold per tonne and 12.4 grams of silver per tonne; 3) 23.3 meters that averaged 5.2 grams of gold per tonne and 11.9 grams of silver per tonne; and 4) 1.98 meters that averaged 2.7 grams of gold per tonne and 41.7 grams of silver per tonne.

In early 2008 (before the First Star 2010-2011 drilling), International Tower Hill Mines (Klipfel and Giroux, 2008) announced that at a cut-off grade of 0.3 gram of gold per tone, the LMS deposit contains 5.86 million tones of material with an average grade of 0.89 gram of gold per tonne, or 167,000 ounces of gold.

Although no exploration activities were conducted on the LMS property in 2016, Gold Reserve Inc. released a new NI43-101 technical report for the LMS gold project in February (Hunter and Giroux, 2016). In March 2016, Gold Reserve Inc. completed a purchase-and-sale agreement with Raven Gold Alaska Inc., a wholly-owned subsidiary of Corvus Gold Inc., to acquire the LMS Gold Project in the Goodpaster District for $350,000. Raven retains a royalty interest with respect to precious metals produced and recovered equal to 3 percent of net smelter returns, and base metals produced and recovered equal to 1 percent of net smelter returns. Gold Reserve Inc. has the option, for a period of 20 years from the date of closing of the acquisition, to buy back a one-third interest (that is, 1 percent) in the precious-metals royalty for $4 million (Athey and Werdon, 2017).

Alteration:

Associated with a silicified breccia zone about 30 meters thick that dips west in metamorphic rocks (Klipfel and Giroux, 2008).

Age of mineralization:

Paleozoic or younger based on the age of the host rocks (Wilson and others, 1998).

Generic deposit model:

Deposit model:

Gold-quartz mineralization in a thick, silicified breccia zone in quartzite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The LMS prospect was discovered by AngloGold Ashanti (USA) Exploration Company in the search for the source of anomalous stream sediment and soil samples. In 2005, they diamond drilled a total of 3,200 meters 17 locations with encouraging results. In 2008, International Tower Hill Mines Ltd. explored the property in a joint venture with AngloGold. In 2010, First Star Resources optioned the LMS prospect; they drilled 3 holes totaling 1,103 meters in 2010 and 10 more holes in 2011.

Production notes:

None.

Reserves:

In early 2008, International Tower Hill Mines (Klipfel and Giroux, 2008) announced that at a cut-off grade of 0.3 gram of gold per tone, the LMS deposit contains 5.86 million tones of material with an average grade of 0.89 gram of gold per tonne, or 167,000 ounces of gold.

The Camp Zone, part of the encompassing LMS property, contains an inferred resource, at a cut-off grade of 0.5 gram of gold per tonne, of 8.32 million tonnes of material estimated to contain 267,000 ounces of Au at an average grade of 1.00 gram of gold per tonne (Hunter and Giroux, 2016). The effective date for this resource estimate is March 26, 2014. The Camp Zone remains open along strike and at depth, and is situated at the southeast end of a 6-kilometer-long, northwest-trending zone of aligned surface geochemical samples containing anomalous gold, arsenic, and lesser silver and copper.

Additional comments:

The 04/01/2012 record update of this prospect misspelled the name as LWM instead of LMS in all text and references.

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

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Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

First Star Resources, 2010, LMS and WP gold projects: http://www.firststarresources.com/projects.php (as of Feb 20, 2011).

First Star Resources, 2010, High grade gold mineralization encountered in graphitic quartzite breccia and lower gneiss zone:
http://www.firststarresources.com/pdf/November-10.pdf (News release, Nov. 10, 2010).

Hunter, Ed, and Giroux, Gary, 2016, Technical report on the LMS gold project, Goodpaster mining district, Alaska, 74 p. http://www.goldreserveinc.com/lms-gold-project/ (last accessed 8/25/2017)

Klipfel, Paul, and Giroux, Gary, 2008, Summary report on the LMS gold project, Goodpaster district, Alaska: Technical report for International Tower Hill Mines Ltd., 66 p. (posted on www.sedar.com, Aug. 29, 2008).

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geology map of central (interior) Alaska: U.S. Geological Survey Open-File Report OFR 98-133, 3 sheets. 63 p.. and appendix.

Primary Reference: Klipfel and Giroux, 2008; Corvus Gold Inc., 2011

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Wolverine; Rob

Site type: Prospect

ARDF no.: BD057

Latitude: 64.3855 **Quadrangle:** BD B-1

Longitude: 144.227

Location description and accuracy:

The Wolverine prospect is on the ridge north of Wolverine Creek, about 2.8 miles north of the north '5080' peak of Black Mountain. It is at an elevation of about 3,300 feet, about 0.5 mile north-northeast of the center of section 20, T. 6 S., R. 18 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au, Sb

Other: Cu, Pb, Te, W

Ore minerals: Arsenopyrite, gold, jamesonite, pyrite, stibnite

Gangue minerals: Quartz

Geologic description:

Although several mines and prospects have been known since the 1930s within a mile of this prospect, the Wolverine prospect was first described by name by Freeman in 2004. From 1995 to 1999, The Stone Boy Joint Venture (Sumitomo Metal Mining and WGM Inc.) spent more than $1.3 million exploring in the area; they did extensive surface mapping and sampling, surface and airborne geophysics, and 16,215 feet of diamond drilling. They drilled 26 holes but the details of their location are vague. They may have drilled at the Wolverine prospect.

In 2002, Freegold Ventures optioned a large block of claims that covered this prospect and several other nearby deposits that are described separately: the Grizzly Bear (BD003), Michigan Lode (BD025), and Upper Trench, Lower Trench (BD058). Freegold Ventures explored them as a unit under the name Rob. Freegold continued to explore the property through 2011 (Freegold Ventures Ltd., 2011). The work has included extensive geologic mapping, surface sampling, and geochemical and geophysical surveys. Through 2004, Freegold spent more than $1 million exploring the Rob property and in 2004 they commissioned a comprehensive NI 43-101 report (Freeman, 2004) that summarized their and previous work. That report was updated in 2010 (Flanders, 2010).

As interpreted by Bailey (2001) and Freeman (2004), this and several other similar prospects in the area are near the contact of a large Cretaceous granodiorite stock that intrudes a large dome of Paleozoic biotite gneiss, feldspar-biotite augen gneiss, and quartzite. Locally the granodiorite is cut by hornblende andesite-porphyry dikes. The rocks are locally intensely sheared and this and the nearby Michigan Lode (BD025), Blue Lead (BD003), and Grizzly Bear (BD018) deposits are aligned along the northeast-trending Gray Lead fault. The Wolverine prospect is entirely within a Cretaceous granodiorite pluton that is cut by several Cretaceous, andesite porphyry dikes; it is associated with the northeast-trending 'Double Bear' fault.

The Wolverine prospect is probably similar to the other mines and prospects in the immediate area in that it is probably a gold -quartz vein along a shear zone. The quartz veins typically contain gold +/- base metal +/- silver and a variable combination of sulfides, including arsenopyrite, jamesonite, pyrite, and stibnite. The veins are commonly 2 to 3 feet in wide but some are as wide as 8 feet (Thomas, 1970). Samples collected by Freegold (Flanders, 2010) contained up to 1.47 ounces of gold per ton, 22.8 parts per million (ppm) silver, and 1.85 percent arsenic. Freeman (2004) and Flanders (2010) classifies the deposit as 'stockwork-shear style mineralization hosted in porphyritic intermediate to felsic intrusive rocks'.

Alteration:

Not specified but the intrusive rocks are altered.

Age of mineralization:

Probably genetically related to a nearby Cretaceous granodiorite intrusive.

Generic deposit model:

Deposit model:

Silver-gold-quartz veins and stockwork, +/- arsenic, copper, lead, antimony, tellurium, and tungsten (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

Although several mines and prospects have been known since the 1930s within a mile of this prospect, the Wolverine prospect was first described by Freeman in 2004. From 1995 to 1999, The Stone Boy Joint Venture (Sumitomo Metal Mining and WGM Inc.) spent more than $1.3 million exploring in the area, where they did extensive surface mapping and sampling, surface and airborne geophysics, and 16,215 feet of diamond drilling. They drilled 26 holes but their location is vague. They probably drilled one or more holes at Wolverine. In 2002, Freegold Ventures optioned a large block of claims that covered the this prospect and several other nearby deposits that are described separately: the Grizzly Bear (BD003), Michigan Lode (BD025), and Upper Trench, Lower Trench (BD058). Through early 2012, Freegold has continued to explore them as a unit as the Rob project (Flanders, 2010; Freegold Ventures Inc., 2012). The work has included extensive mapping, surface sampling, and geochemical and geophysical surveys.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bailey, R.O., 2001, ROB Claim Group, Tibbs Creek, Alaska, Goodpaster Mining District: Unpublished report, 137 pp.

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Flanders, R.W., 2010, Executive Summary report for the Rob Gold property, Goodpaster Mining District, Alaska: Unpublished report for Freegold Recovery, Inc., 55 p. (posted on www.sedar.com, March 31, 2010).

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Primary Reference: Freeman, 2004; Flanders, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Upper Trench/ Lower Trench; Rob

Site type: Prospect

ARDF no.: BD058

Latitude: 64.3747 **Quadrangle:** BD B-1

Longitude: 144.2168

Location description and accuracy:

The Upper Trench/ Lower Trench prospect is on the ridge south of Wolverine Creek, about 2.5 miles north of the north peak '5080' of Black Mountain. It is at an elevation of about 3,300 feet about 0.4 mile south-southeast of the center of section 20, T. 6 S., R. 18 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au, Sb

Other: Cu, Pb, Te, W

Ore minerals:

Gangue minerals: Quartz

Geologic description:

Although several mines and prospects have been known since the 1930s within a mile of this prospect, the Upper Trench/ Lower Trench prospect was first described by Freeman in 2004. From 1995 to 1999, The Stone Boy Joint Venture (Sumitomo Metal Mining and WGM Inc.) spent more than $1.3 million exploring in the area; they did extensive surface mapping and sampling, surface and airborne geophysics, and 16,215 feet of diamond drilling. The joint venture drilled 26 but their location is vague. They probably drilled one or more holes at the Upper Trench/Lower Trench prospect and did considerable trenching.

In 2002, Freegold Ventures optioned a large block of claims that covered this prospect and several other nearby deposits that are described separately, the Grizzly Bear (BD003), Michigan Lode (BD025), and Wolverine (BD057). Freegold Ventures explored them as a unit under the name Rob. They continued the work through early 2012 (Freegold Ventures Ltd., 2012). The work has included extensive geologic mapping, surface sampling, and geochemical and geophysical surveys. Through 2004, Freegold spent more than $1 million exploring the Rob property and in 2004 commissioned a comprehensive NI 43-101 report (Freeman, 2004) that summarized their and previous work. That report was updated in 2010 (Flanders, 2010).

As interpreted by Bailey (2001) and Freeman (2004), this and the several other similar prospects in the area are near the contact of a large Cretaceous granodiorite stock that intrudes a large dome of Paleozoic biotite gneiss, feldspar-biotite augen gneiss, and quartzite. Locally the granodiorite is cut by hornblende andesite-porphyry dikes. The rocks are locally intensely sheared and this and the nearby Michigan Lode (BD025), Blue Lead (BD003), and Grizzly Bear (BD018) deposits are aligned along the northeast-trending Gray Lead fault. The Upper Trench/Lower Trench prospect is entirely within a Cretaceous granodiorite pluton which is cut by several Cretaceous andesite porphyry dikes.

The Upper Trench/Lower Trench prospect is probably similar to the other mines and prospects in the immediate area in that is is a gold -quartz vein along a shear zone. The quartz veins typically contain gold +/- base metal +/- silver and a variable combination of sulfides, including arsenopyrite, jamesonite, pyrite, and stibnite. The veins are commonly 2 to 3 feet in width but some are as wide as 8 feet (Thomas, 1970). There is little specific information on this prospect but Freeman (2004) and Flanders (2010) cite grab samples in the trenches that contain up to 2.04 ounces of gold per ton, 43.6 parts per million (ppm) silver,

1.35 percent arsenic and 17.6 percent antimony. Verification samples collected in 2002 contained up to 22.29 grams of gold per ton, up to 15.75 ppm silver, more than 10,000 ppm arsenic, up to 11.25 ppm bismuth, up to 1,925 ppm lead, more than 10,000 ppm antimony, and up to 1.0 ppm tellurium. Freeman (2004) and Flanders classifies the deposit as 'stockwork-shear style mineralization hosted in porphyritic intermediate to felsic intrusive rocks'.

Alteration:

Not specified.

Age of mineralization:

Probably genetically related to a nearby Cretaceous granodiorite pluton.

Generic deposit model:

Deposit model:

Silver-gold-quartz veins and stockwork, +/- arsenic, copper, lead, antimony, tellurium, and tungsten (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

Although several mines and prospects have been known within a mile of this prospect since the 1930s, the Upper Trench/Lower Trench prospect was first publicly described by Freeman in 2004. From 1995 to 1999, The Stone Boy Joint Venture (Sumitomo Metal Mining and WGM Inc.) spent more than $1.3 million exploring in the area; they did extensive surface mapping and sampling, surface and airborne geophysics, and 16,215 feet of diamond drilling. In 2002, Freegold Ventures optioned a large block of claims that covered this prospect and several other nearby deposits that are described separately: the Grizzly Bear (BD003), Michigan Lode (BD025), and Wolverine (BD057). Freegold Ventures explored them as a unit under the name Rob. The work has included extensive geologic mapping, surface sampling, and geochemical and geophysical surveys. Freegold continued their exploration into early 2012 (Flanders, 2010; Freegold Ventures Inc., 2012).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bailey, R.O., 2001, ROB Claim Group, Tibbs Creek, Alaska, Goodpaster Mining District: Unpublished report, 137 pp.

Freeman, C.J., 2004, Executive summary report for the Rob gold property, Goodpaster Mining District, Alaska: Unpublished NI 43-101 report prepared for Freegold Recovery, Inc., 30 p. (posted on www.sedar.com as of April 27, 2008).

Flanders, R.W., 2010, Executive Summary report for the Rob Gold property, Goodpaster Mining District, Alaska: Unpublished report for Freegold Recovery, Inc., 55 p. (posted on www.sedar.com, March 31, 2010).

Foster, H. L., Albert, N. R. D.,Griscom, A., Hessin, T. D., Menzie, W. D.; Turner, D. L., and Wilson, F. H., 1979, Alaskan Mineral Resource Assessment Program: Background Information to accompany folio of geologic and mineral resource maps of the Big Delta quadrangle, Alaska: U.S. Geological Survey Circular 783, 19 p.

Freeman, C.J., 2004, Executive summary report for the Rob gold property, Goodpaster Mining District, Alaska: NI 43-101 report prepared for Freegold Recovery, Inc., 30 p. (posted on www.sedar.com on April 27, 2008).)

Freegold Ventures Ltd., 2012, Rob project, Alaska: http://www.freegoldventures.com/s/RobGold.asp?ReportID=296782 (as of March 4, 2012).

Thomas, B.I., 1970, Reconnaissance of the gold-bearing quartz veins in the Tibbs Creek area, Goodpaster River, Big Delta quadrangle, central Alaska: U.S. Bureau of Mines Open-File Report 14-70, 12 p.

Weber, F.R., Foster, H.L., Keith, T.E.C., and Dusel-Bacon, C., 1978, Preliminary geologic map of the Big Delta quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-529A, 1 map, scale 1:250,000.

Primary Reference: Freeman, 2004; Flanders, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): O'Reely; Oreely; Rob

Site type: Prospect

ARDF no.: BD059

Latitude: 64.3404 **Quadrangle:** BD B-1

Longitude: 144.2148

Location description and accuracy:

The O'Reely prospect is near the head of Tibbs Creek, about 0.5 mile north of the north peak (5080) of Black Mountain. It is about 0.3 mile north-northeast of the center of section 5, T. 6 S., R. 18 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au, Sb

Other: Cu, Pb, Te, W

Ore minerals: Arsenopyrite?, gold?, jamesonite?, pyrite?, stibnite?

Gangue minerals: Quartz

Geologic description:

Although several mines and prospects have been known since the 1930s within a mile or so of this prospect, the O'Reely vein was first described by Freeman in 2004. From 1995 to 1999, The Stone Boy Joint Venture (Sumitomo Metal Metal Mining and WGM Inc.) spent more than $1.3 million exploring in the area; they did extensive surface mapping and sampling, surface and airborne geophysics, and 16,215 feet of diamond drilling in 26 holes. They did not drill the O'Reely prospect.

In 2002, Freegold Ventures optioned a large block of claims that covered the O'Reely vein and the several other nearby deposits that are described separately: the Grizzly Bear (BD003), Michigan Lode (BD025), Wolverine (BD057), and Upper Trench/ Lower Trench (BD058). Freegold has continued the exploration through early 2012 as the Rob project. (Flanders, 2010; Freegold Ventures Ltd., 2012). The work has included extensive geologic mapping, surface sampling, and geochemical and geophysical surveys. Freegold commissioned a comprehensive NI 43-101 report in 2004 that summarized their and previous work (Freeman, 2004). The O'Reely vein was first mentioned in it. The 2004 report was updated in 2010 by Flanders (2010).

As interpreted by Bailey (2001) and Freeman (2004), this and the several other similar prospects in the area are near the contact of a large Cretaceous biotite granodiorite pluton that intrudes a large dome of Paleozoic biotite gneiss, feldspar-biotite augen gneiss, and quartzite. The granodiorite is cut by hornblende andesite-porphyry dikes. The rocks are locally intensely sheared and the nearby Michigan Lode (BD025), Blue Lead (BD003), and Grizzly Bear (BD018) deposits are aligned along the northeast-trending Gray Lead fault. The O'Reely vein is in the granodiorite near the contact with Paleozoic gneiss near a similar fault.

The O'Reely vein is probably similar to the other mines and prospects in the immediate area in that it is a gold -quartz vein along a shear zone. The quartz veins typically contain gold +/- base metal +/- silver and a variable combination of sulfides, including arsenopyrite, jamesonite, pyrite, and stibnite. The veins are commonly 2 to 3 feet in wide but some are as wide as 8 feet (Thomas, 1970). The O'Reely vein strikes northeast and can be traced for about 1,500 feet. Freeman (2004) describes the O'Reely vein as a 'polyphase hydrothermal breccia'. Two samples contained 8.04 and 8.38 grams of gold per ton, 16.10 and 53.70 parts per million (ppm) silver, 1,065 and 1,985 ppm arsenic, 15.35 and 39.70 ppm bismuth, 1,800 and 4,210 ppm lead, and 761,1,000 ppm antimony, and anomalous bismuth and tellurium (Freeman 2004). Other surface samples of veins and altered granite collected in subsequent years varied greatly in their relative and specific

metal content but they have essentially the same association of metals.

In 2007, Freegold drilled 9 holes on the O'Reely vein (Freegold Ventures Ltd., 2007). All of the holes cut the vein in mineralized intercepts from 5 to 20 feet wide. Of the 128 intervals that were assayed, 31 contained over 0.2 gram of gold per tonne; the highest was 2.1 grams of gold per tonne across 3 feet. The drilling indicated that the vein is continuous for at least 750 feet horizontally and does not have any structural offsets.

Alteration:

Not described in detail but alteration is associated with the veins.

Age of mineralization:

Probably genetically related to a nearby Cretaceous granodiorite pluton.

Generic deposit model:

Deposit model:

Silver-gold-quartz veins and stockwork, +/- arsenic, copper, lead, antimony, tellurium, and tungsten (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

Although several mines and prospects have been known since the 1930s within a mile or so of this prospect, the O'Reely vein was first described by Freeman in 2004. From 1995 to 1999, The Stone Boy Joint Venture (Sumitomo Metal Metal Mining and WGM Inc.) spent more than $1.3 million exploring in the area; they did extensive surface mapping and sampling, surface and airborne geophysics, and 16,215 feet of diamond drilling in 26 holes. They did not drill the O'Reely prospect. In 2002, Freegold Ventures optioned a large block of claims that covered the O'Reely vein and the several other nearby deposits that are described separately: the Grizzly Bear (BD003), Michigan Lode (BD025), Wolverine (BD057), and Upper Trench/ Lower Trench (BD058). They continued to explore them as a unit as the Rob project through early 2012 (Flanders, 2010; Freegold Ventures Ltd., 2012). The work has included extensive geologic mapping, surface sampling, and geochemical and geophysical surveys. In 2007, Freegold drilled 9 holes on the O'Reely vein (Freegold Ventures Ltd., 2007).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bailey, R.O., 2001, ROB Claim Group, Tibbs Creek, Alaska, Goodpaster Mining District: Unpublished report, 137 pp.

Flanders, R.W., 2010, Executive Summary report for the Rob Gold property, Goodpaster Mining District, Alaska: Unpublished report for Freegold Recovery, Inc., 55 p. (posted on www.sedar.com, March 31, 2010)

Foster, H. L., Albert, N. R. D.,Griscom, A., Hessin, T. D., Menzie, W. D.; Turner, D. L., and Wilson, F. H., 1979, Alaskan Mineral Resource Assessment Program: Background Information to accompany folio of geologic and mineral resource maps of the Big Delta quadrangle, Alaska: U.S. Geological Survey Circular 783, 19 p.

Freeman, C.J., 2004, Executive summary report for the Rob gold property, Goodpaster Mining District, Alaska: Unpublished NI 43-101 report prepared for Freegold Recovery, Inc., 30 p. (posted on www.sedar.com as of April 27, 2008).

Freegold Ventures Ltd., 2007, Freegold drilling hits high-grade gold at Rob - 29 g/t over 4 m: http://www.freegoldventures.com/s/NewsReleases.asp?ReportID=266245&_Type=News-Releases&_Title=Freegold-Drilling-Hits-High-Grade-Gold-at-Rob-29-gt-Over-4-m (News release, Oct 11, 2007).

Freegold Ventures Ltd., 2012, Rob project, Alaska: http://www.freegoldventures.com/s/RobGold.asp?ReportID=296782 (as of March 4, 2012).

Thomas, B.I., 1970, Reconnaissance of the gold-bearing quartz veins in the Tibbs Creek area, Goodpaster River, Big Delta quadrangle, central Alaska: U.S. Bureau of Mines Open-File Report 14-70, 12 p.

Weber, F.R.; Foster, H.L.; Keith, T.E.C. and Dusel-Bacon, C., 1978, Preliminary geologic map of the Big

Primary Reference: Freeman, 2004; Flanders, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): ER-Ogo-Fire

Site type: Prospect

ARDF no.: BD060

Latitude: 64.4433 **Quadrangle:** BD B-3

Longitude: 145.1239

Location description and accuracy:

This prospect is in on the divide between the headwaters of the Goodpaster River and Shaw Creek, about a mile southeast of hill 3750. The coordinates are at about the center of an area with several drill holes on a block of claims outlined by Baknes (2008). It is about 0.6 mile northwest of the center of section 35, T. 5 S., R. 13 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au, Bi, Sb

Other:

Ore minerals: Chalcopyrite, jamesonite, pyrite, pyrrhotite

Gangue minerals: Quartz

Geologic description:

The rocks in the area are part of the Yukon-Tanana Terrane of the northern Cordillera; they consist largely of late Paleozoic to Devonian medium- to high-grade metamorphic rocks that have been intruded by Cretaceous and Tertiary granitic stocks and batholiths (Baknes, 2008; Wilson and others, 1998). The metamorphic rocks are structurally complex with an older, middle to early Paleozoic and/or late Proterozoic unit that consists of gneiss, schist, quartzite, and amphibolite and a younger, Mississippian and/or Devonian unit that consists largely of augen gneiss that locally forms domal structures. The metamorphic rocks are intruded by 55 Ma to 107 Ma, granitic plutons. The structure of the area is complex and difficult to determine because of poor exposure but several major thrust fault have been identified as well as a series of northeast-trending, northwest-dipping high-angle faults.

The dominant mineralization in the area and the target of most of the exploration are deposits related to Cretaceous intrusions, several classic examples being the Fort Knox Mine (FB115) near Fairbanks and the nearby Pogo Mine (BD033). These deposits are characterized by an association with moderately reduced, I- and S- type granitic intrusions and a lithophile, gold-bismuth-tungsten-arsenic-tellurium-molybdenum(-tin-copper-lead-antimony) suite of elements. The deposits vary from low-sulfide, sheeted or stockwork deposits in the intrusions to replacement deposits, veins, and stockworks in the country rock. The mineralization at the nearby Pogo deposit is the model used in exploring this and other prospects in the area. The mineralization at Pogo consists of thick gently-dipping quartz veins that grade laterally into pegmatite dikes related to 107 Ma syenite and monzonite intrusions. The quartz veins contain about 3 percent sulfides, mainly arsenopyrite, pyrite, pyrrhotite, loellingite, chalcopyrite, bismuthinite, native bismuth and native gold. The veins are associated with biotite alteration overprinted by sericite-dolomite-chlorite-quartz alteration, that extends into the country rock for several meters.

Soon after the recognition of nearby Pogo as a major, economically attractive deposit in 1998, Rimfire Minerals Corporation in conjunction with several joint-venture partners began work in the area and identified this deposit. In 2008, they entered into a joint venture with Rubicon Minerals Corporation and commissioned a thorough technical report on their properties in the Goodpaster District (Baknes, 2008), which is the source of most of the information on this prospect.

The rocks at the ER-Ogo-Fire prospect are Paleozoic augen gneiss interlayered with quartz-feldspar-

biotite paragneiss, and Cretaceous granitic intrusions. Felsic dikes that vary in texture from aplite to pegmatite are common. Scattered occurrences of pyrrhotite and pyrite occur in the vicinity of the prospect and an occurrence of pyrrhotite, pyrite, and chalcopyrite is at the contact between quartz-feldspar and biotite-feldspar schist. Quartz veins are common at the surface but few contain sulfides. Four samples of quartz veins collected at the surface (one of which has jamesonite) contained 15 to 1,521 parts per billion (ppb) gold, less than 0.2 to 0.9 parts per million (ppm) silver, 484 to 2,833 ppm arsenic, up to 0.76 ppm bismuth, 7 to 286 ppm lead, and 13 to 68 ppm antimony. Nine holes were drilled by Anglo-Gold Ashanti (USA) in 2003 and 2004. The drilling cut numerous intercepts up to 3.6 meters long of quartz veins and breccia with arsenopyrite, pyrite, and pyrrhotite. The quartz veins and breccia appear to occur along faulted contacts and are often associated with extensive quartz-sericite-pyrite alteration. There is also post-mineralization, silica-dolomite(-pyrite) alteration associated with re-brecciation of the mineralization. The best of the mineralized intercepts contained 9.0 to 5,310 ppb gold, 0.1 to more than 1 ppm silver, 1,535 to more than 1 percent arsenic, 0.06 to 11.80 ppm bismuth, and 19 to more than 1,000 ppm stibnite.

Alteration:

The quartz veins and breccia intersected in the drill holes are often associated with extensive quartz-sericite-pyrite alteration. There is also post-mineralization, silica-dolomite(-pyrite) alteration associated with re-brecciation of the mineralization.

Age of mineralization:

Probably about 107 Ma based on similarities with the nearby Pogo Mine.

Generic deposit model:

Deposit model:

Quartz veins and breccia related to nearby Cretaceous intrusions.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Extensive surface sampling, and geochemical and geophysical surveys beginning in 1999 and continuing through 2007. Nine holes drilled by AngloGold Ashanti (USA) in 2003 and 2004 totaled 3,158.2 meters.

In October 2016, Millrock Resources Inc. announced that, through a series of purchase and option agreements and claim staking, it has assembled a 39,159-acre land position covering high-potential gold targets (ARDF numbers BD054, BD055, and BD060) in the Goodpaster Mining District near the Pogo gold mine (BD033). The claims cover soil geochemical anomalies, many of which are untested. On several sites there are intersections obtained through drilling by prior operators that are anomalous in gold. Millrock conducted core re-logging, surface geologic mapping, and soil and rock sampling in 2016; this work defined a northeast–southwest-trending corridor of anomalous gold values and several east–west-trending quartz vein systems as well as a small low-angle, northwest-dipping quartz vein with similar characteristics to the tabular bodies at Pogo (BD033). Millrock also collected short-wave infrared spectra from both core and surface samples (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Baknes, M.E., 2008, 2008 Technical report on the Goodpaster District properties: Technical report prepared for Rimfire Minerals Corp. and Rubicon Minerals Corp., 55 p. (posted on www.sedar.com on May 7, 2008).

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Baknes, 2008

Reporter(s): D.J. Grybeck (Port Ludlow, WA); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Eagle

Site type: Prospect

ARDF no.: BD061

Latitude: 64.287 **Quadrangle:** BD B-3

Longitude: 145.4197

Location description and accuracy:

The Eagle prospect is about 1.8 mile west of the top of Shaw Creek Dome. The coordinates are at about the center of an area with several drill holes in a block of claims outlined by Baknes (2008). The prospect is about 0.6 mile south-southwest of the center of section 20, T. 7 S., R. 12 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au, Bi, Sb

Other: Cu, Pb

Ore minerals: Chalcopyrite, molybdenite, pyrite

Gangue minerals: Albite, calcite, quartz

Geologic description:

The rocks in the area are part of the Yukon-Tanana Terrane of the northern Cordillera; they consist largely of late Paleozoic to Devonian medium- to high-grade metamorphic rocks that have been intruded by Cretaceous and Tertiary granitic stocks and batholiths (Baknes, 2008; Wilson and others, 1998). The metamorphic rocks are structurally complex with an older, middle to early Paleozoic and/or late Proterozoic unit that consists of gneiss, schist, quartzite, and amphibolite and a younger, Mississippian and/or Devonian unit that consists largely of augen gneiss that locally forms domal structures. The metamorphic rocks are intruded by 55 Ma to 107 Ma, granitic plutons. The structure of the area is complex and difficult to determine because of poor exposure but several major thrust fault have been identified as well as a series of northeast-trending, northwest-dipping high-angle faults.

The dominant mineralization in the area and the target of most of the exploration are deposits related to Cretaceous intrusions, several classic examples being the Fort Knox Mine (FB115) near Fairbanks and the nearby Pogo Mine (BD033). These deposits are characterized by an association with moderately reduced, I- and S- type granitic intrusions and a lithophile, gold-bismuth-tungsten-arsenic-tellurium-molybdenum(-tin-copper-lead-antimony) suite of elements. The deposits vary from low-sulfide, sheeted or stockwork deposits in the intrusions to replacement deposits, veins, and stockworks in the country rock. The mineralization at the nearby Pogo deposit is the model used in exploring this and other prospects in the area. The mineralization at Pogo consists of thick gently-dipping quartz veins that grade laterally into pegmatite dikes related to 107 Ma syenite and monzonite intrusions. The quartz veins contain about 3 percent sulfides, mainly arsenopyrite, pyrite, pyrrhotite, loellingite, chalcopyrite, bismuthinite, native bismuth and native gold. The veins are associated with biotite alteration overprinted by sericite-dolomite-chlorite(-quartz alteration, that extends into the country rock for several meters.

Soon after the recognition of nearby Pogo as a major and economically attractive deposit in 1998, Rimfire Minerals Corporation in conjunction with several joint-venture partners began work in the area and identified this deposit. In 2008, they entered into a joint venture with Rubicon Minerals Corporation and commissioned a thorough technical report on their properties in the Goodpaster District (Baknes, 2008), which is the source of most of the information on this prospect.

The rocks in the vicinity of the Eagle prospect are dominantly irregularly-shaped, multiphase granite to

granodiorite intrusions surrounded by orthogneiss. The geology is poorly exposed but several lineaments roughly parallel soil-geochemical anomalies. Several samples with disseminated pyrite and trace chalcopyrite and one with molybdenite were identified on the surface and numerous samples were collected. Nine of the samples collected at the surface had significant metal values. These contained 113 to 8,080 parts per billion (ppb) gold, 0.8 to 3.05 parts per million (ppm) silver, 9 to 430 ppm arsenic, 0.11 to 2,600 ppm bismuth, 13 to 26 ppm copper, and less than 2 to 12 ppm antimony. Five holes were drilled in 2000 by Hyder Gold and another 9 holes were drilled in 2004 by AngloGold Ashanti (USA); these totaled 3,054 meters. The drilling intersected 26 stockwork zones with significant gold values that varied in thickness from 0.2 to 1.5 meters; the best of these intervals contained by 437 to 7,896 ppb gold, 0.1 to 4.0 ppm silver, 13 to 4,430 ppm arsenic, 1 to 100 ppm bismuth, and 1 to 77 ppm antimony. The stockwork zones, many of them lacking sulfides, consists of quartz, albite, and calcite, and are associated with variable sericitic and chlorite alteration.

Alteration:

Stockwork zones in granitic rocks are associated with sericitic and chloritic alteration.

Age of mineralization:

Probably about 107 Ma based on similarities with the nearby Pogo Mine.

Generic deposit model:

Deposit model:

Quartz veins and stockwork zones related to nearby Cretaceous intrusions.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Extensive surface sampling and geochemistry and geophysical surveys beginning in 1999 and continuing through 2007. Five holes were drilled in 2000 by Hyder Gold and another 9 holes were drilled in 2004 by AngloGold Ashanti (USA); these totaled 3,054 meters.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Baknes, M.E., 2008, 2008 Technical report on the Goodpaster District properties: Technical report prepared for Rimfire Minerals Corp. and Rubicon Minerals Corp., 55 p. (posted on www.sedar.com on May 7, 2008).

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Baknes, 2008

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Boundary

Site type: Prospect

ARDF no.: BD062

Latitude: 64.418

Quadrangle: BD B-1

Longitude: 144.3769

Location description and accuracy:

The Boundary prospect is on a ridge about 2.6 miles west, northwest of the junction of Tibbs Creek and Last Chance Creek. The coordinates are at about the center of a group of drill sites on a large block of claims outlined by Baknes (2008). The prospect is about 0.6 mile southeast of the center of section 4, T6 S., R. 17 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, Au, Bi, Sb

Other: Cu, Pb

Ore minerals: Arsenopyrite, pyrite, bismuthinite

Gangue minerals: Quartz

Geologic description:

The rocks in the area are part of the Yukon-Tanana Terrane of the northern Cordillera; they consist largely of late Paleozoic to Devonian medium- to high-grade metamorphic rocks that have been intruded by Cretaceous and Tertiary granitic stocks and batholiths (Baknes, 2008; Wilson and others, 1998). The metamorphic rocks are structurally complex with an older, middle to early Paleozoic and/or late Proterozoic unit that consists of gneiss, schist, quartzite, and amphibolite and a younger, Mississippian and/or Devonian unit that consists largely of augen gneiss that locally forms domal structures. The metamorphic rocks are intruded by 55 Ma to 107 Ma, granitic plutons. The structure of the area is complex and difficult to determine because of poor exposure but several major thrust fault have been identified as well as a series of northeast-trending, northwest-dipping high-angle faults.

The dominant mineralization in the area and the target of most of the exploration are deposits related to Cretaceous intrusions, several classic examples being the Fort Knox Mine (FB115) near Fairbanks and the nearby Pogo Mine (BD033). These deposits are characterized by an association with moderately reduced, I- and S- type granitic intrusions and a lithophile, gold-bismuth-tungsten-arsenic-tellurium-molybdenum(-tin-copper-lead-antimony) suite of elements. The deposits vary from low-sulfide, sheeted or stockwork deposits in the intrusions to replacement deposits, veins, and stockworks in the country rock. The mineralization at the nearby Pogo deposit is the model used in exploring this and other prospect in the area. The mineralization at Pogo consists of thick gently-dipping quartz veins that grade laterally into pegmatite dikes related to 107 Ma syenite and monzonite intrusions. The quartz veins contain about 3 percent sulfides, mainly arsenopyrite, pyrite, pyrrhotite, loellingite, chalcopyrite, bismuthinite, native bismuth and native gold. The veins are associated with biotite alteration overprinted by sericite-dolomite-chlorite-quartz alteration, that extends into the country rock for several meters.

Soon after the recognition of nearby Pogo as a major and economically attractive deposit in 1998, Rimfire Minerals Corporation in conjunction with several joint-venture partners began work in the area and identified this deposit. In 2008, they entered into a joint venture with Rubicon Minerals Corporation and commissioned a thorough technical report on their properties in the Goodpaster District (Baknes, 2008), which is the source of most of the information on this prospect.

The rocks in the area of the Boundary deposit are iron-stained gneiss intruded by granitic dikes and sills

that are generally aplite but locally grade into pegmatite. The gneiss shows variable sericite-quartz-pyrite/pyrrhotite alteration. The rocks are poorly exposed and the only recognizable structures are lineaments that probably represent faults. Several shows of mineralization occur in an area about 2 kilometers in diameter that roughly coincides with an arsenic-bismuth-antimony-gold soil anomaly of about 1.5 x 2.5 km in size. The Boundary stockworks is a 100 by 300 meters talus zone with scattered, vuggy quartz veinlets that contain traces of arsenopyrite and bismuthinite. The Daydreamer showing is an area of about 25 meters by 75 meters in size with quartz boulders that contain finely disseminated blebs of arsenopyrite and rare pyrite and bismuthinite. The Topgun showing is an area about 10 meters in diameter with mineralization similar to the Daydreamer showing. The Pebble showing is 15 to 20 meters in size with weathered quartz pebbles and fine-grained quartz breccia. Eighteen samples collected at the surface from these showing contained significant metal values: 20 to 24,853 parts per billion (ppb) gold), 0.6 to 33.2 parts per million (ppm) silver, 2 ppm to more than 1 percent arsenic, 12 to 1,215 ppm bismuth, 8 to 168 ppm copper, and 6 to 1,055 ppm lead. Five holes that totaled 1,446 meters were drilled at the Boundary prospect in 2000 and 2001. Three of the holes intercepted mineralization 0.1 to 4.2 meters long; the metal values in these intercepts varied from 1,110 to 35,240 ppm gold, 1 ppm to more than 1 percent arsenic, and 14 to 1,250 ppm bismuth.

Alteration:

The gneiss host rocks show variable sericite-quartz-pyrite/pyrrhotite alteration.

Age of mineralization:

Probably about 107 Ma based on similarities with the nearby Pogo Mine.

Generic deposit model:

Deposit model:

Quartz veins and stockwork zones related to nearby Cretaceous intrusions.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Extensive surface sampling and geochemical and geophysical surveys beginning in 1999 and continuing through 2007. Five holes that totaled 1,446 meters were drilled in 2000 and 2001.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Baknes, M.E., 2008, 2008 Technical report on the Goodpaster District properties: Technical report prepared for Rimfire Minerals Corp. and Rubicon Minerals Corp., 55 p. (posted on www.sedar.com on May 7, 2008).

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic

map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Baknes, 2008

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Beverly

Site type: Prospect

ARDF no.: BD063

Latitude: 64.387 **Quadrangle:** BD B-2

Longitude: 144.5412

Location description and accuracy:

The Beverly prospect is on top of a ridge in the headwaters of California Creek, about 0.5 mile southwest of hill 3620. The prospect is at about the center of an area with several drill holes on a large block of claims outlined by Baknes (2008). It is about 0.6 mile south-southeast of the center of section 15, T. 6 S., R 16 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au, Bi

Other: Cu

Ore minerals: Arsenopyrite

Gangue minerals: Quartz

Geologic description:

The rocks in the area are part of the Yukon-Tanana Terrane of the northern Cordillera; they consist largely of late Paleozoic to Devonian medium- to high-grade metamorphic rocks that have been intruded by Cretaceous and Tertiary granitic stocks and batholiths (Baknes, 2008; Wilson and others, 1998). The metamorphic rocks are structurally complex with an older, middle to early Paleozoic and/or late Proterozoic unit that consists of gneiss, schist, quartzite, and amphibolite and a younger, Mississippian and/or Devonian unit that consists largely of augen gneiss that locally forms domal structures. The metamorphic rocks are intruded by 55 Ma to 107 Ma, granitic plutons. The structure of the area is complex and difficult to determine because of poor exposure but several major thrust fault have been identified as well as a series of northeast-trending, northwest-dipping high-angle faults.

The dominant mineralization in the area and the target of most of the exploration are deposits related to Cretaceous intrusions, several classic examples being the Fort Knox Mine (FB115) near Fairbanks and the nearby Pogo Mine (BD033). These deposits are characterized by an association with moderately reduced, I- and S- type granitic intrusions and a lithophile, gold-bismuth-tungsten-arsenic-tellurium-molybdenum(-tin-copper-lead-antimony) suite of elements. The deposits vary from low-sulfide, sheeted or stockwork deposits in the intrusions to replacement deposits, veins, and stockworks in the country rock. The mineralization at the nearby Pogo deposit is the model used in exploring this and other prospect in the area. The mineralization at Pogo consists of thick gently-dipping quartz veins that grade laterally into pegmatite dikes related to 107 Ma syenite and monzonite intrusions. The quartz veins contain about 3 percent sulfides, mainly arsenopyrite, pyrite, pyrrhotite, loellingite, chalcopyrite, bismuthinite, native bismuth and native gold. The veins are associated with biotite alteration overprinted by sericite-dolomite-chlorite-quartz alteration, that extends into the country rock for several meters.

Soon after the recognition of nearby Pogo as a major and economically attractive deposit in 1998, Rimfire Minerals Corporation in conjunction with several joint-venture partners began work in the area and identified this deposit. In 2008, they entered into a joint venture with Rubicon Minerals Corporation and commissioned a thorough technical report on their properties in the Goodpaster District (Baknes, 2008), which is the source of most of the information on this prospect.

Most of the Beverly prospect is in augen gneiss intruded by granitic dikes. The area has been studied only

in reconnaissance and the only mineralization consists of quartz boulders in float; a sample contained 2,370 parts per billion (ppb) gold, 0.2 part per million (ppm) silver, 39 ppm bismuth, and 90 ppm copper. Rubicon Minerals Corp. drilled 6 holes in the Beverly area that totaled 1,505.6 meters. Two of the holes cut 4 significant intersections of mineralization 0.76 to 10.30 meters long; they contained 0.96 to 2.24 grams of gold per ton, 0.92 to 10.3 grams of silver per ton, and 436 to greater than 1 percent arsenic.

Alteration:

Not specified.

Age of mineralization:

Probably about 107 Ma based on similarities to the nearby Pogo Mine.

Generic deposit model:

Deposit model:

Quartz veins and stockwork zones related to nearby Cretaceous intrusions.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Surface sampling and geochemical and geophysical surveys beginning in 1999 and continuing through 2007. Rubicon Minerals Corp. drilled 6 holes in the Beverly zone that totaled 1,505.6 meters.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Baknes, M.E., 2008, 2008 Technical report on the Goodpaster District properties: Technical report prepared for Rimfire Minerals Corp. and Rubicon Minerals Corp., 55 p. (posted on www.sedar.com on May 7, 2008).

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Baknes, 2008

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Scott

Site type: Prospect

ARDF no.: BD064

Latitude: 64.4407 **Quadrangle:** BD B-2

Longitude: 144.6262

Location description and accuracy:

The Scott prospect is about 1.2 mile north-northwest of Shawnee Peak. The coordinates are about the center of an area of anomalous geochemical and rock samples in a block of claims outlined by Baknes (2008). The prospect is about 0.5 mile northwest of the center of section 32, T. 5 S., R. 16 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

The rocks in the area are part of the Yukon-Tanana Terrane of the northern Cordillera; they consist largely of late Paleozoic to Devonian medium- to high-grade metamorphic rocks that have been intruded by Cretaceous and Tertiary granitic stocks and batholiths (Baknes, 2008; Wilson and others, 1998). The metamorphic rocks are structurally complex with an older, middle to early Paleozoic and/or late Proterozoic unit that consists of gneiss, schist, quartzite, and amphibolite and a younger, Mississippian and/or Devonian unit that consists largely of augen gneiss that locally forms domal structures. The metamorphic rocks are intruded by 55 Ma to 107 Ma, granitic plutons. The structure of the area is complex and difficult to determine because of poor exposure but several major thrust fault have been identified as well as a series of northeast-trending, northwest-dipping high-angle faults.

The dominant mineralization in the area and the target of most of the exploration are deposits related to Cretaceous intrusions, several classic examples being the Fort Knox Mine (FB115) near Fairbanks and the nearby Pogo Mine (BD033). These deposits are characterized by an association with moderately reduced, I- and S- type granitic intrusions and a lithophile, gold-bismuth-tungsten-arsenic-tellurium-molybdenum(-tin-copper-lead-antimony) suite of elements. The deposits vary from low-sulfide, sheeted or stockwork deposits in the intrusions to replacement deposits, veins, and stockworks in the country rock. The mineralization at the nearby Pogo deposit is the model used in exploring this and other prospect in the area. The mineralization at Pogo consists of thick gently-dipping quartz veins that grade laterally into pegmatite dikes related to 107 Ma syenite and monzonite intrusions. The quartz veins contain about 3 percent sulfides, mainly arsenopyrite, pyrite, pyrrhotite, loellingite, chalcopyrite, bismuthinite, native bismuth and native gold. The veins are associated with biotite alteration overprinted by sericite-dolomite-chlorite-quartz alteration, that extends into the country rock for several meters.

Soon after the recognition of nearby Pogo as a major and economically attractive deposit in 1998, Rimfire Minerals Corporation in conjunction with several joint-venture partners began work in the area and identified this deposit. In 2008, they entered into a joint venture with Rubicon Minerals Corporation and commissioned a thorough technical report on their properties in the Goodpaster District (Baknes, 2008), which is the source of most of the information on this prospect.

The Scott prospect is almost entirely in granitic rocks of the Goodpaster batholith. The prospect is marked

by several gold geochemical anomalies. Only a few surface rock samples have been collected.

Alteration:

Not specifically noted.

Age of mineralization:

Probably about 107 Ma based on similarities with the nearby Pogo Mine.

Generic deposit model:

Deposit model:

Quartz veins and stockwork zones related to nearby Cretaceous intrusions.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Surface sampling and geochemical and geophysical surveys beginning in 1999 and continuing through 2007.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Baknes, M.E., 2008, 2008 Technical report on the Goodpaster District properties: Technical report prepared for Rimfire Minerals Corp. and Rubicon Minerals Corp., 55 p. (posted on www.sedar.com on May 7, 2008).

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Baknes, 2008

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Bou

Site type: Prospect

ARDF no.: BD065

Latitude: 64.3151 **Quadrangle:** BD B-1

Longitude: 144.2017

Location description and accuracy:

The Bou prospect is about 0.7 mile east of the ridge of Black Mountain and about 0.7 mile east-southeast of peak 5020. The prospect is within a block of claims outlined by Barnes (2008). It is at about the southeast corner of section 8, T. 7 S., R. 18 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au, Bi, Sb

Other: Cu, Pb

Ore minerals: Arsenopyrite, pyrite

Gangue minerals: Quartz

Geologic description:

The rocks in the area are part of the Yukon-Tanana Terrane of the northern Cordillera; they consist largely of late Paleozoic to Devonian medium- to high-grade metamorphic rocks that have been intruded by Cretaceous and Tertiary granitic stocks and batholiths (Baknes, 2008; Wilson and others, 1998). The metamorphic rocks are structurally complex with an older, middle to early Paleozoic and/or late Proterozoic unit that consists of gneiss, schist, quartzite, and amphibolite and a younger, Mississippian and/or Devonian unit that consists largely of augen gneiss that locally forms domal structures. The metamorphic rocks are intruded by 55 Ma to 107 Ma, granitic plutons. The structure of the area is complex and difficult to determine because of poor exposure but several major thrust fault have been identified as well as a series of northeast-trending, northwest-dipping high-angle faults.

The dominant mineralization in the area and the target of most of the exploration are deposits related to Cretaceous intrusions, several classic examples being the Fort Knox Mine (FB115) near Fairbanks and the nearby Pogo Mine (BD033). These deposits are characterized by an association with moderately reduced, I- and S- type granitic intrusions and a lithophile, gold-bismuth-tungsten-arsenic-tellurium-molybdenum(-tin-copper-lead-antimony) suite of elements. The deposits vary from low-sulfide, sheeted or stockwork deposits in the intrusions to replacement deposits, veins, and stockworks in the country rock. The mineralization at the nearby Pogo deposit is the model used in exploring this and other prospect in the area. The mineralization at Pogo consists of thick gently-dipping quartz veins that grade laterally into pegmatite dikes related to 107 Ma syenite and monzonite intrusions. The quartz veins contain about 3 percent sulfides, mainly arsenopyrite, pyrite, pyrrhotite, loellingite, chalcopyrite, bismuthinite, native bismuth and native gold. The veins are associated with biotite alteration overprinted by sericite-dolomite-chlorite-quartz alteration, that extends into the country rock for several meters.

Soon after the recognition of nearby Pogo as a major and economically attractive deposit in 1998, Rimfire Minerals Corporation in conjunction with several joint-venture partners began work in the area and identified this deposit. In 2008, they entered into a joint venture with Rubicon Minerals Corporation and commissioned a thorough technical report on their properties in the Goodpaster District (Baknes, 2008), which is the source of most of the information on this prospect.

The Bou prospect is almost entirely in Cretaceous, porphyritic biotite granite. The area is cut by numerous faults and lineaments of diverse orientation. The mineralization at Bou consists of quartz veins that are

generally 15 to 30 centimeters thick but may reach 1 meter. The veins are commonly brecciated and are marked by pervasive sericitization and some sericitization. The veins contain disseminated pyrite and arsenopyrite. While the presence of sulfides is indicative of gold, their abundance does not seem to correlate to the gold values. Seven samples of the veins contained 1,050 to 3,960 parts per billion gold, 0.2 to 1.2 parts per million (ppm) silver, 1,245 ppm to more than 1 percent arsenic, less than 2 to 6 ppm bismuth, 16 to 3,299 ppm antimony, 4 to 50 ppm lead, and less than 1 to 5 ppm copper.

Alteration:

The granitic host rocks of the veins are marked by pervasive sericitization and some sericitization.

Age of mineralization:

Probably about 107 Ma based on similarities to the nearby Pogo Mine.

Generic deposit model:

Deposit model:

Quartz veins related to Cretaceous intrusives.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Surface sampling and geochemical surveys beginning in 1999 and continuing through 2007.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Baknes, M.E., 2008, 2008 Technical report on the Goodpaster District properties: Technical report prepared for Rimfire Minerals Corp. and Rubicon Minerals Corp., 55 p. (posted on www.sedar.com on May 7, 2008).
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Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Baknes, 2008

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Southeast Surf

Site type: Prospect

ARDF no.: BD066

Latitude: 64.3669 **Quadrangle:** BD B-1

Longitude: 144.2795

Location description and accuracy:

The Southeast Surf prospect is about 0.9 mile southwest of the junction of Antimony Creek and Tibbs Creek. The coordinates are at about the center of an area of anomalous geochemical and rock samples in a large block of claims outlined by Baknes (2008). The prospect is about 0.2 mile northeast of the center of section 25, T. 6 S., R. 17 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au, Bi, Sb

Other: Pb

Ore minerals: Arsenopyrite, pyrite, stibnite

Gangue minerals: Quartz

Geologic description:

The rocks in the area are part of the Yukon-Tanana Terrane of the northern Cordillera; they consist largely of late Paleozoic to Devonian medium- to high-grade metamorphic rocks that have been intruded by Cretaceous and Tertiary granitic stocks and batholiths (Baknes, 2008; Wilson and others, 1998). The metamorphic rocks are structurally complex with an older, middle to early Paleozoic and/or late Proterozoic unit that consists of gneiss, schist, quartzite, and amphibolite, and a younger, Mississippian and/or Devonian unit that consists largely of augen gneiss that locally forms domal structures. The metamorphic rocks are intruded by 55 Ma to 107 Ma, granitic plutons. The structure of the area is complex and difficult to determine because of poor exposure but several major thrust fault have been identified as well as a series of northeast-trending, northwest-dipping high-angle faults.

The dominant mineralization in the area and the target of most of the exploration are deposits related to Cretaceous intrusions, several classic examples being the Fort Knox Mine (FB115) near Fairbanks and the nearby Pogo Mine (BD033). These deposits are characterized by an association with moderately reduced, I- and S- type granitic intrusions and a lithophile, gold-bismuth-tungsten-arsenic-tellurium-molybdenum(-tin-copper-lead-antimony) suite of elements. The deposits vary from low-sulfide, sheeted or stockwork deposits in the intrusions to replacement deposits, veins, and stockworks in the country rock. The mineralization at the nearby Pogo deposit is the model used in exploring this and other prospect in the area. The mineralization at Pogo consists of thick gently-dipping quartz veins that grade laterally into pegmatite dikes related to 107 Ma syenite and monzonite intrusions. The quartz veins contain about 3 percent sulfides, mainly arsenopyrite, pyrite, pyrrhotite, loellingite, chalcopyrite, bismuthinite, native bismuth and native gold. The veins are associated with biotite alteration overprinted by sericite-dolomite-chlorite(-quartz) alteration, that extends into the country rock for several meters.

Soon after the recognition of nearby Pogo as a major and economically attractive deposit in 1998, Rimfire Minerals Corporation in conjunction with several joint-venture partners began work in the area and identified this deposit. In 2008, they entered into a joint venture with Rubicon Minerals Corporation and commissioned a thorough technical report on their properties in the Goodpaster District (Baknes, 2008), which is the source of most of the information on this prospect.

The geochemical anomalies and mineralization at the Southeast Surf prospect are mainly in Devonian to

Mississippian augen gneiss near a granitic stock. Few lineaments can be identified but they appears to trend consistently north and northeast. Two areas of mineralization have been identified at the surface. The Spur showing covers an area about 200 by 250 meters where numerous samples of granitic float contain vuggy quartz stockworks. The mineralized granite is altered to quartz, sericite, and dolomite, and some samples are intensely silicified. The quartz stockworks contain pyrite, arsenopyrite and traces of stibnite. Four samples contained 1,020 parts per billion (ppb) gold, 0.2 to 3.2 parts per million (ppm) silver, 1,385 to 6,730 ppm arsenic, less than 2 to 2 ppm bismuth, 2 to 32 ppm copper, and 6 to 970 ppm lead. At the Ol' Timer showing, strongly sericitized augen gneiss with quartz stockworks can be traced for 50 meters in talus. The quartz contains arsenopyrite, pyrite, and traces of stibnite. A sample contained 1,020 ppb gold, less than 0.2 ppm silver, 1,950 ppm arsenic, less than 2 ppm bismuth, 8 ppm antimony, 98 ppm antimony, and 20 ppm lead. No holes have been drilled at the Southeast Surf prospect.

Alteration:

The granitic host rocks are altered to quartz, sericite, and dolomite near the mineralization; some of the granitic rocks are intensely silicified.

Age of mineralization:

Probably about 107 Ma based on similarities to the nearby Pogo Mine.

Generic deposit model:

Deposit model:

Quartz veins and stockworks related to nearby Cretaceous intrusions.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Extensive surface sampling and geochemistry and geophysical surveys beginning in 1999 and continuing through 2007.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Baknes, M.E., 2008, 2008 Technical report on the Goodpaster District properties: Technical report prepared for Rimfire Minerals Corp. and Rubicon Minerals Corp. , 55 p. (posted on www.sedar.com on May 7, 2008).

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Baknes, 2008

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Uncle Sam; Sam

Site type: Prospects

ARDF no.: BD067

Latitude: 64.5052 **Quadrangle:** BD C-5

Longitude: 146.2384

Location description and accuracy:

The Uncle Sam prospects cover an area about 4 miles in diameter. The center of the area is about 2.5 miles southeast of the center of Koepke's Slough on the Salcha River; it is near the center of section 6, T. 5 S., R. 8 E., of the Fairbanks Meridian. The location is accurate within 500 feet.

Commodities:

Main: Au

Other: As, Bi, Sb

Ore minerals: Antimony, bismuth, gold

Gangue minerals: Quartz

Geologic description:

The area is blanketed by loess and surficial material and there is little outcrop. The rocks in the area consist of Paleozoic and/or Proterozoic migmatitic schist and gneiss intruded by felsic igneous rocks (Wilson and others, 1998). At least two intrusive bodies are known on the property, each of which is associated with mineralization.

Kennecott Exploration began exploration in the area in the late 1990s and they staked a block of more than 500 claims on 'exceptionally large' bismuth-arsenic-antimony stream-sediment anomalies (Millrock Resources Inc., 2010; Eden, 2010). Individual prospects within the Uncle Sam project area were identified in 2000. These include Lone Tree (ARDF number BD075) , Lone Wolf (ARDF number BD076), and Christmas Tree (ARDF number BD077), described individually in detail in separate records. Kennecott worked and drilled the property through 2003 and then passed it on to Geoinformatics Exploration Ltd., who did additional drilling under an agreement with Midas Resources Ltd. There have been 23 core holes totaling 4,198 meters on the property and 57 reverse-circulation holes totaling 2,844 meters, as well as considerable geochemical work, geophysical surveys, and sampling. It was optioned by Millrock Resources Inc. in 2009 and in 2011 the property was covered by 194 unpatented 40-acre Alaska state mining claims.

The drilling cut 19 intercepts, 3 to 12 meters wide, with more than 1.0 gram of gold per tonne (Millrock Resources Inc., 2010; Eden, 2010). Three main centers of mineralization have been identified: the Lone Wolf, Christmas, and Lone Tree zones (Millrock Resources Inc., 2010). The Lone Wolf zone is marked by a soil anomaly in gold that is over 2 kilometers long. The zone is also associated with a pronounced magnetic low. Two of the best drill intercepts are 4.0 meters with 3.03 grams of gold per tonne and 11.2 meters with 2.38 grams of gold per tonne. The Christmas zone features a soil anomaly in gold over 4 kilometers long. One drill intercept of 5.5 meters contained 4.94 grams of gold per tonne. The Lone Tree zone is magnetic high that may reflect a buried felsic intrusive. Of the several drill intercepts, the best was 6.1 meters with 10.6 grams of gold per tonne.

In 2011, Millrock with funding by Crescent Resources Inc., drilled five holes in the Lone Tree zone that totaled 1,329 meters (Millrock Resources, Inc., 2011; Crescent Resources Inc., 2011b). Some notable intercepts were 19.22 meters that averaged 2.03 grams of gold per tonne, 6.0 meters that averaged 1.79 grams of gold per tonne, and 14.0 meters that averaged 1.65 grams of gold per tonne.

Alteration:

Locally sericite, carbonate, silicification, and/or disseminated sulfides (Eden, 2010).

Age of mineralization:

Cretaceous based on the age of the associated plutons (Wilson and others, 1998)?

Generic deposit model:

Deposit model:

Possibly an intrusion related, Fort Knox type, gold porphyry.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Kennecott Exploration began exploration in the area in the late 1990s when they staked a block of more than 500 claims on 'exceptionally large' bismuth-arsenic-antimony stream-sediment anomalies (Millrock Resources Inc., 2010; Eden, 2010). Kennecott worked and drilled the property through 2003 but then passed it on to Geoinformatics Exploration Ltd., who did additional drilling under an agreement with Midas Resources Ltd. There have been 23 core holes totaling 4,198 meters on the property and 57 reverse-circulation holes totaling 2,844 meters, as well as considerable geochemical work, geophysical surveys, and sampling. It was optioned by Millrock Resources Inc. in 2009 and in 2010; the property was covered by 194 unpatented 40-acre Alaska state mining claims.

In 2011, Millrock with funding by Crescent Resources Inc., drilled five holes in the Lone Tree zone that totaled 1,329 meters (Millrock Resources, Inc., 2011; Crescent Resources Inc., 2011b).

In December 2011, Crescent announced amendment of terms of option to earn 100 percent interest in the Uncle Sam project (Crescent Resources, 2011a). As of September 2011, the property owner is Coventry Resources Inc., which is a 100 percent owned subsidiary of Crescent Resources Inc. (Coventry Resources Inc., 2012).

Great American Minerals Exploration Inc. (GAME) consolidated ownership of the 26,639-acre Uncle Sam property and made a deal with Stone Boy Inc. on their adjacent Monte Cristo property; the area encompassing these properties, now termed the Sam project, is located about 40 miles west of Pogo mine. In 2011, the Naosi zone, a gold-silver-antimony prospect within the larger Monte Cristo property, was drilled; results included 7.92 meters of 7.8 grams of gold per tonne, 19.7 grams of silver per tonne, and 0.1 percent antimony; and, 22.83 meters grading 4.2 grams of gold per tonne, 48 grams of silver per tonne, and 0.17 percent antimony. From 2008 through 2012, Stone Boy Inc. drilled 79 holes at Naosi, outlining the deposit for about 1,500 meters along strike and to a depth of about 500 meters (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

In 2014, individual ARDF records were made for Lone Wolf, Lone Tree, and Christmas Tree. As recently as the 2012 ARDF update, these prospects were included within part of the Uncle Sam prospects; however, each prospect has discrete geology characteristics.

In December 2011, Crescent announced amendment of terms of option to earn 100 percent interest in the

Uncle Sam project (Crescent Resources, 2011a). As of September, 2012, the property owner is Coventry Resources Inc., which is a 100 percent owned subsidiary of Crescent Resources Inc. (Coventry Resources Inc., 2012).

The Sam Project as of 2016 includes the Uncle Sam, Naosi, and Monte Cristo properties. More information about the Naosi and Monte Cristo properties will be forthcoming.

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

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Primary Reference: Eden, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.): M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Junction

Site type: Prospect

ARDF no.: BD068

Latitude: 64.3375

Quadrangle: BD B-6

Longitude: 146.5412

Location description and accuracy:

The Junction prospect is about 2.0 miles west-southwest of the mouth of Democrat Creek on Junction Creek. It is about 0.6 mile north-northeast of hill 1984 and about 0.2 mile west-northwest of the center of section 3, T. 7 S., R. 6 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, Au

Other: As, Bi, Pb, Sb, Zn

Ore minerals: Gold, pyrite

Gangue minerals: Quartz

Geologic description:

The Richardson District is characterized by gentle slopes and broad, alluvium-filled valleys (Prindle and Katz, 1913). The area is unglaciated and largely overlain by windblown silt, sand, and loess, locally up to 50 meters thick (Foster and others, 1979). The rocks consist of three structure-bounded units (Weber and others, 1978; Swainbank and others, 1984; Noyes and others, 2006; Freeman, 2011). There is a core that consists mainly of biotite-hornblende-feldspar-quartz gneiss and lesser amphibolite, quartzite, marble and calc-silicate hornfels. The core is bounded on the north and south by amphibolite-grade pelitic schist. The contacts between the units are probably low-angle faults; north-trending vertical faults occur widely. Weber and others (1978) assign the pre-metamorphic age of the rocks to the Precambrian or Paleozoic. They were metamorphosed in the Middle to Late Devonian and recrystallized in the Early Cretaceous (Dusel-Bacon and others, 2004; Freeman, 2011). The metamorphic rocks are intruded by 90 Ma, felsic to intermediate dikes and plugs, notable the quartz-feldspar porphyry dike at the nearby Democrat Mine (BD014).

The Junction prospect was discovered in 1991 by searching for the source of anomalous stream sediment and panned concentrate samples collected during a regional geochemical study done by the Tri-Valley Corporation and TSNIGRI of the Russian Ministry of Geology (Vartanyan, 1992; Freeman, 2011). Half of the samples from streams draining the north side of the Junction prospect had visible gold. The concentrates also had high contents of pyrite, ilmenite, tourmaline, magnetite, and biotite.

The country rocks at the prospect consist of quartz-muscovite schist and quartz-feldspar-biotite schist cut by east-trending, steeply-dipping, quartz-feldspar porphyry dikes 100 to 250 meters thick, similar to those at the nearby Democrat Mine (BD014). The mineralization consists of closely-spaced quartz and quartz-pyrite veinlets in the dike. Talus boulders up to 0.3 meter in diameter consist of druzy to coarsely-crystalline quartz with fine-grained silver-lead-bismuth minerals. Weak to intense, greisen-like, quartz-muscovite-sericite alteration is notable in and at the margin of the quartz-feldspar-porphyry dike but does not extend far into the country rock. Twenty-eight samples contained from less than 5 to 307 parts per billion gold, from l 0.2 to 41.1 parts per million (ppm) silver, 14 to 710 ppm arsenic, less than 5 to 76 ppm bismuth, 9 to 4,500 ppm lead, less than 5 to 54 ppm antimony, and 3 to 171 ppm zinc.

Alteration:

Age of mineralization:

Probably about 90 Ma as is other mineralization in the district.

Generic deposit model:

Deposit model:

Intrusion-related gold.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Only surface sampling and mapping.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Dusel-Bacon, Cynthia, Wooden, J.L., and Layer, P.W., 2004, A Cretaceous Ion-Microprobe U-Pb zircon Age for the West Point Orthogneiss: Evidence for another Gneiss Dome in the Yukon-Tanana Upland in Galloway, J.P., ed., 2004, Studies by the U.S. Geological Survey in Alaska, 2001: U.S. Geological Survey Professional Paper 1678, p. 41 - 60.

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Primary Reference: Freeman, 2011

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): First Chance Creek

Site type: Prospect

ARDF no.: BD069

Latitude: 64.4269 **Quadrangle:** BD B-5

Longitude: 146.4809

Location description and accuracy:

This placer deposit is near the middle of a creek that is not named on the USGS topographic maps but has been known locally and in mining literature since at least 1905 as First Chance Creek. It is about 9.9 miles north-northwest of Richardson on the Richardson Highway. It is about 2.4 miles northeast of the junction of Redmond Creek and Shamrock Creek, and about 0.6 mile northwest of the center of section 1, T. 6 S., R. 6 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Cassiterite, cinnabar, gold, molybdenite, scheelite

Gangue minerals:

Geologic description:

The Richardson District is characterized by gentle slopes and broad, alluvium-filled valleys (Prindle and Katz, 1913). The area is unglaciated and largely overlain by windblown silt, sand, and loess, locally up to 50 meters thick (Foster and others, 1979). The rocks consist of three structure-bounded units (Weber and others, 1978; Swainbank and others, 1984; Noyes and others, 2006; Freeman, 2011). There is a core that consists mainly of biotite-hornblende-feldspar-quartz gneiss and lesser amphibolite, quartzite, marble and calc-silicate hornfels. The core is bounded on the north and south by amphibolite-grade pelitic schist. The contacts between the units are probably low-angle faults; north-trending vertical faults occur widely. Weber and others (1978) assign the pre-metamorphic age of the rocks to the Precambrian or Paleozoic. They were metamorphosed in the Middle to Late Devonian and recrystallized in the Early Cretaceous (Dusel-Bacon and others, 2004; Freeman, 2011). The metamorphic rocks are intruded by 90 Ma, felsic to intermediate dikes and plugs, notable the quartz-feldspar porphyry dike at the nearby Democrat Mine (BD014).

Olson and others (1985) report mining on First Chance Creek in 1905 but there is little hard evidence of mining in subsequent years. Based on an old newspaper article, Mitchell (1989) noted that prospecting on First Chance Creek at some uncertain time found auriferous gravel with 0.25 ounce of gold per pan at a depth of 80 feet. Mitchell located old dumps next to by shafts on First Chance Creek but they were too small to indicate significant production. A 1906 newspaper article reported as much as 5 ounces of gold per cubic yard from from gravel in shafts 40 to 90 feet deep on First Chance Creek; the gold was said to be accompanied by cassiterite, cinnabar, scheelite, and molybdenite. Freeman (2011) questions that location and there is no documentation of the amount of gold produced from First Chance Creek from 1905 to 2011.

In 2003, the Tri-Valley Corporation drilled 44 reverse-circulation holes on the placer in lower First Chance Creek. The holes averaged 18.6 meters deep and the deepest was 28.5 meters (Vardanyan and others, 2003; Freeman, 2011). The drilling indicated a 60-meter-wide zone of old drift mining on the lower part of First Chance Creek that verifies that there was some early mining. Samples collected in 1999 by Placer Dome (USA) and by TSNIGRI working with the Tri-Valley Corporation found visible gold 0.1 to 3.0 millimeters in size as well as cassiterite, scheelite, cinnabar, and molybdenite in the heavy sand fraction.

The 2003 drilling defined two pay streaks that extend for more than 3 kilometers along the creek. An

upper auriferous channel was covered by aeolian silt; the lower auriferous channel was on bedrock The gravel in the upper channel was about 2.8 meters thick beneath 4.6 meters of overburden; the gravel averaged 0.38 gram of gold per cubic meter. The gravel in the lower channel was about 2.6 meters thick under about 16.8 meters of overburden; the gravel averaged 0.86 gram of gold per cubic meter. Vartanyan and others (2003) estimated that lower First Chance Creek has a total resource of 37,871 ounces of gold in 1,661,000 cubic yards of gravel overlain by 7,100,000 yards of overburden.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

There are indications of mining in 1905 and perhaps for a few more years but little evidence of when and how much gold was produced. Placer drilling in 2003 identified a 60-meter-wide zone of old drift mining on the lower part of First Chance Creek that verifies that there was some early mining. In 2003, the Tri-Valley Corporation drilled 44 reverse-circulation holes on lower First Chance Creek that identified a measurable placer gold resource.

Production notes:

There is no documentation of placer production on First Chance Creek, but there was mining at least in 1905. Drilling in 2003 identified a 60-meter-wide zone of old drift mining of uncertain age but may date to before WWI.

Reserves:

As defined by 44 holes drilled in 2003, Vartanyan and others (2003) estimated that lower First Chance Creek has a total resource of 37,871 ounces of gold in two channels of auriferous gravel that total 1,661,000 cubic yards of material. The auriferous gravel is overlain by 7,100,000 yards of overburden.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dusel-Bacon, C., Wooden, J.L. and Layer, P.W., 2004, A Cretaceous Ion-Microprobe U-Pb zircon Age for the West Point Orthogneiss: Evidence for another Gneiss Dome in the Yukon-Tanana Upland in Galloway, J.P., ed., 2004, Studies by the U.S. Geological Survey in Alaska, 2001: U.S. Geological Survey Professional Paper 1678, p. 41 - 60.

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Primary Reference: Freeman, 2011

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): First Chance (lode)

Site type: Prospect

ARDF no.: BD070

Latitude: 64.4309 **Quadrangle:** BD B-5

Longitude: 146.483

Location description and accuracy:

The First Chance (lode) prospect is about 0.1 mile south of hill 1275; it is just north of the First Chance Creek placer mine (BD069). The First Chance lode prospect is about 10.2 miles north-northwest of Richardson on the Richardson Highway, about 2.6 miles northeast of the junction of Redmond Creek and Shamrock Creek, and about 0.7 mile southwest of the center of section 36, T. 5 S., R. 6 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: As, Au

Other:

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

The Richardson District is characterized by gentle slopes and broad, alluvium-filled valleys (Prindle and Katz, 1913). The area is unglaciated and largely overlain by windblown silt, sand, and loess, locally up to 50 meters thick (Foster and others, 1979). The rocks consist of three structure-bounded units (Weber and others, 1978; Swainbank and others, 1984; Noyes and others, 2006; Freeman, 2011). There is a core that consists mainly of biotite-hornblende-feldspar-quartz gneiss and lesser amphibolite, quartzite, marble and calc-silicate hornfels. The core is bounded on the north and south by amphibolite-grade pelitic schist. The contacts between the units are probably low-angle faults; north-trending vertical faults occur widely. Weber and others (1978) assign the pre-metamorphic age of the rocks to the Precambrian or Paleozoic. They were metamorphosed in the Middle to Late Devonian and recrystallized in the Early Cretaceous (Dusel-Bacon and others, 2004; Freeman, 2011). The metamorphic rocks are intruded by 90 Ma, felsic to intermediate dikes and plugs, notable the quartz-feldspar porphyry dike at the nearby Democrat Mine (BD014).

Vartanyan and others (1991) indicate that the bedrock in the upper third of First Chance Creek is primarily pelitic schist. The schist in the lower two-thirds is deformed and contains numerous quartz veins and veinlets, and dacite (?) dikes 150 to 500 meters long.

The First Chance lode deposit was discovered in 1991 during the search for the source of high gold and arsenic in panned concentrate samples from the south flank of hill 1275 on the north side of lower First Chance Creek (Vartanyan and others, 1991; Freeman, 2011). Subsequent soil sampling to the north and south of First Chance Creek identified a northwest-trending area anomalous in gold and arsenic; the area is about 1,500 meters long and about 400 meters wide on the hill slopes between Last Chance Creek and hill 1275 (Vartanyan and others, 2003). Twenty-four chip samples of quartz were collected in the anomalous area that contained up to 3 grams of gold per tonne.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Deposit model:

Intrusion-related gold.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Limited geochemical and rock sampling in several episodes from 1991 to 2003.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Dusel-Bacon, C., Wooden, J.L., and Layer, P.W., 2004, A Cretaceous Ion-Microprobe U-Pb zircon Age for the West Point Orthogneiss: Evidence for another Gneiss Dome in the Yukon-Tanana Upland in Galloway, J.P., ed., 2004, Studies by the U.S. Geological Survey in Alaska, 2001: U.S. Geological Survey Professional Paper 1678, p. 41 - 60.

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Primary Reference: Freeman, 2011

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Hilltop

Site type: Prospect

ARDF no.: BD071

Latitude: 64.4237 **Quadrangle:** BD B-6

Longitude: 146.6563

Location description and accuracy:

The Hilltop prospect is on hill 1920 about 13.9 miles northwest of Richardson on the Richardson Highway and about 6.0 miles east of the center of Harding Lake. It is about 0.4 mile east of the center of section 1, T. 6 S., R. 5 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, Au

Other: As, Au, Bi, Cu, Sb

Ore minerals:

Gangue minerals: Quartz

Geologic description:

The Richardson District is characterized by gentle slopes and broad, alluvium-filled valleys (Prindle and Katz, 1913). The area is unglaciated and largely overlain by windblown silt, sand, and loess, locally up to 50 meters thick (Foster and others, 1979). The rocks consist of three structure-bounded units (Weber and others, 1978; Swainbank and others, 1984; Noyes and others, 2006; Freeman, 2011). There is a core that consists mainly of biotite-hornblende-feldspar-quartz gneiss and lesser amphibolite, quartzite, marble and calc-silicate hornfels. The core is bounded on the north and south by amphibolite-grade pelitic schist. The contacts between the units are probably low-angle faults; north-trending vertical faults occur widely. Weber and others (1978) assign the pre-metamorphic age of the rocks to the Precambrian or Paleozoic. They were metamorphosed in the Middle to Late Devonian and recrystallized in the Early Cretaceous (Dusel-Bacon and others, 2004; Freeman, 2011). The metamorphic rocks are intruded by 90 Ma, felsic to intermediate dikes and plugs, notable the quartz-feldspar porphyry dike at the nearby Democrat Mine (BD014). The poorly exposed rocks at the Hilltop prospect are predominantly quartz-feldspar-biotite+/-muscovite gneiss with some amphibolite.

The Hilltop prospect was first suspected when Vartanyan and others (1991) identified anomalous gold in stream sediment and panned concentrated samples from streams draining Hill 1920. No outcrop is exposed on Hill 1920 but in 2000, Vartanyan and others (1991) collected 63 rock-chip samples, 24 samples from trenches to bedrock, and 195 soil samples from 203 pits to bedrock. Rock samples contained 0.003 to 1.726 ounces of gold per ton, up to 289 parts per million (ppm) bismuth, up to 30 parts per million (ppm) copper, up to one percent or more arsenic, and up to 276 ppm antimony. Many of the soil samples were highly anomalous in gold and arsenic. Based on limited field work, the Hilltop deposit appears to trend north-northwest, and is estimated to be 200-900 feet wide and extends along strike for over 3,000 feet.

Alteration:

Not specifically noted.

Age of mineralization:

Uncertain but probably 90 Ma as are many of the intrusion-related gold deposits in the district.

Generic deposit model:

Deposit model:

Intrusion-related gold deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Covered by regional geochemical surveys with stream sediment and panned concentrate samples in 1991. No outcrop is exposed on Hill 1920 but in 2000, Vartanyan and others (1991) collected 63 rock-chip samples, 24 samples from channels to bedrock, and 195 soil samples from 203 pits to bedrock.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Dusel-Bacon, C., Wooden, J.L., and Layer, P.W., 2004, A Cretaceous Ion-Microprobe U-Pb zircon Age for the West Point Orthogneiss: Evidence for another Gneiss Dome in the Yukon-Tanana Upland in Galloway, J.P., ed., 2004, Studies by the U.S. Geological Survey in Alaska, 2001: U.S. Geological Survey Professional Paper 1678, p. 41 - 60.

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Primary Reference: Freeman, 2011

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Gold Run

Site type: Prospect

ARDF no.: BD072

Latitude: 64.4001 **Quadrangle:** BD B-5

Longitude: 146.3842

Location description and accuracy:

The Gold Run prospect is centered about 1.5 miles north-northeast of VABM 3026 'Buck'. It is about 8.0 miles north-northwest of Richardson on the Richardson Highway and about 0.7 mile northwest of the center of section 1. T. 6 S., R. 7 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Au

Other: As, Bi

Ore minerals:

Gangue minerals:

Geologic description:

The Richardson District is characterized by gentle slopes and broad, alluvium-filled valleys (Prindle and Katz, 1913). The area is unglaciated and largely overlain by windblown silt, sand, and loess, locally up to 50 meters thick (Foster and others, 1979). The rocks consist of three structure-bounded units (Weber and others, 1978; Swainbank and others, 1984; Noyes and others, 2006; Freeman, 2011). There is a core that consists mainly of biotite-hornblende-feldspar-quartz gneiss and lesser amphibolite, quartzite, marble and calc-silicate hornfels. The core is bounded on the north and south by amphibolite-grade pelitic schist. The contacts between the units are probably low-angle faults; north-trending vertical faults occur widely. Weber and others (1978) assign the pre-metamorphic age of the rocks to the Precambrian or Paleozoic. They were metamorphosed in the Middle to Late Devonian and recrystallized in the Early Cretaceous (Dusel-Bacon and others, 2004; Freeman, 2011). The metamorphic rocks are intruded by 90 Ma, felsic to intermediate dikes and plugs, notable the quartz-feldspar porphyry dike at the nearby Democrat Mine (BD014).

The Gold Run prospect is associated with a coarse-grained, porphyritic quartz monzonite stock, the Gold Run intrusive (Swainbank and others, 1984; Rogers, 1999). The stock extends over an area about 1.8 by 2.3 kilometers in size. Only the top of the stock is exposed and the southern margin is bounded by a fault. The stock is rimmed by fine- to medium-grained equigranular granite, locally mixed with gneiss. Pegmatite dikes composed mainly of quartz, feldspar, muscovite, and biotite are common beyond the stock. Biotite from the stock has been dated as 92 Ma by Ar/Ar methods (Graham, 2002).

Mineralization at the Gold Gun prospect was first suspected in 1991 from the presence of gold in rock and panned concentrate samples collected in a regional geochemical survey (Vartanyan and others, 1991). Placer Dome (USA) subsequently collected soil samples at the top of bedrock over the area on a 200-meter grid. That geochemical survey defined a bismuth anomaly about 0.5 kilometer wide by 1.2 kilometers long (Rogers and others, 1999). Rock samples contained from less than 5 to 40 parts per billion gold, and low arsenic and bismuth. Freeman (2011) suggests that the the prospect is an intrusion-related gold deposit.

Alteration:

Age of mineralization:

Probably related to the 92 Ma stock that hosts the deposit.

Generic deposit model:

Deposit model:

Intrusion-related gold.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Covered by geochemical surveys; the prospect has had only limited surface sampling and mapping.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Dusel-Bacon, C., Wooden, J.L., and Layer, P.W., 2004, A Cretaceous Ion-Microprobe U-Pb zircon Age for the West Point Orthogneiss: Evidence for another Gneiss Dome in the Yukon-Tanana Upland in Galloway, J.P., ed., 2004, Studies by the U.S. Geological Survey in Alaska, 2001: U.S. Geological Survey Professional Paper 1678, p. 41 - 60.

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Vartanyan, S.S., Konstantinov, V.Y., Oreshin, V.Y., Rodionov, V.A., Pyatnitshy, V.A., Brovkin, V.A., Zagoskin, B.S. and Zelikson, B.S., 1991, Estimation of gold potential of the Richardson Mining District, Alaska: Internal TsNIGRI report to Tri-Valley Corporation, December, 1991, 40 p.

Weber, F.R., Foster, H.L., Keith, T.E.C., and Dusel-Bacon, Cynthia, 1978, Preliminary geologic map of the Big Delta quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-529-A, 1 sheet, scale 1:250,000.

Primary Reference: Freeman, 2011

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Bald Knob

Site type: Prospect

ARDF no.: BD073

Latitude: 64.3551 **Quadrangle:** BD B-5

Longitude: 146.2451

Location description and accuracy:

The Bald Knob prospect is centered on hill 2860, a high bare hill at the head of Banner Creek. The prospect is about 5.7 mile north-northeast of Richardson on the Richardson Highway and about 0.4 mile northwest of the center of section 31, T. 6 S., R. 7 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Au

Other: Bi, Te

Ore minerals:

Gangue minerals: Quartz

Geologic description:

The Richardson District is characterized by gentle slopes and broad, alluvium-filled valleys (Prindle and Katz, 1913). The area is unglaciated and largely overlain by windblown silt, sand, and loess, locally up to 50 meters thick (Foster and others, 1979). The rocks consist of three structure-bounded units (Weber and others, 1978; Swainbank and others, 1984; Noyes and others, 2006; Freeman, 2011). There is a core that consists mainly of biotite-hornblende-feldspar-quartz gneiss and lesser amphibolite, quartzite, marble and calc-silicate hornfels. The core is bounded on the north and south by amphibolite-grade pelitic schist. The contacts between the units are probably low-angle faults; north-trending vertical faults occur widely. Weber and others (1978) assign the pre-metamorphic age of the rocks to the Precambrian or Paleozoic. They were metamorphosed in the Middle to Late Devonian and recrystallized in the Early Cretaceous (Dusel-Bacon and others, 2004; Freeman, 2011). The metamorphic rocks are intruded by 90 Ma, felsic to intermediate dikes and plugs, notable the quartz-feldspar porphyry dike at the nearby Democrat Mine (BD014). As seen in the core from three holes drilled in 2000 at or near the Bald Knob prospect, the rocks in the area consist of gneiss, migmatite, and felsic granitic dikes that vary from pegmatite to aplite (Noyes and others, 2006).

The Bald Knob prospect was discovered by the Tri-Valley Corporation during reconnaissance exploration in 1998 after 10 float samples of quartz were found that contained 0.35 to 1.54 ounces of gold per ton at the nearby Buckeye prospect (BD048); the samples also contained up to 846 parts per million (ppm) bismuth and up to 127 ppm tellurium (Vantanyan and others, 1998). In late 1998, the Tri-Valley Corporation and Placer Dome (USA) formed a joint venture that initially concentrated their work in the headwaters of Banner Creek over the Buckeye prospect but soon was extended to this prospect about a mile and a half to the north. In 1999, Placer Dome collected 1,037 soil samples on bedrock, collected 136 rock samples, and drilled three hole that totaled 516.5 meters (Rogers and others 1999). The soil samples defined a strong gold-bismuth-tellurium anomaly over the Buckeye and Bald Knob prospects. One drill hole was at the Buckeye prospect, the other two were at the Bald Knob prospect. Placer Dome did more soil and rock sampling in 2000 and drilled three more holes (Graham 2002; Noyes and others, 2006). Low-grade intercepts of more than 100 parts per billion gold were seen in the six holes drilled in 1999 and 2000. The high gold values in the core can be correlated with high bismuth and tellurium but there seems to be no correlation of gold with such pathfinder elements as silver, arsenic, antimony, copper, lead, or zinc, elements that are commonly associated with other gold deposits in the district. The higher gold values are

associated with narrow quartz veins that cut otherwise unaltered gneiss. Additional soil sampling was done in 2005 but added little to the extent of the previous anomalies. The source of the rich gold-bismuth-tellurium-quartz samples found at the surface near the Buckeye prospect in 1998 remains unknown. Freeman (2011) in his synthesis of the previous work on the gold mineralization of the Richardson district suggests that the mineralization at the Bald Knob prospect is a distal intrusion-related gold deposit.

Alteration:

Notable lack of alteration in the gneiss host rock.

Age of mineralization:

Probably 90 Ma as are most of the gold deposits in the district.

Generic deposit model:

Deposit model:

Distal intrusion-related gold deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Three generations of soil sampling on bedrock from 1998 to 2005. Numerous rock samples collected and analyzed. Nine holes were drilled in 1999 and 2000 at this and the nearby Buckeye prospect (BD048).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Dusel-Bacon, C., Wooden, J.L., and Layer, P.W., 2004, A Cretaceous Ion-Microprobe U-Pb zircon Age for the West Point Orthogneiss: Evidence for another Gneiss Dome in the Yukon-Tanana Upland in Galloway, J.P., ed., 2004, Studies by the U.S. Geological Survey in Alaska, 2001: U.S. Geological Survey Professional Paper 1678, p. 41 - 60.

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Unpublished M.S. Thesis, University of Alaska, Fairbanks, 138 p.

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Primary Reference: Freeman, 2011

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Banner; Banner Dikes

Site type: Prospect

ARDF no.: BD074

Latitude: 64.3516 **Quadrangle:** BD B-5

Longitude: 146.3465

Location description and accuracy:

The Banner prospect is on a hillside in the headwaters of Banner Creek and about 4.1 mile north of Richardson on the Richardson Highway. It is about 1.0 mile north of the mine symbol shown on the USGS 1:63-360-scale topographic map at the head of Banner Creek and about 0.3 mile west of the center of section 34, T. 6 S., R. 7 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au

Other: Cu, Pb, Sn, W

Ore minerals: Andorite, arsenopyrite, chalcopyrite, freibergite, jamesonite, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The Richardson District is characterized by gentle slopes and broad, alluvium-filled valleys (Prindle and Katz, 1913). The area is unglaciated and largely overlain by windblown silt, sand, and loess, locally up to 50 meters thick (Foster and others, 1979). The rocks consist of three structure-bounded units (Weber and others, 1978; Swainbank and others, 1984; Noyes and others, 2006; Freeman, 2011). There is a core that consists mainly of biotite-hornblende-feldspar-quartz gneiss and lesser amphibolite, quartzite, marble and calc-silicate hornfels. The core is bounded on the north and south by amphibolite-grade pelitic schist. The contacts between the units are probably low-angle faults; north-trending vertical faults occur widely. Weber and others (1978) assign the pre-metamorphic age of the rocks to the Precambrian or Paleozoic. They were metamorphosed in the Middle to Late Devonian and recrystallized in the Early Cretaceous (Dusel-Bacon and others, 2004; Freeman, 2011). The metamorphic rocks are intruded by 90 Ma, felsic to intermediate dikes and plugs, notable the mineralized quartz-feldspar porphyry dike at the nearby Democrat Mine (BD014).

The Banner prospect was discovered in 1992 in the search for the source of visible gold in stream sediment and panned-concentrate samples (Vartanyan and others, 1992; 1998). Work in 1992 and 1998 consisted of considerable sampling in several long trenches, along road cuts, and in 30 hand-dug pits.

The northern portion of the prospect is mostly biotite-quartz-feldspar paragneiss intruded by a series of north-northwest-trending quartz-feldspar-porphyry dikes similar to the dike at the nearby Democrat Mine (BD014). The southern portion is in paragneiss and orthogneiss cut by two zones of steeply dipping granodiorite dikes that trend southeast. The quartz-feldspar porphyry varies from unaltered to intensely altered to greisen-like rock with pyrite veinlets and clots of pyrite. The alteration is strongest along the dike margins. Early quartz-sericite alteration is cut by brecciation, quartz veins, and quartz-sulfide veins.

The mineralization consists of sulfide-pyrite-quartz- veins, often with open-space textures (Freeman, 2011). The veins have up to 30 percent ore minerals; arsenopyrite and jamesonite are common; andorite, freibergite, sphalerite, and chalcopyrite less so. The 128 rock samples that were analyzed contained up to 1,729 parts per billion gold, up to 171.9 parts per million (ppm) silver, up to 2,454 ppm arsenic, up to 242 ppm copper, up to 3,948 ppm lead, up to 2,000 ppm arsenic, up to 51 ppm tin, and up to 91 ppm tungsten. Bismuth and tellurium were below the detection limit.

Freeman (2011) interprets the prospect as a high-level, volatile-rich silver-tin-polymetallic hydrothermal system with strong affinities to intrusion-related gold deposits.

Alteration:

The quartz-feldspar porphyry that hosts the veins varies from unaltered to intensely altered to greisen-like rock with pyrite veinlets and clots of pyrite. The alteration is strongest along the dike margins. Early quartz-sericite alteration is cut by brecciation, quartz veins, and quartz-sulfide veins.

Age of mineralization:

Probably 90 Ma as is most of the gold mineralization in the Richardson district.

Generic deposit model:

Deposit model:

Gold-silver-tin-polymetallic hydrothermal system with strong affinities to intrusion-related gold deposits.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The Banner prospect was discovered in 1992 in the search for the source of visible gold in stream sediment and panned-concentrate samples (Vartanyan and others, 1992; 1998). Work in 1992 and 1998 consisted of considerable sampling in several long trenches, along road cuts, and in 30 hand-dug pits.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Dusel-Bacon, C., Wooden, J.L, and Layer, P.W., 2004, A Cretaceous Ion-Microprobe U-Pb zircon Age for the West Point Orthogneiss: Evidence for another Gneiss Dome in the Yukon-Tanana Upland in Galloway, J.P., ed., 2004, Studies by the U.S. Geological Survey in Alaska, 2001: U.S. Geological Survey Professional Paper 1678, p. 41 - 60.

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Primary Reference: Freeman, 2011

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Lone Tree

Site type: Prospect

ARDF no.: BD075

Latitude: 64.5161 **Quadrangle:** BD C-5

Longitude: 146.2098

Location description and accuracy:

The prospect is part of the Uncle Sam property. The coordinates are located at the center of the claim. The prospect is about 0.4 mile southwest of the center of section 31, T. 4 S., R. 8 E., of the Fairbanks Meridian, 2.5 miles east-southeast of the junction of Koepke Slough, of the Salcha River, and Twentyfive Mile Creek. It is located 65 km southeast of Fairbanks, Alaska and 60 km west of the Pogo Gold Mine. The location is accurate to within about 500 feet of the center of the prospect.

Commodities:

Main: Au, Pb, Zn

Other: Bi, Sb

Ore minerals: Arsenopyrite, galena, gold, jamesonite, pyrite, sphalerite, stibnite

Gangue minerals: Biotite, calcite, chlorite, kaolinite, halloysite?, sericite (illite)

Geologic description:

Lone Tree is a prospect at the Uncle Sam property, within the Tintina Gold Belt. The area is blanketed by loess and surficial material and there is little outcrop. The rocks in the area consist of Paleozoic and/or Proterozoic migmatitic schist and gneiss intruded by felsic igneous rocks (Wilson and others, 1998). At least two intrusive bodies are known on the property, each of which is associated with mineralization (Eden, 2010).

Lone Tree is characterized as a gold soil anomaly with a pronounced magnetic low. It appears to be structurally controlled in a brittle-ductile shear zone that strikes roughly east-west with moderate to gentle northward dips.

In the Lone Tree area Au correlates strongly with As, Ag, Cd, and Sb and more erratically with Zn, Pb, and Bi (Eden, 2010).

The area surrounding Lone Tree was discovered by Kennecott Exploration Company in 1999 during regional grass-roots reconnaissance of the Big Delta Quadrangle. During 1999 and 2001, Kennecott Exploration Company collected a total of 2648 soil samples, identifying Lone Tree in 2000 through soil geochemistry. At this time, Kennecott also conducted geophysical surveys consisting of an airborne magnetic survey, a gravity survey and two IP/Resistivity surveys. Soil targets were drill tested, totaling seven holes at Lone Tree. Potential ore-grade intercepts from the 2000 and 2001 drilling programs conducted by Kennecott Exploration came from the Lone Tree area with intervals of 15.93 m (USC-001), 19.22 m (USC-011) and 14 m (USC-013) that averaged 1.1 g/t, 2.03 g/t and 1.65 g/t. In 2003 Kennecott optioned the claim block to Geoinformatics Exploration LTD., who then (2005) entered into an agreement in principle with Midas Resources Ltd. with respect to Geoinformatics' Uncle Sam gold project in Alaska (Eden, 2010).

In April 2006, Midas Resources Ltd. completed an RC drilling program. In the beginning of 2007, Midas Resources Ltd. withdrew from the Uncle Sam gold project an returned it to Geoinformatics Alaska Exploration Inc. In 2009, Millrock Resources Inc. executed an option agreement with Geoinformatics Alaska Exploration Inc. and Kiska Metals Corporation pertaining to the Uncle Sam property. In 2010, Millrock released a 43-101 compliant technical report (Eden, 2010).

Alteration:

Nearly all of the mineralization observed to date is associated with shears or fault zones. Alteration in shears consists of intense sericite (illite) alteration of primary feldspars and biotite, apparently overprinting an earlier chlorite + calcite + sericite alteration. Kaolinite and/or halloysite alteration of feldspars is common adjacent to Au zones and appears to be late. District wide, Au mineralization shows a strong relationship with illite alteration of primary feldspars and biotite. In addition, Au correlates strongly with As, Ag, Cd, and Sb and more erratically with Zn, Pb, and Bi (Eden, 2010).

Age of mineralization:

Cretaceous based on the age of the associated plutons (Wilson and others, 1998)?

Generic deposit model:

Deposit model:

Mineralization related to shear veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The area surrounding Lone Tree was discovered by Kennecott Exploration Company in 1999 during regional grass-roots reconnaissance of the Big Delta Quadrangle. During 1999 and 2001, Kennecott Exploration Company collected a total of 2648 soil samples, identifying Lone Tree in by 2000 through soil geochemistry. At this time, Kennecott also conducted geophysical surveys consisting of an airborne magnetic survey, a gravity survey and two IP/Resistivity surveys. Soil targets were drill tested, totaling seven holes at Lone Tree. Potential ore-grade intercepts from the 2000 and 2001 drilling programs conducted by Kennecott Exploration came from the Lone Tree area with intervals of 15.93 m (USC-001), 19.22 m (USC-011) and 14 m (USC-013) that averaged 1.1 g/t, 2.03 g/t and 1.65 g/t. In 2003 Kennecott optioned the claim block to Geoinformatics Exploration LTD., who then (2005) entered into an agreement in principle with Midas Resources Ltd. with respect to Geoinformatics' Uncle Sam gold project in Alaska (Eden, 2010).

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Production notes:

None.

Reserves:

None.

Additional comments:

References:

Eden, Karsten, 2010, Uncle Sam Property, Yukon-Tanana Terrane, East-Central Alaska National Instrument 43-101 Technical Report, prepared for Millrock Resources Inc., Inc.: www.sedar.com (as of March 30,

2014).

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Eden, 2010

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-06-03

Site name(s): Lone Wolf

Site type: Occurrence

ARDF no.: BD076

Latitude: 64.4966 **Quadrangle:** BD B-5

Longitude: 146.2948

Location description and accuracy:

The prospect is part of the Uncle Sam property. The coordinates are located at the center of the claim. The prospect is about 0.2 mile east of the center of section 14, T. 5 S., R. 7 E., of the Fairbanks Meridian, 2.5 miles south of the junction of Koepke Slough, of the Salcha River, and Twentyfive Mile Creek. It is located 65 km southeast of Fairbanks, Alaska and 60 km west of the Pogo Gold Mine. The location is accurate to within about 500 feet of the center of the prospect.

Commodities:

Main: Au, Cu

Other: Bi, Sb, Te, W

Ore minerals: Arsenopyrite, gold, pyrite, pyrrhotite, stibnite

Gangue minerals: Sericite, mica, quartz

Geologic description:

Lone Wolf is a prospect at the Uncle Sam property, within the Tintina Gold Belt. The area is blanketed by loess and surficial material and there is little outcrop. The rocks in the area consist of Paleozoic and/or Proterozoic migmatitic schist and gneiss intruded by felsic igneous rocks (Wilson and others, 1998). At least two intrusive bodies are known on the property, each of which is associated with mineralization. Lone Wolf has weak to moderate gold soil anomalies and strongly anomalous trace element values (bismuth, tellurium, tungsten, arsenic and copper) in addition to a geophysical magnetic high. Geophysical interpretation of magnetic data indicates the presence of at least three granitoid intrusive bodies at depth (Eden, 2010).

Drilling in 2006 by Midas Resources returned gold anomalous results from a zone of quartz stockwork, sericite altered quartz-mica schist accompanied by pyrite-arsenopyrite, stibnite, and pyrrhotite sulfide development. The mineralized alteration zone is coincident with a shallow (40 degree) southwest dipping structure. This structure and its associated alteration zone and shearing form a cohesive zone which has been drill intersected over a strike extent of 110 m and to a vertical depth of 100 m. Altered but only weakly gold anomalous granite dikes/sills were intersected by the drilling in 2006 and lend support to the geophysical interpretation of larger granite stocks at depth. The mineralized shear zone intersected by the 2006 drill program at Lone Wolf is coincident with one of several interpreted northwest trending structural lineaments as interpreted from magnetic imagery. The most significant mineralization was intersected in USRC-022 from 24.38 –30.48 m (6.1 m at 10.61 g/t Au) and in USR-055 from 51.8 - 64 m (12.2 m at 1.47 g/t Au) (Eden, 2010).

Alteration:

Quartz stockwork, sericite altered quartz-mica schist accompanied by pyrite arsenopyrite + stibnite, and pyrrhotite sulfide development (Eden, 2010).

Age of mineralization:

Cretaceous based on the age of the associated plutons (Wilson and others, 1998)?

Generic deposit model:

Deposit model:

Intrusion-related gold?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The mineralization surrounding Lone Wolf was discovered by Kennecott Exploration Company in 1999 during regional grass-roots reconnaissance of the Big Delta Quadrangle. During 1999 and 2001, Kennecott Exploration Company collected a total of 2648 soil samples, identifying Lone Wolf in by 2000 through soil geochemistry in a tight grid sampling of 100 by 100 m. At this time, Kennecott also conducted geophysical surveys consisting of an airborne magnetic survey, a gravity survey and two induced polarization (IP)/Resistivity surveys, and soil targets were drill tested. In 2003 Kennecott optioned the claim block to Geoinformatics Exploration LTD., who then (2005) entered into an agreement in principle with Midas Resources Ltd. with respect to Geoinformatics' Uncle Sam gold project in Alaska (Eden, 2010).

In April 2006, Midas Resources Ltd. completed a rotary chip (RC) drilling program, designed to test the Lone Wolf target area where previous drilling had intersected significant gold mineralization (Midas Resources, 2006). Results of this drilling program included 12.2 m grading at 1.47 g/t gold in drill hole USR-055 and 6.1 m grading at 1.15 g/t gold in drill hole USR-056 (Eden, 2010).

In the beginning of 2007, Midas Resources Ltd. withdrew from the Uncle Sam gold project and returned it to Geoinformatics Alaska Exploration Inc. In 2009, Millrock Resources Inc. executed an option agreement with Geoinformatics Alaska Exploration Inc. and Kiska Metals Corporation pertaining to the Uncle Sam property. In 2010, Millrock released a 43-101 compliant technical report (Eden, 2010).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Eden, Karsten, 2010, Uncle Sam Property, Yukon-Tanana Terrane, East-Central Alaska National Instrument 43-101 Technical Report, prepared for Millrock Resources Inc., Inc.: www.sedar.com (as of March 30, 2014).

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Eden, 2010

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-06-03

Site name(s): Christmas Tree

Site type: Prospect

ARDF no.: BD077

Latitude: 64.4906 **Quadrangle:** BD C-5

Longitude: 146.2404

Location description and accuracy:

The prospect is part of the Uncle Sam property. The coordinates are located at the center of the claim. The prospect is about 0.2 mile south of the center of section 7, T. 5 S., R. 8 E., of the Fairbanks Meridian, 3.2 miles south-southeast of the junction of Koepke Slough, of the Salcha River, and Twentyfive Mile Creek. It is located 65 km southeast of Fairbanks, Alaska and 60 km west of the Pogo Gold Mine. The location is accurate to within about 500 feet of the center of the prospect.

Commodities:

Main: Au

Other: Bi, Sb

Ore minerals:

Gangue minerals: Carbonates, goethite, quartz, sericite, tourmaline

Geologic description:

Christmas Tree is a prospect at the Uncle Sam property, within the Tintina Gold Belt. The area is blanketed by loess and surficial material and there is little outcrop. The rocks in the area consist of Paleozoic and/or Proterozoic migmatitic schist and gneiss intruded by felsic igneous rocks (Wilson and others, 1998). Christmas Tree is characterized as a gold soil anomaly over with a magnetic high thought to be associated with a mafic schist package that has been domed in the middle of the Christmas Tree area. The Christmas Tree soil anomaly is over four kilometers long and parallels northwest trending structure interpreted from airborne magnetics (Eden, 2010).

This prospect displays narrow Au mineralization related to brittle-ductile shear zones hosted within schist and schistose gneiss that are thought to be shallow to moderately dipping. Sheared veins of quartz-tourmaline ± carbonate are common and have associated goethite after sulfides. Wallrock alteration consists chiefly of intense sericitization of primary feldspars and micas along with minor silicification. The highest-grade intercept came from drilling in 2006 by Midas Resources as USC-006 (161.3-163 m), where a 1.3 m thick quartz-tourmaline veined brittle-ductile shear zone assayed 6.7 g/t Au. The most significant mineralization was intersected in USRC-0007 from 24.5-30 m (5.5 m at 4.94 g/t Au) and in URC-021 from 18.9 – 29.8 m (11.9 m at 1.61 g/t Au) (Eden, 2010).

Alteration:

Sheared veins of quartz-tourmaline ± carbonate are common and have associated goethite after sulfides. Wallrock alteration consists chiefly of intense sericitization of primary feldspars and micas along with minor silicification (Eden, 2010).

Age of mineralization:

Cretaceous based on the age of the associated plutons? (Wilson and others, 1998).

Generic deposit model:

Deposit model:

Intrusion-related gold?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The mineralization surrounding Christmas Tree was discovered by Kennecott Exploration Company in 1999 during regional grass-roots reconnaissance of the Big Delta Quadrangle. During 1999 and 2001, Kennecott Exploration Company collected a total of 2648 soil samples, identifying Christmas Tree in by 2000 through soil geochemistry in a tight grid sampling of 100 by 100 m. At this time, Kennecott also conducted geophysical surveys consisting of an airborne magnetic survey, a gravity survey and two induced polarization (IP)/Resistivity surveys, and soil targets were drill tested, five of which were at Christmas Tree. In 2003 Kennecott optioned the claim block to Geoinformatics Exploration LTD., who then (2005) entered into an agreement in principle with Midas Resources Ltd. with respect to Geoinformatics' Uncle Sam gold project in Alaska. Midas did some drilling in 2006. In 2010, Millrock Resources Inc. released a 43-101 compliant technical report (Eden, 2010).

Production notes:

None.

Reserves:

None.

Additional comments:

In the beginning of 2007, Midas Resources Ltd. withdrew from the Uncle Sam gold project and returned it to Geoinformatics Alaska Exploration Inc. In 2009, Millrock Resources Inc. executed an option agreement with Geoinformatics Alaska Exploration Inc. and Kiska Metals Corporation pertaining to the Uncle Sam property. In 2010, Millrock released a 43-101 compliant technical report (Eden, 2010.

References:

Eden, Karsten, 2010, Uncle Sam Property, Yukon-Tanana Terrane, East-Central Alaska National Instrument 43-101 Technical Report, prepared for Millrock Resources Inc., Inc.: www.sedar.com (as of March 30, 2014).

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Eden, 2010

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-06-03

Site name(s): Sugar Daddy

Site type: Mine

ARDF no.: BD078

Latitude: 64.9606 **Quadrangle:** BD D-4

Longitude: 145.8647

Location description and accuracy:

The Sugar Daddy gold deposit is located about 9 miles southeast of Chena Hot Springs resort; about 0.2 mile from the center of section 35, T. 1 N., R. 10 E., of the Fairbanks Meridian (Bohan, 2013). Accurate within about 1/4 mile.

Commodities:

Main: Au

Other:

Ore minerals: Gold, magnetite

Gangue minerals: Limonite, quartz

Geologic description:

The Sugar Daddy gold deposit is a placer deposit on Ottertail Creek containing gold bearing gravels, benches, plus immense rust oxidized zones of crumbly weathered bedrock. The placer gravels also overlie a shallow gold lode deposit (Bohan, 2013).

The placer gold is associated with sulfides composed of partially oxidized to limonite and magnetite. The lode gold is hosted in a garnet-bearing phyllite to phyllitic schist. The gold-bearing sulfides are layered in mineralized zones along quartz reef-like fissure veins and surrounding in foliated boudinaged veins. Refractory gold also exists within the fissure lode quartz. The placer is a combination of gravel concentrates plus the weathered lode rock that lies beneath the pay leads (Bohan, 2013).

The placer contains both coarse and fine gold. The larger, coarse nuggets come from stacked fissure veins within a zone of boudinaged quartz in a garnet schist. The finer equigranular gold nuggets come from a skarn deposit and a monzonite pluton located on the north claim blocks (Bohan, 2013).

Pegmatite with the gemstone schorl (black tourmaline) is also found in float cobbles. This sodium, iron rich tourmaline is notable in that its presence suggests that boron is introduced into the hornfels facies contact system (Bohan, 2013).

Alteration:

Iron oxidation (Bohan, 2013).

Age of mineralization:

Placer gold mineralization is Quaternary in age (Weber and others, 1978).

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au-PGE (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Sugar Daddy gold load/placer is at the greenfields stage of exploration and has had very little exploration completed. The 2010-2013 field season yielded gold reserves from 65 cubic yards of gravel washed per ounce of gold to 45 cubic yards of gravel moved (Bohan, 2013).

Production notes:

A six-inch suction dredge was used for sampling on the Sugar Daddy prospect on Ottertail Creek in 2002. Later in 2004, an industrial dredge replaced the six-inch and can run 2-4 yards per hour (Bohan, 2013).

Reserves:

None.

Additional comments:

Gold recovery will be estimated 45 cubic yards gravel washed per ounce of gold recovered on high grade pay leads. The lower grade end of gold leads should average 65 cubic yards of gravel washed per ounce of gold recovered (Bohan, 2013).

References:

Bohan, W.R., 2013, Geologic Reconnaissance of the Sugar Daddy Gold Deposit at Ottertail Creek and Vicinity, Big Delta D-4 Quadrangle Alaska, unpublished report (copy held at Alaska Earth Sciences, Inc., Anchorage, AK).

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Weber, F.R., Foster, H.L., Keith, T.E.C., Dusel-Bacon, Cynthia, 1978, Preliminary geologic map of the Big Delta quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-529-A, 1 sheet, scale 1:250,000.

Primary Reference: Bohan, 2013

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-09

Site name(s): Tuluksak River

Site type: Mine

ARDF no.: BH014

Latitude: 60.9877 **Quadrangle:** BH D-3

Longitude: 159.9873

Location description and accuracy:

The Tuluksak River has been almost continuously mined by dredge and mechanized equipment for more than 8 miles downstream from the mouth of California Creek to about a mile upstream from the mouth of Granite Creek. The Tuluksak placer extend from the Russian Mission quadrangle into the Bethel quadrangle and the coordinates above represent the center of the placer in the Bethel quadrangle. The Tuluksak River site in the Russian Mission quadrangle is ARDF site RM028. The information is duplicated in the separate records in the two quadrangles. The location accuracy is unknown.

Commodities:

Main: Au

Other: Pt

Ore minerals: Gold

Gangue minerals:

Geologic description:

Gold was first discovered in the Nyac district on Bear Creek (RM032), a tributary of the Tuluksak River, near the mouth of Bonanza Creek in 1907 or 1908 and soon after gold was discovered on the Tuluksak River. Dredging began on the Tuluksak River in 1936 and for many years the mining in the district, which was mainly on the Tuluksak River, was carried out by the New York-Alaska Company and its successor the New York-Alaska Gold Dredging Company. The company built a company town, Nyac and an extensive physical plant and community facilities including a hydroelectric power station to power the dredges, the town, and other mining in the district. In 1965, the property was taken over by the Tuluksak Dredging Company and since 1990, the Nyac Mining Company has been actively mining in the area under an agreement with the Calista Native Corporation, which now owns most of the placer claims in the district.

Parts from a small wood-hulled dredge that had operated on Bear Creek between 1928 and 1935 were used to build a steel-hulled dredge on the Tuluksak River in 1936. In 1937, another steel-hulled dredge was built and began mining (Mining World, 1941). Dredging continued in the 1960s by the New York-Alaska Dredging Company. There has also been extensive mechanized mining using draglines, tractors, and non-floating washing plants over the years along the Tuluksak. As of 2006, the Tuluksak River is marked by dredge tailings a thousand feet or more wide that extend almost continuously from the mouth of California Creek to about five miles below Nyac. In recent years, there apparently has been little mining along the Tuluksak River itself. However in the early 1980s, Tuluksak Dredging and Northland Dredging rebuilt the steel-hulled dredge about 5 miles downstream from Nyac; they operated it for a year or more until they shut down as a result of a water-quality dispute. There apparently is no public record of it but the conventional wisdom in 2006 among those familiar with the district was that Northland Dredging had drilled out reserves that contained (still contain?) about 37,000 ounces of gold in the vicinity of their dredge above the mouth of Granite Creek (D.J. Grybeck, conversations with miners and knowledgeable individuals during field work, 2006).

There is no public record of the production specifically from the Tuluksak River. But the district produced a minimum of 600,000 ounces of gold (Calista Corp., 2008), all from placers, and a large part of that,

perhaps more than half, came from the Tuluksak River judging on the extent of the tailings.
Joesting (1942) reported that some platinum was produced with the gold and that asbestos and graphite were dredged from bedrock. There is no evidence that any significant amount of platinum was produced. Inquiries in 2006 about platinum (D.J. Grybeck, conversations with local miners) at best indicated a vague knowledge that someone may have found some platinum in the gold placers but it has not been a component of placer concentrates in recent years.
Most of the rocks in the drainage basin of the Tuluksak River are hornfelsed or metamorphosed Jurassic volcanic and sedimentary rocks cut by mid-Cretaceous granitic plutons and Jurassic gabbro (Box and others, 1993; Wenz, 2005).
Historic field work at Tuluksak River include rock and soil sampling (Calista Corp., 2000).
In 2012, the property was operated by Nyac Gold LLC. Work performed at Tuluksak River includes magnetic susceptibility readings on outcrops (Flanders and others, 2012).

Alteration:

Age of mineralization:
Quaternary (Wenz, 2005).

Generic deposit model:
Placer deposits (Garnett and Bassett, 2005)

Deposit model:
Placer Au-PGE (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: Yes; medium

Site Status: Undetermined

Workings/exploration:
Gold was first discovered in the Nyac district on Bear Creek (RM032), a tributary of the Tuluksak River, near the mouth of Bonanza Creek in 1907 or 1908 and soon after gold was discovered on the Tuluksak River. Dredging began on the Tuluksak River in 1936 and for many years the mining in the district, which was mainly on the Tuluksak River, was carried out by the New York-Alaska Company and its successor the New York-Alaska Gold Dredging Company. The company built a company town, Nyac and an extensive physical plant and community facilities including a hydroelectric power station to power the dredges, the town, and other mining in the district. In 1965, the property was taken over by the Tuluksak Dredging Company and since 1990, the Nyac Mining Company has been actively mining in the area under an agreement with the Calista Native Corporation, which now owns most of the placer claims in the district.
Parts from a small wood-hulled dredge that had operated on Bear Creek between 1928 and 1935 were used to build a steel-hulled dredge on the Tuluksak River in 1936. In 1937, another steel-hulled dredge was built and began mining (Mining World, 1941). Dredging continued in the 1960s by the New York-Alaska Dredging Company. There has also been extensive mechanized mining using draglines, tractors, and non-floating washing plants over the years along the Tuluksak. As of 2006, the Tuluksak River is marked by dredge tailings a thousand feet or more wide that extend almost continuously from the mouth of California Creek to about five miles below Nyac. In recent years, there apparently has been little mining along the Tuluksak River itself. However in the early 1980s, Tuluksak Dredging and Northland Dredging rebuilt the steel-hulled dredge about 5 miles downstream from Nyac; they operated it for a year or more until they shut down as a result of a water-quality dispute.
Historic field work at Tuluksak River include rock and soil sampling (Calista Corp., 2000).
In 2012, the property was operated by Nyac Gold LLC. Work performed at Tuluksak River includes magnetic susceptibility readings on outcrops (Flanders and others, 2012).

Production notes:

There is no public record of the production specifically from the Tuluksak River. But the district produced a minimum of 600,000 ounces of gold (Calista Corp, 2008), all from placers, and a large part of that, perhaps more than half, came from the Tuluksak River judging fromthe extent of the tailings.

Joesting (1942) reported that some platinum was produced with the gold and that asbestos and graphite were dredged from bedrock. There is no evidence that a any significant amount of platinum was produced. Inquiries in 2006 about platinum (D.J. Grybeck, conversations with local miners) at best indicated a vague knowledge that someone may have found some platinum in the gold placers but it has not been a component of placer concentrates in recent years.

Reserves:

There apparently is no public record of it but the conventional wisdom in 2006 among those familiar with the district was that Northland Dredging had drilled out reserves that contained (still contain?) about 37,000 ounces of gold in the vicinity of their dredge above the mouth of Granite Creek (D.J. Grybeck, conversations with miners and knowledgeable individuals during field work, 2006).

Additional comments:

References:

Box, S.E, Moll-Stalcup, E.J., Frost, T.P., and Murphy, J.M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., scale 1:250,000.

Calista Corporation, 2000, The Nyac Mining District, Southwestern Alaska: http://www.calistacorp.com/sites/default/files/documents/lands/reports/Nyac_Prospectus.pdf (as of July 7, 2014).

Calista Corporation, 2008: http://www.calistacorp.com/landresources/projects/nyacdistrict.asp (as of March 4, 2008).

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Flanders, R., Van der Poel, W.I., Deininger Jr., J., 2012 Drilling and Exploration for Lode Gold Deposits in the Nyac District, Southwest Alaska: Nyac Gold LLC Internal report, 20 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Joesting, H.R., 1942, Strategic mineral occurrences in interior Alaska: Alaska Territorial Department of Mines Pamphlet 1, 46 p.

Mining World, 1941, Nyac, Sub-arctic gold dredging makes unusual demands upon men and equipment: Mining World, v. 3, no. 6, p. 3-8.

Wenz, Z.J. 2005, An investigation of the geology and gold mineralization in the Nyac district, Southwest

Primary Reference: Wenz, 2005

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Port Ludlow, WA); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-10

Site name(s): Tuluksak River (below Granite Creek)

Site type: Prospect

ARDF no.: BH016

Latitude: 60.969 **Quadrangle:** BH D-4

Longitude: 160.1994

Location description and accuracy:

Maddren (1915) located this placer prospect near the Tuluksak River about 5 miles downstream from the mouth of Granite Creek (BH015). The coordinates given here are at about this location, about 0.6 mile southwest of the center of section 12, T. 10 N., R. 62 W. However, there is no other reference to this prospect and its exact location is uncertain. This is locality 9 of Cobb (1972 [MF 455]) and of Hoare and Cobb (1977).

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Maddren (1915) reported that fine gold was found in a 50-foot prospect shaft through frozen ground near the Tuluksak River about 5 miles below the mouth of Granite Creek (BH015). The prospect is on the lower part of the river, where the gradient decreases as it enters onto the lowlands of the lower Kuskokwim River. The low elevation and proximity to the Kuskokwim River lowlands suggest that Quaternary sea level fluctuations could have influenced placer development on the lower Tuluksak River. There apparently has been no other work on the Tuluksak River below the mouth of Granite Creek.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Inactive

Workings/exploration:

A 50-foot prospecting shaft was dug before 1915 through frozen ground.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1972, Metallic mineral resources map of the Bethel quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-455, 1 sheet, scale 1:250,000.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Hoare, J.M., and Cobb, E.H., 1977, Mineral occurrences (other than mineral fuels and construction materials) in the Bethel, Goodnews, and Russian Mission quadrangles, Alaska: U.S. Geological Survey Open-File Report 77-156, 98 p.

Maddren, A.G., 1915, Gold placers of the lower Kuskokwim, with a note on copper in the Russian Mountains: U.S. Geological Survey Bulletin 622-H, p. 292-360.

Primary Reference: Maddren, 1915

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Kapon Creek

Site type: Mine

ARDF no.: BH020

Latitude: 60.11 **Quadrangle:** BH

Longitude: 160.16

Location description and accuracy:

Kapon Creek is an east tributary to the Eek River. The mouth of Kapon Creek is 9.5 miles downstream of the mouth of Rainy Creek (BH002) on the Eek River. This placer mine was referred to under the name 'Kapon Ck.' by Hoare and Cobb (1977). The map site is in the SE1/4 of section 6, T. 1 S., R. 63 W., of the Seward Meridian. It is approximately located, perhaps within miles, as the headwaters of this creek are about 4 miles further upstream from the map site.

Commodities:

Main: Au, Hg

Other:

Ore minerals: Arsenopyrite, cinnabar, gold, magnetite

Gangue minerals:

Geologic description:

Placer gold mining along Kapon Creek is reported to have taken place in 1914 and 1915 (Hoare and Cobb, 1977, p. 18). The lower part of the creek is in a glaciated area of outwash deposits. The upper reaches do not appear to have been occupied by glaciers but some outwash deposits may be present. The extreme headwaters of Kapon Creek are across a narrow saddle from the headwaters of Rainy Creek (BH002), where lode cinnabar mineralization has been identified (BH001). Coarse gravels in Kapon Creek were ground-sluiced in 1914 and found to be of low grade (Maddren, 1915, p. 357). The gold was dark and flaky and accompanied by magnetite, arsenopyrite, and small cinnabar pebbles. Bedrock in the Kapon Creek drainage is clastic sedimentary rocks of the mid-Cretaceous Kuskokwim Group locally cut by felsic and mafic dikes (Hoare and Cobb, 1977; Box and others, 1993).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au-PGE (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

Kapon Creek has been prospected and some small surface workings are probably present locally along the creek.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Box, S.E, Moll-Stalcup, E.J., Frost, T.P., and Murphy, J.M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., scale 1:250,000.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Hoare, J.M., and Cobb, E.H., 1977, Mineral occurrences (other than mineral fuels and construction materials) in the Bethel, Goodnews, and Russian Mission quadrangles, Alaska: U.S. Geological Survey Open-File Report 77-156, 98 p.

Maddren, A.G., 1915, Gold placers of the lower Kuskokwim, with a note on copper in the Russian Mountains: U.S. Geological Survey Bulletin 622-H, p. 292-360.

Primary Reference: Hoare and Cobb, 1977

Reporter(s): Travis L. Hudson

Last report date: 2001-03-24

Site name(s): Golden Alder

Site type: Prospect

ARDF no.: BH023

Latitude: 60.2651 **Quadrangle:** BH B-2

Longitude: 159.4082

Location description and accuracy:

The Golden Alder prospect is about 1.1 mile north of (unnamed) lake 1541 which is about 3 miles northeast of Gold Lake. The prospect is about 0.5 mile east-northeast of the center of section 18, T. 2 N., R. 58 W., of the Seward Meridian.

Commodities:

Main: Ag, Au

Other: Pb, Sb, W

Ore minerals: Galena

Gangue minerals: Calcite, chlorite, quartz

Geologic description:

As originally described by the U.S. Geological Survey, the mineralization at the Golden Alder prospect consists of oxidized, pyrite-bearing rhyolite dikes and sulfide-bearing quartz veins that cut Jurassic volcaniclastic rocks (Box and others, 1993). Anomalous values of silver, arsenic, gold, copper, mercury, molybdenum, lead, antimony, and tungsten were found in samples of quartz veins, altered dikes, and hydrothermal breccia (Frost, 1990; Frost and others, 1993). The maximum gold value was 2 parts per million (ppm) and the maximum silver value was 7 ppm. The dikes are variably replaced by sericite, illite, and quartz. Galena is the only sulfide mineral Fort and others (1993) identified in the quartz veins.

The prospect was re-examined, mapped, and resampled by Gold Crest Mines Inc. in 2007 (Gold Crest, 2011 [summary]). They identified an area about 200 meters wide by 600 meters long showing diffuse carbonate-sulfide alteration (Gold Crest Mines Inc., 2011 [geology]. They collected 30 rock chip samples (Gold Crest Mines Inc., 2011 [rocks and soils]) that averaged 1.6 grams of gold per tonne; the highest contained 8.2 grams of gold per tonne.

Alteration:

Silicification, argillization, and oxidation.

Age of mineralization:

Jurassic or younger based on the age of the host rock. May be related to a buried pluton, many of which in the region are Late Cretaceous or Early Tertiary (?) (Box and others, 1993).

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Inactive

Workings/exploration:

Reconnaissance surface sampling by the U.S. Geological Survey (Box and others 1993). Re-examined, mapped, and resampled by Gold Crest Mines Inc. in 2007 (Gold Crest, 2011 [summary]).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Box, S.E, Moll-Stalcup, E.J., Frost, T.P., and Murphy, J.M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., scale 1:250,000.

Frost, T.P., 1990, Geology and geochemistry of mineralization in the Bethel quadrangle, southwestern Alaska, in Goldfarb, R.J., Nash, J.T., and Stoeser, J.W., eds., Geochemical studies in Alaska by the U.S. Geological Survey, 1989: U.S. Geological Survey Bulletin 1950, p. C1-C9.

Frost, T.P., Box, S.E., and Moll-Stalcup, E.J. 1993, Mineral resource assessment of the Bethel and southeastern part of the Russian Mission quadrangles, Alaska: U.S. Geological Survey Bulletin 2041, p. 30-48.

Frost, T.P., Bradley, L., O'Leary, R.M., and Motooka, J., 1992, Analytical results, sample locality map, and description of rock samples from the Bethel and southern part of the Russian Mission 1-degree x 3-degree quadrangles, Alaska: U.S. Geological Survey Open-File Report 92-315, 229 p., 1 sheet, 1:250,000.

Gold Crest Mines Inc., 2011, Golden Alder target [summary]: http://www.goldcrestminesinc.com/projects/alaska/gl-golden-alder.asp (as of Feb. 11, 2011].

Gold Crest Mines Inc., 2011, Golden Alder anomaly, generalized geology: http://www.goldcrestminesinc.com/downloads/alaska/southern/GoldenAlder_GeoMap.pdf (as of Feb 11, 2011).

Gold Crest Mines Inc., 2011, Golden Alder anomaly, gold in rocks and soils:

Primary Reference: Frost 1990; Gold Crest Mines Inc. 2011 [summary]

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Kisa Breccia; Golden Dyke

Site type: Prospects

ARDF no.: BH028

Latitude: 60.3546 **Quadrangle:** BH B-1

Longitude: 159.3011

Location description and accuracy:

The Kisa Breccia prospect is about 0.3 mile north-northwest of peak 3690 and about 2.3 miles north of the narrow channel between the two basins of Kisaralik Lake. It is about 0.3 mile north of the center of section 14, T. 3 N., R. 58 W., of the Seward Meridian. This location is probably accurate. The exact location of the Golden Dyke prospect is uncertain but it is nearby.

Commodities:

Main: As, Au

Other: Ag, Bi, Cu, Mo, Te, W

Ore minerals: Pyrite

Gangue minerals: Carbonate, quartz

Geologic description:

Gold Crest Mines Inc. (2011 [Kiska summary]) has explored a poorly exposed, extensively carbonate-sulfide altered breccia body along a ridge crest and on steep, north-facing slopes by surface mapping and sampling, geophysical surveys, and drilling. The breccia is composed of altered sedimentary and igneous clasts, many of which show multiple generations of veining and brecciation. The breccia is exposed over an area about 500 meters by 300 meters, a vertical distance of about 250 meters. Rock chips collected systematically of the breccia averaged more than 1.25 grams of gold per tonne; some samples contained up to 7 grams of gold per ton (Gold Crest Mines Inc., 2011 [Kiska rock chip]). Several types of igneous rocks form clasts in the breccia and the breccia may represent the top of a mineralized stock. Gold Crest drilled 5 holes in the breccia totaling more than 940 meters (Gold Crest Mines Inc., 2011 [Kiska drill holes]). Some notable intercepts were: 206 meters with an average grade of 0.3 gram of gold per tonne; 115 meters with an average grade of 0.7 gram of gold per tonne; 44 meters with an average grade of 1.13 gram of gold per tonne, and several intercepts of more than 2 meters that averaged up to 0.25 ounce of gold per ton. The sulfides are not specified.

The U.S. Geological Survey visited the site earlier and collected several samples of pyrite-bearing rhyolite dikes and sulfide-bearing quartz veins (Frost, 1990; Box and others, 1993). Rock samples from a large, red-weathering area, which possibly is the Kisa prospect, contained up to 0.41 parts per million (ppm) gold, 1.5 ppm silver, 7,000 ppm arsenic and 100 ppm antimony.

The rocks in the area are Jurassic marine, volcaniclastic sandstone, conglomerate, and argillite; no nearby plutonic rocks are mapped by Box and others (1993).

The exact location of the Golden Dyke prospect is unknown but it is nearby (Gold Crest Mines Inc., 2011 [Golden Dyke summary]). As described by Gold Crest Mines Inc. (2011), the mineralization at this prospect consists of numerous, altered, silica-carbonate-sulfide rhyolite dikes and sills. More than 20 dikes and sills are known that vary from about 3 feet thick to over 30 feet thick; many pinch and swell and locally form small stock-like bodies. Rock chips were collected systematically from the dikes and altered sandstone, allowing for the steep and rugged terrain. The samples contained up to 0.18 ounce of gold per ton, major arsenic, up to 328 ppm antimony, 57 ppm bismuth, 45 ppm molybdenum, 6 ppm silver, 1 percent copper, 30 ppm tellurium, and 48 ppm tungsten (Gold Crest Mines Inc., 2011 [Golden Dyke rock chip]).

Alteration:

Extensive carbonate-sulfide alteration in mineralized breccia; rhyolite dikes nearby have silica-carbonate-sulfide alteration.

Age of mineralization:

Jurassic or younger based on the age of the host rock. May be related to a buried pluton, many of which in the region are Late Cretaceous or Early Tertiary (?) (Box and others, 1993).

Generic deposit model:

Deposit model:

Mineralized breccia and rhyolite dikes with gold values.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Considerable surface mapping and sampling; aerial geophysical surveys; and 5 holes drilled at the Kisa prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Box, S.E, Moll-Stalcup, E.J., Frost, T.P., and Murphy, J.M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., scale 1:250,000.

Frost, T.P., 1990, Geology and geochemistry of mineralization in the Bethel quadrangle, southwestern Alaska, in Goldfarb, R.J., Nash, J.T., and Stoeser, J.W., eds., Geochemical studies in Alaska by the U.S. Geological Survey, 1989: U.S. Geological Survey Bulletin 1950, p. C1-C9.

Frost, T.P., Bradley, L., O'Leary, R.M., and Motooka, J., 1992, Analytical results, sample locality map, and description of rock samples from the Bethel and southern part of the Russian Mission 1-degree x 3-degree quadrangles, Alaska: U.S. Geological Survey Open-File Report 92-315, 229 p., 1 sheet, 1:250,000.

Gold Crest Mines Inc., 2011, Kisa Breccia target [summary]: http://www.Gold Crestminesinc.com/projects/alaska/kisa-breccia.asp (as of Feb 11, 2011)
Gold Crest Mines Inc., 2011, Kisa Breccia target 2007 drill hole locations: http://www.Gold Crestminesinc.com/downloads/alaska/southern/Kisa_Drill_Plan.pdf (as of Feb 11, 20111)

Gold Crest Mines, Inc., 2011, Kisa Breccia Target, E-W cross section: http://www.Gold Crestminesinc.com/downloads/alaska/southern/Kisa_Cross_Sections.pdf (as of February 11, 2011)
Gold Crest Mines Inc., 2011, Kisa Breccia target, rock chip geochemistry: http://www.Gold Crestminesinc.

com/downloads/alaska/southern/Kisa_Rock_Chip.pdf (as of Feb. 11, 2011)

Gold Crest Mines Inc., 2011, Golden Dyke target [summary}: http://www.Gold Crestminesinc.com/projects/alaska/kisa-golden-dyke.asp (as of February 11, 2011).

Gold Crest Mines Inc., 2011, Golden Dyke prospect, rock chip sampling: http://www.Gold Crestminesinc.com/downloads/alaska/southern/GoldenDyke_RockChip.pdf (as of Feb. 11, 2011).

Gold Crest Mines Inc., 2011, Golden Dyke prospect, cross sections: http://www.Gold Crestminesinc.com/downloads/alaska/southern/GoldenDyke_CrossSections.pdf (as of Feb. 11, 2011).

Primary Reference: Gold Crest Mines Inc. 2011 [Kisa summary]; Gold Crest Mines Inc., 2011 [Golden Dyke summary]

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Luna

Site type: Prospect

ARDF no.: BH030

Latitude: 60.4379 **Quadrangle:** BH B-2

Longitude: 159.4851

Location description and accuracy:

The Luna prospect is located along the North Fork of the Kisaralik River approximately 2 miles downstream of North Fork Lakes in the central-west area of section 14, T. 4 N., R. 59 W. of the Seward Meridian. The location is centered on an outcrop that returned a rock chip sample containing 64.7 grams per tonne gold (Southern Crown Resources Limited, 2014a). The previous recorded location incorrectly put the Luna prospect 3.6 miles northwest of the outlet of the Kisaralik River on Kisaralik Lake.

Commodities:

Main: Ag, Au, Cu

Other: As, Bi, Mo, Sb, Sn, Te

Ore minerals: Arsenopyrite, chalcopyrite, pyrite, sphalerite, stibnite

Gangue minerals: Carbonate, quartz

Geologic description:

Mineralization at the Luna prospect is in Cretaceous calcareous siltstone, shale, sandstone, argillite, conglomerate, tuff and tuffaceous chert that are intruded by Late Cretaceous to Early Tertiary quartz monzodiorite, granodiorite, and biotite granite stocks and aplite dikes (Box and others, 1993).

The Luna prospect is located along a northeast structural corridor with apparent strike slip movement and evidence of additional cross-cutting complexity. A shear zone over 700 meters wide has been mapped along the river beds underneath alluvial cover (Southern Crown Resources Limited, 2014a). Results from a ground geophysical survey completed in 2014 show a very clear northeast trending structure, the Luna Fault, with the Luna prospect located on a structural splay (Southern Crown Resources Limited, 2014b). Channel and auger drill samples show anomalous metal values following the northeast trend next to the Luna Fault with bismuth being the best pathfinder element (Southern Crown Resources Limited, 2014c).

Quartz-carbonate stockwork veins contain anomalous gold, silver, antimony, bismuth, arsenic, molybdenum, tellurium, and tin. The northeast end of the mineralized trend (Luna East) contains highly anomalous copper (Southern Crown Resources Limited, 2014a). Several zones of stratiform, replacement mineralization were found that contain up to 70 percent sulfides, primarily pyrite, arsenopyrite and stibnite, with lesser chalcopyrite and sphalerite. More than half of the 72 rock samples that were collected before 2014 contained anomalous gold. Several of the airborne geophysical anomalies correspond to the location of the semi-massive sulfides on the ground. The mineralization is accompanied widespread fracturing and clay alteration (Gold Crest Mines Inc., 2011).

Alteration:

Mineralization is accompanied by widespread clay alteration (Gold Crest Mines Inc., 2011).

Age of mineralization:

Late Cretaceous or younger based on the age of the host rocks and intrusions (Box and others, 1993).

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

The Luna prospect was discovered in 2006 by Gold Crest Mines Inc. while field checking an airborne geophysical survey. Further field work that year included ground induced polarization and magnetic surveys and rock and stream-sediment sampling. The stream sediment sampling outlined an area of 10 square miles with anomalous values in gold, arsenic, and antimony. Rock samples contained up to 0.75 ounce per ton gold, 8,400 parts per million (ppm) arsenic, 158 ppm antimony, 36 ppm bismuth, 64 ppm molybdenum, 23 ppm silver, 0.44 percent copper, 12 percent lead, and 0.6 percent zinc. In 2007, 50 State of Alaska mining claims were staked that covered an area of about 8,000 acres.

In 2014 Southern Crown Resources Limited began exploration at Luna through an option with Afranex Gold Limited (Southern Crown Resources Limited, 2014a). Results from a ground geophysical survey completed in 2014 show a very clear northeast trending structure, the Luna Fault, with the Luna prospect located on a structural splay (Southern Crown Resources Limited, 2014b). Channel and auger drill samples show anomalous metal values following the 1.3 kilometer northeast trend next to the Luna Fault. Channel samples returned up to 1480 part per billion (ppb) gold with anomalous silver, antimony, bismuth and arsenic while auger drilling returned rock samples with up to 140 ppb gold and 1200 ppb silver. Vegetation samples were also collected over 3 kilometers of the Luna trend with 350 samples taken to look at biogeochemistry which generally correlated well with the rock sample geochemistry (Southern Crown Resources Limited, 2014c).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Box, S.E, Moll-Stalcup, E.J., Frost, T.P., and Murphy, J.M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., 1 sheet, scale 1:250,000.

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Gold Crest Mines Inc., 2011, Luna prospect: http://www.Gold Crestminesinc.com/projects/alaska/luna.asp (as of Feb 11, 2011; link no longer valid as of July 13, 2015).

Southern Crown Resources Limited, 2014a, Southern Crown takes option over extensive gold/copper/silver projects in world class gold belt: http://southerncrown.com.au/joomla/images/announcements/2014%2008%2020.pdf (News release dated August 20, 2014; link accurate as of July 15, 2015).

Souther Crown Resources Limited, 2014b, Ground magnetic survey confirms major structural corridor: http://southerncrown.com.au/joomla/images/announcements/2014%2009%2014.pdf (News release dated September 15, 2015; link accurate as of July 15, 2015).

Southern Crown Resources Limited, 2014c, Geochemical results highlight Luna-Luna East trend as 'drill-ready' target: http://southerncrown.com.au/joomla/images/announcements/2014%2011%2027.pdf (News release dated November 27, 2014; link accurate as of July 15, 2015).

Primary Reference: Southern Crown Resources Limited, 2014c

Reporter(s): D.J. Grybeck (Contractor, USGS); N.V. King (Alaska Earth Sciences)

Last report date: 2016-02-25

Site name(s): Gossan Ridge

Site type: Prospect

ARDF no.: BH031

Latitude: 60.2301 **Quadrangle:** BH A-2

Longitude: 159.3963

Location description and accuracy:

The Gossan Ridge prospect probably is on the north side of the ridge south of (unnamed) lake 1541 (which is about 3 miles northeast of Gold Lake. It is probably about 1.3 mile south of the northeast corner of lake 1541, about 0.3 mile south of the center of section 29, T. 2 N., R. 58 W., of the Seward Meridian. However, the location is uncertain and the prospect may be a mile or more distant.

Commodities:

Main: Ag, As, Au, Bi, Sb, Te, W

Other: Mo

Ore minerals: Arsenopyrite, stibnite

Gangue minerals: Quartz

Geologic description:

The Gossan Ridge prospect was first identified in the late 1980s by following up highly anomaly gold, arsenic, and antimony values in panned concentrates. The anomalous values covered an area at least 1,500 meters long and 330 meters wide that coincides with a conspicuous rusty-orange color anomaly (Gold Crest Mines Inc., 2011 [summary]). Samples collected by Gold Crest in an area about 450 meters long by 200 meters wide averaged over 0.1 gram of gold per ton and contained up to 0.2 ounce of gold per ton. The mineralization is related to a series of feldspar breccias, porphyry dikes and altered country rock. Numerous epithermal arsenopyrite-stibnite-quartz veins and replacement zones occur along faults and dike margins. The intrusive rocks show pervasive biotite and sericite alteration. The rocks outside the mineralized area are Upper Jurassic or Lower Cretaceous argillite and tuffaceous chert (Box and others, 2003).

The prospect was restaked and reexamined by Gold Crest in 2006 (Gold Crest Mines Inc., 2011 [summary]). They collected 39 rock samples; all had detectable gold. The highest value was 4.8 grams of gold per tonne and the samples contained up to 140 parts per million (ppm) bismuth, 25 ppm silver, 60 ppm molybdenum, 1,000 ppm antimony, 35 ppm tungsten, and 12 ppm tellurium (Gold Crest Mines Inc., 2011 [geochemistry]. Several detailed ground geophysical surveys in 2007 suggest that the prospect is the mineralized cap of a buried intrusion (Gold Crest, 2011 [aeromagnetic]).

Alteration:

The intrusive rocks associated with the mineralization show pervasive biotite and sericite alteration; the country rock is also altered.

Age of mineralization:

Jurassic or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Vein and disseminated mineralization in breccias, dikes, and altered country rock.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Sampled and mapped in the late 80s(?) and sampled and mapped in 2006 and 2007 by Gold Crest Mines Inc. Covered by extensive geochemical and ground and aerial geophysical surveys.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Box, S.E, Moll-Stalcup, E.J., Frost, T.P., and Murphy, J.M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., 1 sheet, scale 1:250,000.

Gold Crest Mines Inc. 2011, Gossan Ridge target [summary]: http://www.goldcrestminesinc.com/projects/alaska/gl-gossan-ridge.asp (as of Feb. 11, 2011)

Gold Crest Mines Inc., 2011, Gold Lake prospect area, RTP TM aeromagnetic: http://www.goldcrestminesinc.com/downloads/alaska/southern/Gossan_Airborne.pdf (as of Feb. 11, 2011).

Gold Crest Mines Inc., 2011, Soil and rock geochemistry: http://www.goldcrestminesinc.com/downloads/alaska/southern/Gossan_Soil_Rock.pdf (as of Feb. 11,

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Ako; East Ako; West Ako; Ako Saddle

Site type: Prospects

ARDF no.: BH032

Latitude: 60.2802 **Quadrangle:** BH B-2

Longitude: 159.6964

Location description and accuracy:

The exact locations of these three prospects is uncertain but they are generally along the western margin of the Crooked Mountain pluton between the upper parts of Swift and Akoswift Creeks. The likely center of these prospects is about 2.3 miles northeast of the center of (unnamed) lake 2050 on Akoswift River, and about 0.5 mile east-northeast of the center of section 9, T. 2 N., R. 60 W., of the Seward Meridian. The location is accurate to within a mile.

Commodities:

Main: As, Au, Cu, Mo

Other: Bi, Sb, W

Ore minerals: Arsenopyrite, chalcopyrite, gold, molybdenite

Gangue minerals: Quartz

Geologic description:

The three prospects of this site are along the western margin of the Late Cretaceous, Crooked Mountain pluton, which has been dated at 69.8 Ma (Box and others, 1993). This composite pluton is about 10 kilometers in diameter. Its core of biotite granodiorite and granite is rimmed by a shell of gabbro and diorite. The pluton is bordered to the west by Late Cretaceous volcanic rocks and tuff that are hornfelsed near its contact.

The Ako prospects were found in the the late 1980s during a regional geochemical survey (Gold Crest Mines Inc., 2011 [summary]). They generally are associated with anomalous arsenic, antimony, bismuth and tungsten, and by iron-stained color anomalies.

The mineralization at the East Ako prospect consists of disseminated, fracture-controlled, and stockwork-veined zones in the Crooked Mountain pluton (Gold crest Mines Inc., 2011 [antimony]; Gold Crest Mines Inc., 2011 [gold]). Several zones of arsenopyrite-quartz veins with sparse molybdenite and chalcopyrite are well exposed. The veins are accompanied by argillic, propylitic, silic, and potassic alteration. The mineralization can be traced for about 150 meters and is up to 75 meters wide.

The mineralization at the West Ako prospect consists of intense biotite alteration, potassium-feldspar flooding, silicification, and quartz-sulfide stockworks along a resistant 'rib' in the pluton. The mineralized zone is 10 to 20 meters thick and can be traced for about 100 meters. Samples across 3 to 5 meters contained up to 0.4 gram of gold per tonne (Gold Crest Mines Inc., 2011 [rock samples]).

The Ako Saddle prospect coincides with a extensive rusty-orange color anomaly. Samples of pyritic, sericite-altered granodiorite had anomalous gold values.

Alteration:

The East Ako mineralization is accompanied by argillic, propylitic, silic, and potassic alteration. The West Ako mineralization is accompanied by intense biotite alteration, potassium-feldspar flooding, and silicification.

Age of mineralization:

Late Cretaceous or younger. The veins cut a 69.9 Ma granitic pluton and may be genetically related to it.

Generic deposit model:

Deposit model:

Polymetallic veining and stockworks in the periphery of a granitic pluton.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Several episodes of mapping and sampling from 1988 to 2007. Covered by regional geochemical and geophysical surveys.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Box, S.E, Moll-Stalcup, E.J., Frost, T.P., and Murphy, J.M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., 1 sheet, scale 1:250,000.

Gold Crest Mines Inc., 2011, Ako prospect [summary]: http://www.goldcrestminesinc.com/projects/alaska/ako.asp (as of Feb. 11, 2011).

Gold Crest Mines Inc., 2011, Ako East target, 1988-2007 rock sample locations: http://www.goldcrestminesinc.com/downloads/alaska/southern/Ako_East_Rock.pdf (as of Feb. 11, 2011).

Gold Crest Mines Inc., 2011: Ako West target, antimony in soils: http://www.goldcrestminesinc.com/downloads/alaska/southern/Ako_West_Antimony.pdf (as of Feb. 11, 2011).

Gold Crest Mines Inc., 2011, Ako West target, gold in soils:

Primary Reference: Gold Crest Mines Inc., 2011 [summary]

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Deadfall; Powdermilk

Site type: Prospect

ARDF no.: BM010

Latitude: 67.4616 **Quadrangle:** BM B-4

Longitude: 160.7957

Location description and accuracy:

The Deadfall prospect is just southeast of the confluence of the two major headwater forks of a major, unnamed, southeast flowing tributary of the Omar River. The coordinates are for the approximate center of the prospect which covers an area of 2 square kilometers in sections 24 and 25, T. 24 N., R. 10 W., of the Kateel River Meridian. The location is accurate.

Commodities:

Main: Ag, Pb, Zn

Other: Ba, Cd?

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals: Barite

Geologic description:

The Deadfall deposit consists of disseminations and clots under 2.5 centimeters in diameter of sphalerite, galena, and rare pyrite in Devonian light-gray dolostone (Schmidt and Allegro, 1988). The sphalerite is coarsely crystalline, locally zoned, and medium to dark brown and red. Barite forms veins in the dolostone. Soil samples from the western river bank exposure contain as much as 1,600 parts per million (ppm) lead, 420 ppm zinc and 7.2 ppm silver. Rock samples from the more oxidized, eastern exposure in the creek contain as much as 280 ppm lead, 230 ppm zinc, and 21 ppm silver. Rock samples contain as much as 20 percent sphalerite, 8 percent galena, and 5 percent pyrite.

The host dolostone strikes NE and dips nearly vertically; a synform structure is suggested (Schmidt and Folger, 1986). Some gray limestone occurs east of the prospect. The Deadfall deposit is similar to southeast Missouri lead-zinc deposits (Cox and Singer, 1986; model 32a) in host rock and mineralization. The sulfides are epigenetic with respect to the host dolostone. Mineralization may be structurally controlled by the synform.

In 2006, NovaGold Resources Inc. began working in the region and staked a large block of claims that covered this and other similar prospects nearby (TintinaGold Resources Inc., 2010). In 2007, NovaGold carried out extensive field work in the area, emphasizing geologic mapping and geochemical sampling. Their geochemical work indicates that the Deadfall prospect is part of a northwest-trending belt of mineralization up to 3 kilometers long and 0.5 kilometer wide. They sampled a 47-meter-long trench in recrystallized dolomite with disseminated coarse sphalerite and galena. Samples from a 12-meter section in the trench contained 10.1 percent zinc and 42.4 grams of silver per tonne; samples from the full 47 meters contained 6 percent zinc and 21.7 grams of silver per tonne.

Alteration:

Surficial weathering resulted in sparse iron oxide staining and local clay alteration.

Age of mineralization:

Devonian?

Generic deposit model:

Deposit model:
Southeast Missouri Pb-Zn (Cox and Singer, 1986; model 32a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
32a

Production Status: None

Site Status: Active

Workings/exploration:
The U.S. Geological Survey did reconnaissance mapping, took a line of 39 soil samples, and collected additional rock and pan concentrate samples (Zayatz and others, 1988). In 2006, NovaGold began working in the region and staked a large block of claims that covered this and other similar prospects nearby (TintinaGold Resources Inc., 2010). In 2007, they carried out extensive field work in the area emphasizing geologic mapping, geochemical sampling, and trench sampling.

Production notes:
None.

Reserves:
None.

Additional comments:

References:
Schmidt, J.M., and Allegro, G.L., 1988, Map showing mineral occurrences and indicators in the Baird Mountains quadrangle, northwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1992, 19 p., 1 sheet, scale 1:250,000.

Schmidt, J.M., and Folger, P.F., 1986, Lead-zinc-silver mineralization in Paleozoic dolostones, Powdermilk prospect, Baird Mountains B-4 quadrangle: in Bartsch-Winkler, S., and Reed, K.M., eds., Geologic studies in Alaska by the U.S. Geological Survey during 1985: U.S. Geological Survey Circular 978, p. 19-21.

TintinaGold Resources Inc., 2010, Baird Project: http://www.mantramining.com/Baird_Project.aspx?m_id=2722 (as of Feb 4, 2010).

Zayatz, M.R., Thompson, W.B., Bailey, E.A., Sutley, S.J., Folger, P.F., Karl, S.M., and Schmidt, J.M., 1988, Analytical results and sample locality maps of mineralized and unmineralized rock samples from the Baird Mountains quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-256-A, 159 p., 2 plates, scale 1:250,000.

Primary Reference: TintinaGold Resources Inc., 2009

Reporter(s): Anita Williams (Anchorage, AK); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Frost

Site type: Prospect

ARDF no.: BM011

Latitude: 67.4804 **Quadrangle:** BM B-4

Longitude: 160.6727

Location description and accuracy:

The Frost prospect is along both sides of Frost Creek, an informally-named east-flowing branch of a northwest tributary of the Omar River. It is in sections 15, 16, and 22, T. 24 N., R. 9 W., of the Kateel River Meridian. The coordinates are at the approximate center of the prospect.

Commodities:

Main: Ba, Cu, Zn

Other: Ag, Pb

Ore minerals: Barite, chalcopyrite, galena, sphalerite

Gangue minerals: Calcite, fluorite, limonite, quartz

Geologic description:

The Frost prospect consists of discontinuous pods or lenses of barite in a zone 30 feet wide and 5,000 feet long. An iron-stained silicified zone surrounds the barite and is weakly mineralized. The silicified zone dips 25 to 45 degrees W and contains disseminated sphalerite and chalcopyrite, and sulfide-bearing quartz-calcite-barite veins. These veins trend N 70 E. Bedrock consists entirely of Devonian, light- to dark-gray limestone and medium- to coarse-grained, stratified dolomite and marble (Degenhart and others, 1978).

An 8-pound sample of barite assayed 96 percent $BaSO_4$ and 0.5 percent zinc. A sample from an 8-foot-wide, quartz-calcite-barite-sulfide vein assayed 0.49 percent copper, 13.2 percent zinc, and 20.7 percent barium. This vein could only be traced for about 10 feet along strike before disappearing under talus (Degenhart and others, 1978).

The analytical results from three rock samples (Schmidt and Allegro, 1988) follow: 1) sample T, a limestone boulder with disseminated sulfides contains 110 parts per million (ppm) arsenic, greater than 100 ppm cadmium, 230 ppm antimony, greater than 2,000 ppm zinc, 1 ppm silver, 1,000 ppm barium, 500 ppm copper, and 3000 ppm lead; 2) sample V, a boulder with quartz, fluorite, sphalerite, galena, and bornite contained 40 ppm arsenic, greater than 100 ppm cadmium, 130 ppm antimony, greater than 2,000 ppm zinc. 0.7 ppm silver, greater than 5,000 ppm barium, 500 ppm copper, 200 ppm lead and 5,00 ppm strontium; 3) sample X, a boulder with vein galena and fine-grained pyrite and sphalerite contained 80 ppm arsenic, 70 ppm cadmium, 170 ppm antimony, greater than 2,000 ppm zinc, 5 ppm silver, 1,000 ppm barium, 700 ppm copper, 5 ppm molybdenum, and 7,000 ppm lead.

In 2006, NovaGold began working in the region and staked a large block of claims that covered this and other similar prospects nearby (TintinaGold Resources Inc., 2010). In 2007, NovaGold carried out extensive field work in the area emphasizing geologic mapping and geochemical sampling. They describe the Frost prospect as a northwest-trending zone about 750 meters long and 200 meters wide of sparse outcrop and abundant rubble crop of barite-sulfide-fluorite mineralization. The sulfides are mainly sphalerite, galena, bornite, and chalcopyrite. Both stratabound and crosscutting mineralization is present. Selected rock samples contain up to 30.6 percent zinc, 20.2 percent copper, and 52.5 grams of silver per tonne.

Alteration:

Silicification.

Age of mineralization:

Devonian.

Generic deposit model:

Deposit model:

Kipushi Cu-Pb-Zn (Cox and Singer, 1986; model 32c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

32c

Production Status: None

Site Status: Active

Workings/exploration:

The Frost deposit was discovered in 1963 by Bear Creek Exploration during a regional stream and soil sampling program. Exposure in the area is poor. An IP survey was done in 1965 (Walters, 1969). During an investigation of the prospect by the U.S. Bureau of Mines in 1978, over 140 soil, silt and rock samples were collected and analyzed (Degenhart and others, 1978). Detailed mapping and sampling were done by the U.S. Geological Survey in the late 1980s (Schmidt and Allegro, 1988; Zayatz and others, 1988). In 2006, NovaGold began working in the region and staked a large block of claims that covered this and other similar prospects nearby (TintinaGold Resources Inc., 2010). In 2007, NovaGold carried out extensive field work in the area emphasizing geologic mapping and geochemical sampling.

Production notes:

None.

Reserves:

Walters (1969) suggested reserves of from 1 to 10 million tons of barite.

Additional comments:

References:

Cobb, E.H., Mayfield, C.F., and Brosgé, W.P., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in eleven quadrangles in northern Alaska (Arctic, Baird Mountains, Chandler Lake, DeLong Mountains, Demarcation Point, Howard Pass, Misheguk Mountain, Mount Michelson, Noatak, Point Lay, and Table Mountain); Supplement to Open-File Report 75-628; Part A, Summaries of data to January 1, 1981: U.S. Geological Survey Open-File Report 81-767-A, 25 p.

Degenhart, C.E., Griffis, R.J., McQuat, J.F., and Bigelow, C.G., 1978, Mineral studies of the western Brooks Range performed under contract to the U.S. Bureau of Mines, Contract #JO155089: U.S. Bureau of Mines Open-File Report 103-78, 529 p., 11 sheets.

Schmidt, J.M., and Allegro, G.L., 1988, Map showing mineral occurrences and indicators in the Baird Mountains quadrangle, northwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1992, 19 p., 1 sheet, scale 1:250,000.

Schmidt, J.M., and Folger, P.F., 1986, Lead-zinc-silver mineralization in Paleozoic dolostones, Powdermilk

prospect, Baird Mountains B-4 quadrangle: in Bartsch-Winkler, S., and Reed, K.M., eds., Geologic studies in Alaska by the U.S. Geological Survey during 1985: U.S. Geological Survey Circular 978, p. 19-21.

TintinaGold Resources Inc., 2010, Baird Project: http://www.mantramining.com/Baird_Project.aspx?m_id=2722 (as of Feb 4, 2010).

Walters, R.R., 1969, Bear Creek Exploration Annual Progress Report, December 31, 1969: Bear Creek Exploration, Spokane, Washington, unpublished report, 22 p. (Report held by NANA Regional Corporation, Anchorage, Alaska).

Zayatz, M.R., Thompson, W.B., Bailey, E.A., Sutley, S.J., Folger, P.F., Karl, S.M., and Schmidt, J.M., 1988, Analytical results and sample locality maps of mineralized and unmineralized rock samples from the Baird Mountains quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-256-A, 159 p., 2 plates, scale 1:250,000.

Primary Reference: TintinaGold Resources Inc., 2010

Reporter(s): Anita Williams (Anchorage, AK); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Omar

Site type: Prospect

ARDF no.: BM012

Latitude: 67.4898 **Quadrangle:** BM B-4

Longitude: 160.8834

Location description and accuracy:

The main occurrences at the Omar prospect are centered approximately 0.5 mile northwest of what is informally called Omar Mountain. They are mostly in the lower portions of sections 9 and 10, T. 24 N., R. 10 W., of the Kateel River Meridian. The location is accurate.

Commodities:

Main: Cu

Other: Ag, Co, Zn

Ore minerals: Bornite, chalcopyrite, covellite, malachite, pyrite, tetrahedrite

Gangue minerals: Calcite, dolomite, iron oxides, quartz

Geologic description:

The Omar deposit was discovered by Bear Creek Exploration in 1962 as a result of a regional geochemical reconnaissance program. Work done on the prospect into the 1980s includes geologic mapping, soil, silt and rock sampling, hand trenching, ATM and EM surveys, and 19 cored drill holes. The geophysical surveys produced indifferent results even though they were in areas of known mineralization (C.G. Bigelow, personal communication, 1975).

The Omar deposit consists of copper and iron sulfides in discordant veinlets, blebs and stringers in Devonian carbonates. Outcrops are rare at Omar and extensive frost-heaved rubble obscures most lithologic contacts. A 3-kilometer-long, complex fracture zone trends north-northwest across the prospect and hosts the deposit. Highly leached gossans are in the southern and central areas of the prospect. Three samples of gossan contained 1,070 parts per million (ppm) copper, greater than 20,000 ppm copper, and 13,400 ppm copper. Mineralized zones containing chalcopyrite, bornite, covellite and malachite in breccias and fracture fillings are 300 to 1,000 meters long and up to 30 meters wide. Bornite and chalcopyrite are the dominant copper sulfides. Typical samples of sulfide-bearing talus contain 9.6 percent copper. A sample from the southwest slope of hill 2455 contained 15.39 percent copper; other samples collected along the 3-kilometer trend varied from 0.1 to 9.6 percent copper (Degenhart and others, 1978). High values of cobalt accompany the copper sulfides, as well as minor zinc and silver. The best intercepts from two drill cores 300 feet apart were 25 to 30 feet of 9 percent copper. These holes intersected two parallel shear zones (C.G. Bigelow, personal communication, 1975).

Microscopic examination shows that the chalcopyrite forms coherent exsolution lamellae and noncoherent blebs and dots in bornite or tetrahedrite. Solution of the host dolostone created open spaces which were filled by dolomite, sulfides, and quartz. The mineralizing event occurred prior to metamorphism and deformation associated with the middle Jurassic to Cretaceous Brooks Range orogeny (Folger and Schmidt, 1986). The carbonate sequences at Omar have been folded into broad anticlines and synclines. Most rock units at Omar strike north-northeast to northwest. Dips vary from 6 degrees to vertical.

In 2006, NovaGold began working in the region, staked a large block of claims, and subsequently acquired the Omar property (TintinaGold, 2010). In 2007, NovaGold carried out extensive field work in the area, emphasizing geologic mapping and geochemical sampling. Their work indicates that the Omar prospects are part of a north-northwest-trending belt of mineralization three kilometers long and up to a half

kilometer wide. Rock samples contained up to 34.3 percent copper, 0.85 percent zinc, and 0.4 percent cobalt. NovaGold subsequently passed the property to TintinaGold who did considerable field work in the area in 2009. See also the similar Frost (BM011), Deadfall (BM010), and Peak (BM022) prospects nearby that were also studied by NovaGold and TintinaGold.

Alteration:

Hydrothermal dolomitization.

Age of mineralization:

Devonian or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Kipushi Cu-Pb-Zn (Cox and Singer, 1986; model 32c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

32c

Production Status: None

Site Status: Active

Workings/exploration:

The Omar deposit was discovered by Bear Creek Exploration in 1962 as a result of a regional geochemical reconnaissance program. Work done on the prospect includes geologic mapping, soil, silt and rock sampling, hand trenching, ATM and EM surveys, and 19 core drill holes. The geophysical surveys produced indifferent results even though they were run in areas of known mineralization (C.G. Bigelow, personal communication, 1975).

In 2006, NovaGold began working in the region, staked a large block of claims, and subsequently acquired the Omar property (TintinaGold, 2010). In 2007, NovaGold carried out extensive field work in the area emphasizing geologic mapping and geochemical sampling. TintinaGold Resources Inc. continued the NovaGold work and did considerable field work in the area in 2009. See also the similar Frost (BM011), Deadfall (BM010) and Peak (BM022) prospects nearby that were also studied by NovaGold and TintinaGold.

Production notes:

None.

Reserves:

Based on results of two drill holes, Bear Creek Exploration calculated possible reserves of 200,000 tons of ore containing 9 percent copper.

Additional comments:

References:

Cobb, E.H., Mayfield, C.F., and Brosgé, W.P., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in eleven quadrangles in northern Alaska (Arctic, Baird Mountains, Chandler Lake, DeLong Mountains, Demarcation Point, Howard Pass, Misheguk Mountain, Mount Michelson, Noatak, Point Lay, and Table Mountain); Supplement to Open-File Report 75-628; Part A, Summaries of data to January 1, 1981: U.S. Geological Survey Open-File Report 81-767-A, 25 p.

Degenhart, C.E., Griffis, R.J., McQuat, J.F., and Bigelow, C.G., 1978, Mineral studies of the western Brooks Range performed under contract to the U.S. Bureau of Mines, Contract #JO155089: U.S. Bureau of Mines Open-File Report 103-78, 529 p., 11 sheets.

Folger, P.F., and Schmidt, J.M., 1986, Geology of the carbonate-hosted Omar copper prospect, Baird Mountains, Alaska: Economic Geology, v. 81, p. 1690-1695.

Jansons, Uldis, 1982, Cobalt content in samples from the Omar copper prospect, Baird Mountains, Alaska: U.S. Bureau of Mines Mineral Land Assessment 109-82, 16 p.

Schmidt, J.M., and Folger, P.F., 1986, Lead-zinc-silver mineralization in Paleozoic dolostones, Powdermilk prospect, Baird Mountains B-4 quadrangle: in Bartsch-Winkler, S., and Reed, K.M., eds., Geologic studies in Alaska by the U.S. Geological Survey during 1985: U.S. Geological Survey Circular 978, p. 19-21.

TintinaGold Resources Inc., 2010, Baird Project: http://www.mantramining.com/Baird_Project.aspx?m_id=2722 (as of Feb 4, 2010).

WGM Staff, 1980, Non-fuel mineral resources of Alaska: Anchorage, Alaska, WGM, Inc. Unpublished report for Phillips Petroleum Company, 320 p. (Report held by NANA Regional Corporation, Anchorage, Alaska).

Primary Reference: TintinaGold Resources Inc., 2010

Reporter(s): Anita Williams (Anchorage, AK); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Peak

Site type: Prospect

ARDF no.: BM022

Latitude: 67.5638 **Quadrangle:** BM C-4

Longitude: 160.7914

Location description and accuracy:

The Peak prospect is at the head of an unnamed northwest tributary to the Omar River. The mineralization forms a belt that extends from the lower half of section 18 to the northwest portion of section 13, T. 24 N., R. 9 W. of the Kateel River Meridian. The coordinates are at about the center of the belt. The location is accurate.

Commodities:

Main: Ba, Cu, Pb, Zn

Other:

Ore minerals: Barite, galena, smithsonite, sphalerite

Gangue minerals: Carbonates, quartz

Geologic description:

In 2006, NovaGold Resources began working in the region and staked a large block of claims that covered this and other similar prospects nearby (TintinaGold Resources Inc., 2010). In 2007, NovaGold carried out extensive field work in the area, emphasizing geologic mapping and geochemical sampling, in the course of which they discovered this previously unrecognized mineralization.

The rocks in the area consist of folded and faulted, Paleozoic limestone and dolomite of the Paleozoic Baird Group. In 2009, TintinaGold worked extensively on the Peak prospect. They identified scattered narrow trains of mineralization that include gossan, silica veins, and barite-rich rock that extends for more than 1.5 kilometers. The mineralization consists of smithsonite encrustations, coarsely crystalline sphalerite and galena, and massive barite. A two-meter-wide sample of a silica-barite vein in carbonates contained 5.3 percent zinc. Samples of gossan contained up to 1 percent zinc, 0.5 percent lead, and 500 parts per million (ppm) copper. Selected samples contained up to 33.1 percent zinc and 4.1 percent lead. Most of the mineralization is strongly oxidized at the surface.

Alteration:

Silicification; sulfides are largely oxidized to gossan.

Age of mineralization:

Paleozoic or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Zinc-lead mineralization in Paleozoic carbonates. Insufficient data to determine whether epigenetic or (remobilized?) syngenetic.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

In 2006, NovaGold began working in the region and staked a large block of claims that covered this and other similar prospects nearby (TintinaGold Resources Inc., 2010). In 2007, NovaGold carried out extensive work in the area. The previously unknown mineralization at the Peak prospect was identified by additional surface mapping, sampling, and soil geochemistry.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

TintinaGold Resources Inc., 2010, Baird Project: http://www.mantramining.com/Baird_Project.aspx?m_id=2722 (as of Feb 4, 2010).

Primary Reference: TintinaGold Resources Inc., 2010

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Harrys Creek

Site type: Prospect

ARDF no.: BN055

Latitude: 65.9263 **Quadrangle:** BN D-3

Longitude: 163.3466

Location description and accuracy:

Harrys Creek is a small unnamed headwater tributary to Cunningham Creek, which flows into Hannum Creek. The Harrys Creek prospect extends across Harrys Creek approximately 1,500 feet above its mouth. It is about 0.5 mile north of the center of section 17, T. 6 N., R. 22 W. The location is accurate.

Commodities:

Main: Ag, Au, Pb, Zn

Other:

Ore minerals: Boulangerite, galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks in the area consist of a Paleozoic, poorly exposed, interlayered sequence of pelitic schist and schistose dolomitic marble that strikes northwest and dips 15 to 65 degrees north (Till and others, 1986; Hawley, 2007; Stevens, 2008). Part of this metasedimentary sequence is siliceous and described as quartzite (Herreid, 1966). The frozen ground here and at the Hannum prospect area has handicapped efforts to expose bedrock (Mulligan, 1965; Herreid, 1966). Most of the area is covered by surficial material that obscures the structure of the rocks.

The galena-bearing lode was first noted by 1905 (Moffit, 1905). On both sides of Harrys Creek, over a distance of 1,400 feet, deeply weathered, gossanous exposures of bedrock and surficial debris are exposed in 6 trenches that in dozer trenches show alteration and mineralization in marble and siliceous schist (Hudson and others, 1977). The mineralization is near a contact between dolomitic marble and siliceous schist (Hudson and others, 1977). Herreid (1966) describes the silica-rich rock as quartzite and interprets it to be silicified marble. The silica-rich zones are coarse-grained, porous, and contain some quartz-crystal-lined cavities (Herreid, 1966). Mineralization includes pods, veinlets, and disseminations of galena in silica-rich rock, in places with disseminated pyrite and sphalerite. Pebbles and cobbles of massive galena are abundant in the stream bed of Harrys Creek at and below the dolomitized marble outcrops. Boulangerite is disseminated in galena from gossan float in a dozer trench on the south side of the creek (Herreid, 1966). Light brown, surficial material containing fragments of silica-rich rock and massive limonite gossan contained 0.05 percent copper, 4.0 percent lead, 0.62 percent zinc, 0.04 ounce of gold per ton, and 1 ounce of silver per ton. An 18-inch-wide gossan with a 2- to 3-inch core of galena assayed 0.05 percent copper, 10 percent lead, 2.2 percent zinc, 1.76 ounce of silver per ton, and no gold (Herreid, 1966). Samples of surficial materials from slopes and dozer trenches have more than 1,000 parts per million (ppm) lead over a length of 1,250 feet. Sampling by Mulligan (1965) also indicated traces of gold in the mineralized zones. The dozer trenches primarily expose deeply weathered material and not bedrock. Burand (1957) collected a series of 5-foot channel samples in two of the dozer trenches: 1) five samples of yellow, sandy soil with visible quartz and galena contained 2.3 to 5.8 percent lead, 0.37 to 10.11 ounces of silver per ton, and no gold; 2) eight samples over poorly exposed carbonate-bearing bedrock contained 1.7 to 6.2 percent lead, 0.23 to 7.52 ounces of silver per ton, and nil to 0.03 ounce of gold per ton; and 3) five samples over a yellow clay-rich zone contained 2.3 to 9.6 percent lead, 6.42 to 10.09 ounces of silver per ton, and 0.01 to

0.06 ounce of gold per ton. The mineralized zone is open to both the northwest and southeast. Similar mineralization occurs on strike on at the Inmuchuk prospect (BN056), 4,000 feet southeast.

From 2002 to 2005, Royal Pretoria Mines did considerable geochemical sampling in the area and defined a strong anomaly in zinc and lead that extends from the Harrys Creek prospect to the Inmachuk prospect (BN056) (Hawley, 2007).

Alteration:

Development of silica-rich rock is characteristic; it is variably developed but extensive. The deposit is deeply weathered and oxidized.

Age of mineralization:

The deposit may be epigenetic and younger than the lower Paleozoic host rocks. Epigenetic deposits on Seward Peninsula are primarily Cretaceous in age. If the deposit is stratiform, it may be similar in age to the Paleozoic host rocks (Till and others, 1986).

Generic deposit model:

Deposit model:

Pods, veinlets, and disseminations of galena and sphalerite in silicified marble.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Six dozer trenches totaling 1,250 feet were dug on the south side of Harrys Creek prior to 1966. Royal Pretoria Mines did considerable geochemical sampling in the area from 2002 to 2005.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Burand, W.M., 1957, The Hannum Creek lead deposit: Alaska Territorial Department of Mines Prospect Evaluation 44-02, 4 p.

Cobb, E.H., 1975, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Bendeleben quadrangle, Alaska: U.S. Geological Survey Open-File Report 75-429, 123 p.

Hawley, C.C., 2007, Inmachuk exploration project, Seward Peninsula, northwestern, Alaska: NI 43-101 Technical Report for First Factor Developments, Inc., 57 p. (Posted on www.sedar.com, June 25, 2007, under Millrock Resources, Inc.).

Herreid, G.H., 1966, The geology and geochemistry of the Inmachuk River map area, Seward Peninsula, Alaska: Alaska Division of Mines and Minerals Geological Report 23, 25 p., 1 sheet, scale 1:63,360.

Hudson, T.L., Miller, M. L., and Pickthorn, W. J., 1977, Map showing metalliferous and selected nonmetalliferous mineral deposits, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 77-796-B, 46 p., 1 sheet, scale 1:1,000,000.

Moffit, F.H., 1905, The Fairhaven gold placers, Seward Peninsula, Alaska: U.S. Geological Survey Bulletin 247, 85 p.

Mulligan, J.J., 1965, Examination of the Hannum lead prospect, Fairhaven district, Seward Peninsula, Alaska: U.S. Bureau of Mines Open-File Report 6-65, 16 p.

Stevens, D.L., 2008, Inmachuk prospect, Fairhaven mining district, Seward Peninsula, Alaska: NI43-101 Technical Report report for Millrock Resources, Inc., 41 p. (posted on www.sedar.com, June 6, 2008).

Till, A.B., Dumoulin, J.A., Gamble, B. ., Kaufman, D.S., and Carroll, P.I., 1986, Preliminary geologic map and fossil data, Solomon, Bendeleben, and southern Kotzebue quadrangles, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 86-276, 10 p., 3 plates, scale 1:250,000.

Primary Reference: Stevens, 2008

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Inmachuk; Hannum

Site type: Prospect

ARDF no.: BN056

Latitude: 65.9212 **Quadrangle:** BN D-3

Longitude: 163.3216

Location description and accuracy:

The Inmachuk prospect is on the west bank of Hannum Creek, about 1,000 feet upstream from the mouth of Cunningham Creek. Hannum Creek is a north tributary to Inmachuk River. The prospect is about 0.3 west of the center of section 16, T. 6 N., R. 22 W. The location is accurate.

Commodities:

Main: Pb, Zn

Other: As, Ba

Ore minerals: Arsenopyrite?, galena, pyrite, sphalerite

Gangue minerals: Barite?, calcite, limonite, quartz

Geologic description:

The rocks in the area consist of a Paleozoic, poorly exposed, interlayered sequence of pelitic schist and schistose dolomitic marble that strikes northwest and dips 15 to 65 degrees north (Till and others, 1986; Hawley, 2007; Stevens, 2008) . Part of this metasedimentary sequence is siliceous and described as quartzite (Herreid, 1966). Herreid considers the quartzite here and at Harrys Creek (BN055), 4,000 feet to the northwest, to be silicified marble. Hudson and others (1977) described outcrops of the silica-rich rock on Harrys Creek as siliceous schist. The frozen ground in the Hannum prospect area has handicapped efforts to expose bedrock (Mulligan, 1965; Herreid, 1966). Most of the area is covered by surficial material that obscures the structure of the rocks.

The prospect has been known since 1906 and there has been considerable activity since 1966 when Bunker Hill Mining Company dug about 1,500 feet of trenching in at least 6 trenches, drilled 15 core holes, and collected numerous soil samples that defined several zones of anomalous zinc and lead (Hawley, 2007; Stevens, 2008). The mineralization is only locally exposed in the trenches; a 30-foot-wide gossan zone within marble is exposed in one trench. Mineralization is apparently pods and stringers of sulfides, primarily galena, sphalerite, and pyrite, in silica-rich rock. An assay of a 6-foot -wide siliceous zone contained 0.05 percent copper, 0.38 percent zinc, 0.12 percent lead, and no silver and gold (Herreid, 1966). Soil samples collected upslope 125 to 375 feet to the west, contained lead and zinc values up to more than 1,000 parts per million. Soil samples near the prospect commonly contain more zinc than lead (Herreid, 1966). From 2002 to 2005, Royal Pretoria Mines in their own behalf and in 2006 for Full Metal Minerals did considerable work in the area and defined a large anomaly that covered the prospect and the Harrys Creek prospect (BN055) (Hawley, 2007; Stevens, 2008). Although it is likely that the mineralization at the Hannum prospect continues west to the Harrys Creek prospect (BN055), this has not been confirmed.

In September, 2007, Millrock Resources Inc. (Stevens, 2008) drilled 5 holes that totaled 644.1 meters to test the Inmachuk mineralization. The drilling was spread along a line about 1,300 meters long on the south side of Cunningham Creek, northwest of the mouth of Hannum Creek. The drilling was along a zone that is strongly anomalous in zinc (Hawley, 2007). Mineralization was intersected in three of the holes and consists of oxidized lead-zinc minerals. The best intercepts were: 3.05 meters with 12.34 percent zinc; 6.61 meters with 2.06 percent zinc; 0.61 meter with 5.55 percent zinc and 3.66 percent lead; and 0.91 meter with 4.56 percent zinc. The mineralization apparently occurs in flat-lying pods that replace marble. The pods are

generally narrow and low grade and the mineralization seems to thin down-dip. MIllrock relinquished the property to Full Metal Minerals in March, 2008.

Alteration:

Pervasive development of silica-rich rock in the marble. The deposit is deeply weathered and oxidized.

Age of mineralization:

The deposit may be epigenetic and younger than the host schist and marble; epigenetic deposits on the Seward Peninsula are primarily Cretaceous. If it is stratiform and syngenetic, it is Paleozoic.

Generic deposit model:

Deposit model:

Sphalerite-galena replacement pods in marble.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

At least six trenches were dug with a bulldozer in the mid-60s along the west bank of Hannum Creek. The trenches total about 1,500 feet but they only locally expose mineralization. Fifteen core holes were drilled in 1966. Five holes totaling 644.1 meters were drilled in 2007; three intersected mineralization.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1975, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Bendeleben quadrangle, Alaska: U.S. Geological Survey Open-File Report 75-429, 123 p.

Hawley, C.C., 2007, Inmachuk exploration project, Seward Peninsula, northwestern, Alaska: NI 43-101 Technical Report for First Factor Developments, Inc., 57 p. (Posted on www.sedar.com, June 25, 2007, under Millrock Resources, Inc.)

Herreid, G.H., 1966, The geology and geochemistry of the Inmachuk River map area, Seward Peninsula, Alaska: Alaska Division of Mines and Minerals Geological Report 23, 25 p., 1 sheet, scale 1:63,360.

Hudson, T.L., Miller, M. L., and Pickthorn, W. J., 1977, Map showing metalliferous and selected nonmetalliferous mineral deposits, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 77-796-B, 46 p., 1 sheet, scale 1:1,000,000.

Millrock Resources Inc., 2008, Millrock announces results of drilling at Inmachuk project, Seward Peninsula, Alaska: http://millrockresources.com/index.

php/news/millrock_announces_results_of_drilling_at_inmachuk_project_seward_peninsula (News release, March 28, 2008).

Stevens, D.L., 2008, Inmachuk prospect, Fairhaven mining district, Seward Peninsula, Alaska: NI 43-101 Technical Report for Millrock Resources, Inc., 41 p. (Posted on www.sedar.com, June 6, 2008).

Mulligan, J.J., 1965, Examination of the Hannum lead prospect, Fairhaven district, Seward Peninsula, Alaska: U.S. Bureau of Mines Open-File Report 6-65, 16 p.

Till, A.B., Dumoulin, J.A., Gamble, B. ., Kaufman, D.S., and Carroll, P.I., 1986, Preliminary geologic map and fossil data, Solomon, Bendeleben, and southern Kotzebue quadrangles, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 86-276, 10 p., 3 plates, scale 1:250,000.

Primary Reference: Stevens, 2008

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Unnamed (on Old Glory Creek)

Site type: Occurrence

ARDF no.: BN059

Latitude: 65.8468 **Quadrangle:** BN D-3

Longitude: 163.187

Location description and accuracy:

This occurrence is on both sides of Old Glory Creek at the mouth of Nelson Creek. It is about 0.4 mile west of the center of section 7, T. 5 N., R. 22 W. The location is accurate.

Commodities:

Main: As, Au, Sb, Zn

Other: Ag

Ore minerals: Arsenopyrite, pyrite, sphalerite, stibnite

Gangue minerals: Quartz

Geologic description:

Herreid (1966) described mineralized, quartz segregations and boudins in schist and marble in an old placer cut just above the mouth of Nelson Creek. A sample contains 0.02 ounce of gold per ton, 0.10 ounce of silver per ton, 0.05 percent copper, 0.05 percent lead, and 0.05 percent zinc (Herreid, 1966). The rocks in the area are Paleozoic schist and marble (Till and others, 1986); they are locally bleached and altered to clay at the occurrence.

In 2006, Royal Pretoria Mines working for Millrock Resources Inc. carried out geochemical surveys in the area; they defined a geochemical anomaly in gold, arsenic, and antimony over this occurrence (Hawley, 2007). Subsequently, they discovered mineralized float on both sides of Old Glory Creek. The float consisted of silicified carbonate rocks with quartz veinlets and a iron-stained quartz boulder with various combinations of stibnite, arsenopyrite, and pyrite. Five samples contained up to 0.92 parts per million (ppm) gold, more than 10,000 ppm antimony, 4,750 ppm zinc, and 3,130 ppm arsenic.

Alteration:

Schist is bleached locally and crosscut by a zone of clay alteration.

Age of mineralization:

Unclear, other than the mineralization is younger than the Paleozoic host rocks. Epigenetic mineralization in metamorphic rocks of Seward Peninsula is primarily of Cretaceous age.

Generic deposit model:

Deposit model:

Gold-stibnite-arsenopyrite-quartz veins in marble.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

Mineralized float occurs on both sides of Old Glory Creek; sampled by government and industry geologists.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1975, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Bendeleben quadrangle, Alaska: U.S. Geological Survey Open-File Report 75-429, 123 p.

Hawley, C.C., 2007, Inmachuk exploration project, Seward Peninsula, northwestern, Alaska: NI 43-101 Technical Report for First Factor Developments, Inc., 57 p. (Posted on www.sedar.com, June 25, 2007, under Millrock Resources, Inc.)

Herreid, G.H., 1966, The geology and geochemistry of the Inmachuk River map area, Seward Peninsula, Alaska: Alaska Division of Mines and Minerals Geological Report 23, 25 p., 1 sheet, scale 1:63,360.

Hudson, T.L., Miller, M. L., and Pickthorn, W. J., 1977, Map showing metalliferous and selected nonmetalliferous mineral deposits, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 77-796-B, 46 p., 1 sheet, scale 1:1,000,000.

Till, A.B., Dumoulin, J.A., Gamble, B. ., Kaufman, D.S., and Carroll, P.I., 1986, Preliminary geologic map and fossil data, Solomon, Bendeleben, and southern Kotzebue quadrangles, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 86-276, 10 p., 3 plates, scale 1:250,000.

Primary Reference: Hawley, 2007

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Billiken; Kugruk

Site type: Prospect

ARDF no.: BN075

Latitude: 65.69 **Quadrangle:** BN C-1

Longitude: 162.4931

Location description and accuracy:

The Billiken prospect is about 1.4 miles northwest of the junction of Independence Creek and the Kugruk River. It is at an elevation of about 580 feet near the center of section 6, T. 3 N., R. 18 W. The location is accurate.

Commodities:

Main: Au, Cu, Fe

Other: Ag, Pb, Zn

Ore minerals: Chalcopyrite, galena, gold, magnetite, pyrite, pyrrhotite, sphalerite

Gangue minerals: Actinolite, chlorite, clinohumite, diopside, dolomite, garnet, idocrase, olivine, phlogopite, pyrite, pyroxene, scapolite, serpentine

Geologic description:

This magnetite-rich skarn prospect was discovered and core drilled by Placid Oil and Minerals in the mid-1970s. Although tundra cover is extensive in this area, the deposit is well expressed in aeromagnetic data. A large, positive, north-south trending aeromagnetic anomaly over this prospect is about 0.4 mile wide and 2 miles long. The deposit contains massive to brecciated magnetite, with blebs to stringers of pyrite and chalcopyrite, in dolomite (Hudson and others, 1977). Newberry and others (1997) classify it as a magnesian-iron skarn developed in dolomite. It contains clinohumite, olivine, diopside, and idocrase. Serpentine minerals replace diopside, and olivine and phlogopite are present. A sample of the skarn contained 0.06 ounce of silver per ton, 0.0003 ounce of gold per ton, 0.2 percent copper, 0.02 percent zinc, 0.01 percent cobalt, and 45 percent iron (Newberry and others, 1997). This deposit is in the east contact zone of the Kugruk pluton, which has a K/Ar age of 94.9 +/- 2.9 Ma (Till and others, 1986, p. A-15).

In 2005, NovaGold began staking a large block of claims that eventually covered much of the basin of the Kugruk River and its tributaries (TintinaGold Resources Inc., 2010 [prospect]). In their extensive regional work, they collected about 2000 soil samples over the Kugruk pluton and the mineralized area of the Billiken prospect. TintinaGold Resources Inc. acquired the property in the spring of 2009. Their 2009 work included ground and aerial surveys, geochemical sampling, geologic mapping, and prospect evaluation. They particularly noted a north-trending belt, up to 2.1 miles wide and 7.5 miles long, of strong geophysical anomalies and copper anomalies in soil on the east side of the Kugruk pluton. The Billiken prospect is in this belt.

TintinaGold drilled three holes near the Billiken prospect in 2010 to test a large magnetic high, coincident with a resistivity low, gravity high, and IP chargeability high (Chutas and Robinson, 2010; TintinaGold, 2010 (drill results]). The first hole went through a zone more than 50 meters thick of massive magnetite with calc-silicate alteration and copper mineralization. The other holes intersected additional zones of copper mineralization associated with magnetite-rich calc-silicate alteration. Chalcopyrite is the primary copper mineral; in some magnetite-rich zones, it is accompanied by pyrite, pyrrhotite, and traces of sphalerite and galena. The alteration assemblages commonly contain pyroxene, garnet, magnetite, scapolite, and locally retrograde chlorite, actinolite, and epidote. Some notable intercepts in the 2010 drilling were: 22 meters with 0.44 percent copper and 49.0 percent iron, and 31.2 meters with 1.70 percent copper, 21.7

percent iron, 0.604 gram of gold per tonne, and 18.6 grams of silver per tonne.

Alteration:

Mg-bearing skarn developed adjacent to a Cretaceous pluton.

Age of mineralization:

Cretaceous; this deposit is probably related to the nearby 94.9 +/- 2.9 Ma pluton (Till and others, 1986, p. A-15).

Generic deposit model:

Deposit model:

Magnesian-iron skarn (Newberry and others, 1997; Cox and Singer, 1986; model 18d).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18d

Production Status: None

Site Status: Active

Workings/exploration:

The prospect was initially explored by Placid Oil by core drilling in the 1970s. Beginning in 2005, NovaGold began staking a large block of claims that eventually covered much of the basin of the Kugruk River and its tributaries (TintinaGold Resources Inc., 2010 [prospect]). In their extensive regional work, they collected about 2,000 soil samples over the Kugruk pluton and the mineralized area of the Billiken prospect. TintinaGold Resources Inc. acquired the property in the spring of 2009. Their 2009 work included both ground and aerial surveys, geochemical sampling, geologic mapping, and prospect evaluation. Tintina Gold drilled 3 holes in 2010.

Production notes:

None.

Reserves:

None.

Additional comments:

None.

References:

Chutas, Nathan, and Robinson, John, 2010, 2010 exploration summary of the Kugruk project, Seward Peninsula, Alaska: Alaska Miners Association, 2010 Convention, Abstracts, p. 20.

Hudson, T.L., Miller, M. L., and Pickthorn, W. J., 1977, Map showing metalliferous and selected nonmetalliferous mineral deposits, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 77-796-B, 46 p., 1 sheet, scale 1:1,000,000.

Newberry, R.J., Allegro, G.L., Cutler, S.E., Hagen-Levelle, D.D., Adams, D.D., Nicholson, L.C., Weglarz, T.B., Bakke, A.A., Clautice, K.H., Coulter, G.A., Ford, M.J., Myers, G.L., and Szumigala, D.J., 1997, Skarn deposits of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 355-395.

Till, A. B.; Dumoulin, J. A.; Gamble, B. M.; Kaufman, D. S.; and Carroll, P. I., 1986, Preliminary geologic

map and fossil data, Solomon, Bendeleben, and southern Kotzebue quadrangles, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 86-276, 60 p.

TintinaGold Resources Inc., 2010, Kugruk prospect: http://www.mantramining.com/Kugruk_Prospect.aspx?m_id=2712 (as of February 1, 2010)

TintinaGold Resources Co., 2010, TintinaGold releases initial drill results from Kugruk copper-gold-silver-iron project, Alaska: http://tintinagold.com/Images/1785TAU-NR%20and%20figures%20-%20Jul-19-10-Final.pdf (News release, July 19, 2010).

Primary Reference: Chutas and Robinson, 2010

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Independence

Site type: Mine

ARDF no.: BN076

Latitude: 65.6717 **Quadrangle:** BN C-1

Longitude: 162.467

Location description and accuracy:

The Independence Mine is at the nose of a low ridge south of the junction between lower Independence Creek and Kugruk River. The deposit is also exposed in outcrop on the east side of Kugruk River, about 1,000 feet upstream of the mouth of Independence Creek and the mineralization can be followed for about a mile to the south along a low ridge. The location is accurate.

Commodities:

Main: Ag, Pb

Other: Zn

Ore minerals: Galena, pyrite, sphalerite, tetrahedrite

Gangue minerals: Actinolite?, calcite, limonite, manganese oxides?, quartz, siderite

Geologic description:

The Independence Mine is along a north-south trending marble-schist contact that is faulted and sheared. The contact dips steeply west and the marble is in the hanging wall. Mineralization has been traced laterally along this contact zone for 6,200 feet and vertically to a depth of 136 feet. On the 40-foot level of the mine, galena, sphalerite, tetrahedrite, and some pyrite are primarily in the footwall schist, although siderite-rich bodies reportedly replace marble locally, and ore minerals in turn replace siderite and marble (Levensaler, 1941). On the 140-foot level, at least part of the schist is described as calcareous (Levelsaler, 1941). The mode of ore mineral occurrence in the underground workings has not been described but boulders of limonitic galena and lead carbonates up to 2 feet in diameter are on surface dumps. The ore minerals may be in veins and stringers that pinch and swell, in disseminations, or as irregular replacements. Four ore zones were sampled on the 40-foot level and one on the 140-foot level. On the 40-foot level, the four ore zones include: 1) a 10-foot-wide by 75-foot-long zone that averaged 6.8 percent lead, and 10 ounces of silver per ton; 2) a 20-foot-wide by 38-foot-long zone averaging 7 percent lead and 10 ounces of silver per ton; 3) a 7-foot-wide by 75-foot-long zone that averaged 6 percent lead and 6.4 ounces of silver per ton; and 4) a 10-foot-wide by 25-foot-long zone that averaged 6 percent lead and 6.3 ounces of silver per ton. On the 140-foot level, the workings exposed an ore zone that was 5 feet wide and 35 feet long; it averaged 3.4 percent lead and 2.5 ounces of silver per ton. The fourth ore zone on the 40-foot level continued beyond the end of the drift. (Note, however, that the descriptions vary widely about the mineralogy, grade, and dimensions of the ore bodies.)

This deposit has historically been thought of as epigenetic; however, there is a possibility that it is stratabound. The faulted and deformed high grade mineralization is apparently discontinuous both laterally and vertically. Bedrock is extensively covered by tundra, but what is exposed in the area is part of a Lower Paleozoic metasedimentary assemblage (Till and others, 1986). Bedrock to the east of Independence Creek and northwest of Kiwalik Mountain may contain felsic metavolcanic rocks. Felsic metavolcanic rocks are associated with several massive sulfide prospects in the area, one near upper Minas Creek (BN119) and one at Big Bar (BN083) southeast of Kiwalik Mountain.

TintinaGold Resources Inc. (2009) explored the area in 2009. They noted that the Independence Mine was along a narrow belt of silver-lead-zinc-copper deposits that extends north-northeast for about 5 miles.

Alteration:

The deposit is oxidized and an early description (Levensaler, 1941) notes that siderite bodies replace limestone (marble).

Age of mineralization:

If the deposit is epigenetic, it is probably Cretaceous because epigenetic mineralization in metamorphic rocks of Seward Peninsula is primarily Cretaceous. If the deposit is stratabound, it may be the same age as the Ordovician to Devonian, sedimentary host rocks.

Generic deposit model:

Deposit model:

Massive to disseminated sulfide minerals along a deformed and faulted marble-schist contact. Polymetallic veins? (Cox and Singer, 1986; model 22c?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Exploration and production workings include dozer trenches, three shafts, and two levels with short drifts. The main shaft, 136 feet deep, was sunk on outcropping mineralization near the Kugruk River. Two drifts driven from this shaft included one 36 feet deep (referred to as the 40 foot level) that trended southerly for 260 feet and northerly for 15 feet along structure and another at a depth of 136 feet (referred to as the 140 foot level) that trended southerly for 205 feet and northerly for 45 feet along structure. A 30-foot-deep exploration shaft was dug (on the Galena Homestake claim) 5,000 feet south of the main shaft. Another exploration shaft (the Valley Galena claim) was dug 1,200 feet north of the main shaft on the west side of Kugruk River.

Production notes:

Two high-grade ore shipments are known (Levensaler, 1941). A shipment of thirty three tons was received at the Selby smelter on October 28, 1921 that contained 33.25 ounces of silver per ton, 29.9 percent lead, 4.8 percent zinc, 5.8 percent silica, 20.8 percent iron, and no arsenic or antimony. On December 10, 1922, 1.75 tons were received at the Bunker Hill smelter that contained 29.4 ounces of silver per ton, 33.5 percent lead, 6.3 percent zinc, and 12.3 percent iron.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1972, Metallic mineral resources map of the Bendeleben quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-417, 1 sheet, scale 1:250,000.

Cobb, E.H., 1975, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Bendeleben quadrangle, Alaska: U.S. Geological Survey Open-File Report 75-429, 123 p.

Levensaler, L.H., 1941 (?), Kugruk Galena Mines, Fairhaven mining district, Seward Peninsula, Alaska: Unpublished report for property owners, 4 p., 2 level plans, and 2 cross sections.

Till, A.B., Dumoulin, J.A., Gamble, B. ., Kaufman, D.S., and Carroll, P.I., 1986, Preliminary geologic map and fossil data, Solomon, Bendeleben, and southern Kotzebue quadrangles, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 86-276, 10 p., 3 plates, scale 1:250,000.

TintinaGold Resources Inc., 2010, Kugruk prospect: http://www.mantramining.com/Kugruk_Prospect.aspx?m_id=2712 (as of February 1, 2010)

Primary Reference: TintinaGold Resources Inc., 2010

Reporter(s): Travis L. Hudson (Applied Geology), D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Boulder Creek; Death Valley

Site type: Prospect

ARDF no.: BN089

Latitude: 65.0507 **Quadrangle:** BN A-1

Longitude: 162.2467

Location description and accuracy:

The Boulder Creek or Death Valley (in the early literature) uranium deposit is in the headwaters of Boulder Creek, a north tributary to the middle Tubutulik River. It is 3.5 miles south of where the Tubutulik River leaves Death Valley, and about 0.3 mile southeast of the center of section 14, T. 3 S., R. 19 W. The deposit has been explored on the east side of Boulder Creek; the discovery pits are 1.0 mile southeast of Hill 990 and 1.0 mile east of Tubutulik River.

Commodities:

Main: U

Other:

Ore minerals: Coffinite, meta-autunite, pyrite, sphalerite

Gangue minerals:

Geologic description:

The Boulder Creek or Death Valley (in the early literature) sandstone-type uranium deposit (Dickinson and others, 1987) was discovered in 1977 and soon explored and drilled by Houston International Minerals Corporation.

The Death Valley deposit is in lower Eocene continental sedimentary rocks that unconformably overlie deeply weathered granitic rocks of the Darby pluton (Miller and Bunker, 1976; Johnson and others, 1979). The Eocene sediments were deposited in a graben between the uplifted Darby pluton to the west and lower Paleozoic metamorphic rocks to the east. This is probably an onshore, exposed equivalent of the deeper parts of the offshore Norton basin. Proximity to the slightly uraniferous Darby pluton seems to be an important control on the development of this deposit. The continental sedimentary rocks are conglomerate, arkosic sandstone, mudstone, and coal. The nonconformable contact between the coarse-grained, poorly sorted basal sedimentary strata and the granitic pluton is gradational and some strata in this part of the section are interpreted as mud flows in alluvial systems. The upper part of the sedimentary section contains mudstones deposited in a lacustrine environment. Eocene basalt is interbedded with and caps the sedimentary section in this area. This basalt may have created a dam that led to lacustrine sedimentation. The lacustrine mudstones contain laminated siderite but all the sediments compositionally reflect their probable source in the granitic rocks of the Darby pluton. Granitic clasts, quartz, and k-feldspar are common detrital components. Carbonized wood fragments are also common in the section which also contains bituminous coal beds up to 100 feet thick.

Uranium mineralization is both epigenetic and supergene. The epigenetic mineralization consists of coffinite, small amounts of pyrite, and trace amounts of sphalerite; it extends vertically over a stratigraphic interval of 300 feet, both above and below basalt layers. This primary mineralization, interpreted to be early Eocene in age, is formed by the reduction of oxidized groundwaters derived from areas of granitic bedrock by carbonized wood in conglomerate and arkosic sandstone. The principal mineralized zone defined by drilling covers an area of 395 by 9,850 feet and averages 10 feet thick. With an average grade of 0.27 percent U3O8, this deposit has a calculated resource of 1,000,000 pounds of U3O8 (Dickinson and others, 1987). The supergene mineralization, which is related to the present surface, consists of several varieties of

meta-autunite in soil and weathered bedrock intervals. The supergene mineralization is less than 20 feet thick. The mineralized surficial materials include three zones: (1) a one-foot thick zone of organic-rich mudstone and sandstone containing basalt cobbles that may be a debris flow; (2) a zone up to 10 feet thick of arkosic sandstone containing carbonized wood fragments; and (3) a zone of granitic grus or semi-consolidated arkosic sandstone and mudstone. Some arkosic sandstone fragments contain 11 percent U3O8 and some basalt fragments have uraniferous weathering rinds. Epigenetic mineralization is considered to be early Eocene in age, a time when the climate was temperate or subtropical (Dickinson and others, 1987). This is the age of the host rocks and the mineralization must have occurred before later Tertiary faulting disrupted groundwater flow eastward from the Darby pluton. The supergene mineralization is Recent in age and may be ongoing today. The Death Valley sandstone-type uranium deposit is the farthest north of its type in the world. At the time of its formation, it was probably at an even higher latitude than it is today, 64 degrees north.

The Boulder Creek deposit is currently (2008) a joint venture between Full Metals Minerals (2007) and Triex Minerals (2007), with Triex as the operator. Triex completed a four-week reconnaissance program in 2005 and identified several geochemical anomalies in the surrounding area. In 2006, they drilled 14 core holes totaling 1,237 meters. Twelve of the holes were on the Boulder Creek deposit; the drilling did not change the known dimensions of the deposit. They drilled two additional holes on geochemical anomalies about 6 kilometers north-northwest of the Boulder Creek deposit; they did not intersect significant mineralization but they did cut rocks favorable for uranium mineralization. Triex drilled another 8 holes in 2007 that totaled 890 meters to better define the deposit. Triex noted that 'No new and continuous zones of significant radioactivity were intersected' although the drilling through 2007 confirmed the grade and thickness of the deposit.

On the basis of airborne geophysical anomalies, Triex also staked a large block of claims in 2006 about 25 kilometers to the southwest in the southeast portion of McCarthy Marsh. They followed up these anomalies in 2006 by considerable soil sampling and biogeochemical surveys.

Alteration:

Various clays are developed in the sedimentary host rocks of the epigenetic deposit that may reflect alteration processes. The supergene enrichment accompanies alteration associated with weathering processes.

Age of mineralization:

The epigenetic mineralization is considered to be early Eocene in age, a time when the climate was temperate or subtropical (Dickinson and others, 1987). This is the age of the sedimentary host rocks and mineralization must have occurred before Tertiary faulting disrupted groundwater flowing eastward from the Darby pluton. Supergene processes are at least Recent in age and may be ongoing today.

Generic deposit model:

Deposit model:

Sandstone U (Cox and Singer, 1986; model 30c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

30c

Production Status: None

Site Status: Active

Workings/exploration:

The Death Valley sandstone-type uranium deposit (Dickinson and others, 1987) was discovered in 1977 and soon explored and drilled by the Houston International Minerals Corporation. Houston Oil and Minerals completed 3,300 meters of core drilling in 52 holes and about 60 m of near-surface split-tube sampling in 21 holes, focused on the Discovery Zone area. Surface grab samples reported by previous

operators returned up to 34 percent U3O8; intercepts of up to 3.3 meters, averaged 0.58 percent U3O8.
As of 2008, the Boulder Creek deposit was a joint venture between Full Metals Minerals and Triex Minerals, with Triex as the operator. Triex completed a four-week reconnaissance program in 2005 and identified several geochemical anomalies in the surrounding area. In 2006, they drilled 14 core holes totaling 1,237 meters. Twelve of the holes were on the Boulder Creek deposit. They drilled two additional holes on geochemical anomalies about 6 kilometers north-northwest of the Boulder Creek deposit; they did not intersect significant mineralization but they did cut rocks favorable for uranium mineralization. Triex drilled another 8 holes in 2007 that totaled 890 meters to better define the deposit.

On the basis of airborne geophysical anomalies, Triex also staked a large block of claims in 2006 about 25 kilometers to the southwest in the southeast portion of McCarthy Marsh. They followed up these anomalies in 2006 by considerable soil sampling and biogeochemical surveys.

Production notes:

None.

Reserves:

The principal mineralized zone that has been defined by drilling covers an area of 395 by 9,850 feet and averages 10 feet in thickness. This deposit has a calculated resource of 1,000,000 pounds of U3O8 at an average grade of 0.27 percent U3O8 (Dickinson and others, 1987). This is the largest presently known uranium deposit in Alaska. The work by Triex and Full Metal Minerals from 2005 to 2007 confirms the grade and thickness of the deposit but they emphasize that the historical reserve figures are not in conformity with modern standards.

Additional comments:

References:

Dickinson, K.A., Cunningham, K.D., and Ager, T.A, 1987, Geology and origin of the Death Valley uranium deposit, Seward Peninsula, Alaska: Economic Geology, v. 82, p. 1558-1574.

Fisher, M.A., Patton, W.W., Jr., and Holmes, M.L., 1982, Geology of Norton Basin and continental shelf beneath northwestern Bering Sea, Alaska: American Association of Petroleum Geologists Bulletin, v. 66, p. 255-285.

Full Metal Minerals, 2007 (Boulder Creek): http://www.fullmetalminerals.com/s/bouldercreek.asp (as of April 2007).

Gamble, B.M., 1988, Non-placer mineral occurrences in the Solomon, Bendeleben, and southern part of the Kotzebue quadrangles, western Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1838-B, 13 p., 1 sheet, scale 1:250,000.

Johnson, B.R., Miller, T.P., and Karl, Susan, 1979, Uranium-thorium investigations of the Darby pluton, Seward Peninsula, Alaska: U.S. Geological Survey Circular 804-B, p. B68-B70.

Miller, T.P., and Bunker, C.M., 1976, A reconnaissance study of the uranium and thorium contents of plutonic rocks of the southeastern Seward Peninsula, Alaska: U.S. Geological Survey Journal of Research, v. 4, p. 367-377.

Triex Minerals, 2007a: Boulder Creek: http://www.triexminerals.com/s/BoulderCreek.asp (as of April 15, 2007)

Triex Minerals Corp., 2007b, Triex Minerals and Full Metal Minerals: 2007, 2007 Alaska progam completed - New uranium mineralization discovered at Fireweed: http://www.triexminerals.com/s/NewsReleases.asp?ReportID=268433&_Type=News-Releases&_Title=Triex-Minerals-and-Full-Metal-Minerals-2007-Alaska-Program-Completed-New-Ur...

Primary Reference: Dickinson and others, 1987; Triex, 2007 (Fireweed)

Reporter(s): Travis L. Hudson (Applied Geology, Inc.); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): RWM

Site type: Prospect

ARDF no.: BN143

Latitude: 65.8572 **Quadrangle:** BN D-3

Longitude: 163.2146

Location description and accuracy:

This prospect is on the ridge between the headwaters of the Inmachuk River and Old Glory Creek in the SW1/4 of section 1, T. 6 N., R. 22 W. It is at an elevation of about 1,000 feet and about 0.8 mile northwest of the Nelson Creek lode gold occurrence (BN059).

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals: Quartz?

Geologic description:

In the Fall of 2004, Royal Pretoria Gold Ltd. staked 2 State of Alaska mining claims and did a soil survey on this prospect. Altar Resources developed the prospect concept, conducted the field work, and held the property in 2004. Soil samples were collected on a 2,200 by 2,400 meter soil grid; the samples were taken 100 meters apart on nine, east-west sample lines, 300 m apart. The samples defined a northwest-trending gold anomaly. The gold content of the soil was as high as 735 parts per billion; anomalous gold values were obtained on 7 of the 9 soil sample lines. Other anomalous elements include arsenic and antimony. On April 7, 2006, Full Metal Minerals (2006, ID=53) announced that it had entered an agreement to acquire 100 percent of this property.

The rocks in the area of this prospect are Paleozoic metasedimentary schist and marble (Till and others, 1986). A northwest-trending fault zone may localize gold mineralization in this area.

Alteration:

Silicification?

Age of mineralization:

Probably mid-Cretaceous.

Generic deposit model:

Deposit model:

Probably quartz veins and segregations in metasedimentary rocks (Cox and Singer, 1986, model 36a?)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a?

Production Status: None

Site Status: Active

Workings/exploration:

In the Fall of 2004, Royal Pretoria Gold Ltd. staked 2 State of Alaska mining claims and did a soil survey on this prospect. Altar Resources developed the prospect concept, conducted the field work, and held the property in 2004. Soil samples were collected on a 2,200- by 2,400-meter soil grid; the samples were taken 100 meters apart on 9 east-west sample lines, 300 meters apart. On April 7, 2006, Full Metal Minerals announced that it had entered an agreement to acquire 100 percent of this property.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Full Metal Minerals, 2006 (ID=53): (http://www.fullmetalminerals.com/news-release.php?news_ID=53; April 2006).

Till, A.B., Dumoulin, J.A., Gamble, B. ., Kaufman, D.S., and Carroll, P.I., 1986, Preliminary geologic map and fossil data, Soloman, Bendeleben, and southern Kotzebue quadrangles, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 86-276, 10 p., 3 plates, scale 1:250,000.

Primary Reference: This record

Reporter(s): Travis L. Hudson (Applied Geology, Inc.)

Last report date: 2005-10-12

Site name(s): Fireweed

Site type: Prospect

ARDF no.: BN144

Latitude: 65.2284 **Quadrangle:** BN A-1

Longitude: 162.4863

Location description and accuracy:

The Fireweed prospect is at the northwest end of Death Valley near the head of Granite Creek. it is about 1.2 miles east of hill 1284 and about 0.3 mile west of the center of section 13, T. 3 S., R. 19 W. The location is accurate.

Commodities:

Main: U

Other:

Ore minerals:

Gangue minerals: Hematite, quartz

Geologic description:

The Fireweed prospect was discovered in 2007 by a joint effort of Triex Minerals Corp. (2007) and Full Metal Minerals during a regional program of uranium exploration. The program was based on an airborne geophysical survey that identified several strong radiometric anomalies and an exploration model based on other uranium deposits in the area. The Fireweed area was covered by a grid of soil samples, ground geophysical surveys, sampling of rocks at the surface, and 5 short diamond-drill holes totaling 267 meters in 2007.

The prospect is on the eastern flank of a coarse-grained Cretaceous quartz syenite stock. But at the prospect itself, the rock is largely weathered outcrops of green feldspar porphyry and aplite. Twenty-one rock samples collected from three areas along nearly 2 kms of the prospect contained 0.14 to 0.82 percent U_3O_8. More than 300 pebbles of silica-hematite rock that were collected over an area about 1,800 meters long by 700 meters wide, had an average scintillometer reading of 4,500 counts per second and 34 had values above 15,000 counts per second. The five drill holes were mostly in quartz syenite; one cut hematite-silica zones similar in mineralogy to the pebbles collected at the surface.

Alteration:

The mineralization is associated with zones of hematite and quartz.

Age of mineralization:

Probably Cretaceous or Tertiary based on the age of the host rocks and similarities to other uranium deposits in the area.

Generic deposit model:

Deposit model:

Uraniferous, hematite-quartz zones in syenite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The Fireweed prospect was discovered in 2007 by a joint effort of Triex Minerals Corp. (2007) and Full Metal Minerals during a regional program of uranium exploration . The program was based on an airborne geophysical survey that identified several strong radiometric anomalies and on an exploration model based on other uranium deposits in the area. The Fireweed area was covered by a grid of soil samples, ground geophysical surveys, sampling of rocks at the surface, and 5 short diamond-drill holes totaling 267 meters in 2007.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Triex Minerals Corp., 2007, Triex and Full Metals Minerals: 2007 Alaska program completed - New uranium mineralization discovered at Fireweed: http://www.triexminerals.com/s/NewsReleases.asp?ReportID=268433&_Type=News-Releases&_Title=Triex-Minerals-and-Full-Metal-Minerals-2007-Alaska-Program-Completed-New-Ur...

Primary Reference: Triex Minerals Corp., 2007 (Fireweed).

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Unnamed (on Albion Creek)

Site type: Prospect

ARDF no.: BN145

Latitude: 65.0232 **Quadrangle:** BN A-4

Longitude: 163.7217

Location description and accuracy:

This prospect is at the head of Albion Creek, a short tributary near the head of Ophir Creek. It is about 8.9 miles north-northwest of Council and about 0.3 mile west of the center of section 27, T.5 S., R. 25 W. The location is accurate to within a mile.

Commodities:

Main: Au

Other: As

Ore minerals: Gold

Gangue minerals:

Geologic description:

In 2010, Millrock Resources in a joint venture with Kinross Gold Corp. drilled 17 holes less than 120 meters deep on a gold-arsenic soil anomaly in gold and arsenic that extends over a 900 by 2,000 meter area (Millrock Resources, 2010). The anomaly and drilling coincided with what in the headwaters of Albion Creek (BN 103) may be a residual placer over lode mineralization. The drill holes began and ended in calcareous schist of the Precambrian or Paleozoic Nome Group. Two of the holes intersected mineralization. The best intercepts were 15 feet that assayed 1.42 grams of gold per tonne and 30 feet that assayed 2.01 grams of gold per tonne.

Alteration:

Note noted.

Age of mineralization:

No information other than the host rocks are Precambrian or Paleozoic.

Generic deposit model:

Deposit model:

Gold-quartz vein? (Cox and Singer, 1986; model 36a?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a?

Production Status: None

Site Status: Active

Workings/exploration:

Covered by a extensive geochemical survey. In 2010, Millrock Resources in a joint venture with Kinross Gold Corp. drilled 17 holes less than 120 meters deep on a likely residual gold placer that coincides with a strong gold-arsenic geochemical anomaly (Millrock Resources, 2010).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Millrock Resources Inc., 2010, Millrock and Kinross report results from drill program and surface geochemical surveys at Council gold project, Alaska:http://www.millrockresources.com/news/millrock_and_kinross_report_results_from_drill_program_and_surface_geochemi/ (News release, Oct. 22, 2010).

Primary Reference: Millrock Resources Inc. 2010

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Gold Bench

Site type: Mine

ARDF no.: BT003

Latitude: 66.981 **Quadrangle:** BT D-2

Longitude: 150.6367

Location description and accuracy:

Gold Bench is on a prominent bend in the South Fork Koyukuk River, about 1.2 miles upstream from the mouth of John R Creek. The mine is named on the current (1975) Bettles D-2 topographic map. The placer is about 1,000 feet wide, 2,000 feet long, and covers an area of about 60 to 100 acres. The location is accurate.

Commodities:

Main: Au

Other: Bi?, Cu, Hg, Pb, REE, Sn, Th, Ti, U, W

Ore minerals: Bismuthinite?, cassiterite, chalcopyrite, cinnabar, galena, gold, magnetite, monazite, pyrite, rutile, scheelite, uranothorianite

Gangue minerals: Garnet, hematite, magnetite, sphene

Geologic description:

Gold Bench was one of the richest of the bench gravels that have been mined along the South Fork of the Koyukuk River Kurtak and others, 2002). Gold was discovered in 1900 and there were several episodes of mining, notably from 1901 to 1910, and in 1945. The early mining was by ground sluicing and shoveling in and by 1937 about 100 acres had been mined. Hydraulic mining in the mid-1940s used a dragline. Production of 8,788 ounces of gold can be documented from incomplete records.

The gold-bearing gravel lies on top of a sloping bench inside a prominent bend in the South Fork of the Koyukuk River. The bench is about 1,000 feet wide and 4,000 feet long. Maddren (1913) reported that the gold was on false bedrock of reddish sand. The richest area was 150 to 200 feet wide and about 1,200 feet long. The gold is fine, flattened, and flaky. Reed (1938) reported that the gold was on false bedrock of blue clay developed from shale, overlain by 6 to 10 feet of gravel with many large boulders.

Samples of concentrates contained a variety of accessory minerals including magnetite, hematite, garnet, pyrite, chalcopyrite, cinnabar, rutile, cassiterite, scheelite, monazite, uranothorianite, galena, sphene, possibly bismuthinite and up to 0.18 percent equivalent uranium (Wedow and others, 1952; Nelson and others, 1954). The source of the gold is not known. Maddren (1913) speculated that it might have come from the Tramway Bar (WI006) area on the Middle Fork Koyukuk River or, more likely, from the hills to the south. Cobb (1973) thought that at least some of the gold was probably from reworked glacial deposits.

Kurtak and others (2002) sampled the placer for the Bureau of Land Management and estimated an 'inferred resource' of 160,000 cubic yards with an average grade of 0.005 ounce of gold per cubic yard. They also indicated that the bench gravel has mostly been mined out and the gravel in the modern channel of the river was subeconomic.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Probably inactive

Workings/exploration:

Gold Bench was one of the richest of the bench gravels that have been mined along the South Fork of the Koyukuk River. Gold was discovered in 1900 and there were several episodes of mining, notably from 1901 to 1910, and in 1945. The early mining was by ground sluicing and shoveling in and by 1937 about 100 acres had been mined. The hydraulic mining in the mid-1940s used a dragline.

Production notes:

Production of 8,788 ounces of gold can be documented from incomplete records (Kurtak and others, 2002).

Reserves:

Kurtak and others (2002) sampled the placer for the Bureau of Land Management and estimated an 'inferred resource' of 160,000 cubic yards with an average grade of 0.005 ounce of gold per cubic yard. They also indicated that the bench gravel has mostly been mined out and the gravel in the modern channel of the river was subeconomic.

Additional comments:

Pleistocene bones are said to have been common in the gravels of Gold Bench (Reed, 1938). See also: Ironside Bench (BT004).

MAS No. 0020390001

References:

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Cobb, E.H., 1972, Metallic mineral resources map of the Bettles quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-387, 1 sheet, scale 1:250,000.

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Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

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Wedow, Helmuth, Jr., 1953, Preliminary summary of reconnaissance for uranium and thorium in Alaska, 1952: U.S. Geological Survey Circular 248, 15 p.

Wedow, Helmuth, Jr., White, M.G. and Moxham, R.M., 1952, Interim report on an appraisal of the uranium possibilities of Alaska: U.S. Geological Survey Open-File Report 51, 123 p.

White, M.G., 1952, Radioactivity of selected rocks and placer concentrates from northeastern Alaska: U.S. Geological Survey Circular 195, 12 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Ironside Bench; Ironside Bar

Site type: Mine

ARDF no.: BT004

Latitude: 66.987 **Quadrangle:** BT D-2

Longitude: 150.6103

Location description and accuracy:

The Ironside Bench is along the south side of the South Fork Koyukuk River about a mile upstream from Gold Bench (BT003). Both Ironside Bench and Gold Bench are named on the current (1975) Bettles D-2 topographic map. The mine is near the center of the south boundary of section 5, T. 25 N., R. 14 W., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Placer gold was discovered on the Ironside Bench of the South Fork of the Koyukuk river in 1900 (Maddren, 1913; Kurtak and others, 2002). Placer mining by hand methods and with heavy equipment continued at erratic intervals until 1941, but only 243 ounces of gold production can be documented. These were mined by ground sluicing and shoveling in 1937 and about 40 acres were said to have been mined by that time (Reed, 1938). Mining took place on a channel about 30 feet higher than the modern channel of the South Fork of the Koyukuk River. The gold was in gravel on a false bedrock (?) surface of decomposed shale. The gravel is coarse with few boulders and there was 6 to 30 feet of gravel, muck and ice over the false bedrock. The gold was distributed through gravel that assayed 0.007 to 0.016 ounce of gold per cubic yard. There was prospecting as recently as 1999 and numerous test pits, tailings piles, and mining equipment from past mining were on the property in 2000. In a 7-foot-deep test pit, Kurtak and others (2002) collected a sample of unmined gravel that contained 0.107 ounce of gold per cubic yard. Kurtak and others (2002) estimated an 'inferred resource' of 50,000 cubic yards with a grade of 0.107 ounce of gold per cubic yard.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active?

Workings/exploration:

Placer gold was discovered on the Ironside Bench of the South Fork of the Koyukuk river in 1900 (Maddren, 1913; Kurtak and others, 2002). Placer mining by hand methods and with heavy equipment continued at erratic intervals until 1941, but only 243 ounces of gold production can be documented. These were mined by ground sluicing and shoveling in 1937 and about 40 acres were said to have been mined by that time (Reed, 1938). There was prospecting as recently as 1999 and numerous test pits, tailings piles, and mining equipment from past mining were on the property in 2000. Sampling by the U.S. Bureau of Land Management in the early 2000s.

Production notes:

Kurtak and others (2002) document production of 243 ounces of gold but the data are incomplete.

Reserves:

Kurtak and others (2002) estimate an 'inferred resource' of 50,000 cubic yards with a grade of 0.107 ounce of gold per cubic yard.

Additional comments:

See also: Gold Bench (BT003).
MAS No. 0020390043

References:

Bottge, R.G., 1986, Maps summarizing land availability for mineral exploration and development in northcentral Alaska, 1985: U.S. Bureau of Mines Open-File Report 70-86, 14 sheets.

Bundtzen, T.K., Swainbank, R.C., Wood, J.E., Clough, A.H., 1991 (1992), Alaska's Mineral Industry 1991: Alaska Division of Geological & Geophysical Surveys, Special Report 46, 89 p.

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Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p.

284-315.

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Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Schrader, F.C., 1904, A reconnaissance in northern Alaska across the Rocky Mountains, along Koyukuk, John, Anaktuvuk, and Colville rivers and the Arctic coast to Cape Lisburne, in 1901, with notes by W.J. Peters: U.S. Geological Survey Professional Paper 20, 139 p.

Swainbank, R.C., Bundtzen, T.K., Clough, A.H., Hansen, E.W., and Nelson, M.G., 1993, Alaska's mineral industry, 1992: Alaska Division of Geological and Geophysical Surveys Special Report 47, 80 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Davis Creek

Site type: Mine

ARDF no.: BT006

Latitude: 66.994 **Quadrangle:** BT D-1

Longitude: 150.4687

Location description and accuracy:

Davis Creek is a tributary to the South Fork, Koyukuk River; the lower half mile of the creek has been extensively mined. The mouth of Davis Creek is about 3.6 miles northwest of the center of Grayling Lake. The center of the mining is about 0.3 mile west of the center of section 17, T. 25 N., R. 13 W., of the Fairbanks Meridian.

Commodities:

Main: Au

Other: Bi, Cu, W, Zn

Ore minerals: Bismuth?, gold, pyrrhotite, scheelite

Gangue minerals: Quartz

Geologic description:

The lower one-quarter to one-half mile of Davis Creek has been extensively placer mined by hand and mechanized methods (Kurtak and others, 2002). Gold was discovered on Davis Creek prior to 1908 but there apparently was little mining between World War I and World War II (Maddren, 1913; Reed, 1938). Kurtak and others (2002) report small-scale mining from 1995 to 2001.

Placer gold was recovered on bedrock along the modern channel of Davis Creek and on benches on the north side of the creek. For about a quarter mile above its mouth, Davis Creek cuts through gravel up to 50 feet thick that was probably deposited by the ancestral South Fork of the Koyukuk River. The modern stream and bench placers may be the result of reworking this ancestral gravel. Samples of the placer concentrates are anomalous in bismuth, tungsten, zinc, and copper. One placer concentrate assayed 1,591 part per million (ppm) bismuth and a soft metallic grain in the concentrates may have been native bismuth.

The total production is unknown but 242 ounces of gold were produced from 1900 to 1909 (Maddren, 1913). Kurtak and others (2002) estimate a resource of 23,000 cubic yards of gravel with an average grade of 0.016 ounce of gold per cubic yard.

Bedrock near the mouth of the creek is Paleozoic chlorite schist with lenses of metamorphic quartz up to 1.0 foot thick (Kurtak and other, 2002). Select samples of quartz with pyrrhotite contained up to 150 parts per billion gold and 444 ppm copper. The schist is overlain by Jurassic, mafic volcanic and intrusive rocks, Jurassic ultramafic rocks, and Cretaceous quartz-pebble conglomerate.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Inactive

Workings/exploration:

The lower one-quarter to one-half mile of Davis Creek has been extensively placer mined by hand and mechanized methods (Kurtak and others, 2002). Gold was discovered on Davis Creek prior to 1908 but there was apparently little mining between World War I and World War II (Maddren, 1913; Reed, 1938). Kurtak and others (2002) report small-scale mining from 1995 to 2001.

Production notes:

The total production is unknown but 242 ounces of gold were produced from 1900 to 1909 (Maddren, 1913).

Reserves:

Kurtak and others (2002) estimate a resource of 23,000 cubic yards of gravel with an average grade of 0.016 ounce of gold per cubic yard.

Additional comments:

MAS No. 0020390037

References:

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of Economic Geologists, Littleton, Colorado, p. 813-843.

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Swainbank, R.C., Bundtzen, T.K., and Wood, J.E., 1991, Alaska's mineral industry, 1990: Alaska Division of Geological and Geophysical Surveys Special Report 45, 78 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Prospect Creek

Site type: Mine

ARDF no.: BT008

Latitude: 66.793 **Quadrangle:** BT D-2

Longitude: 150.5119

Location description and accuracy:

The mouth of Prospect Creek on the Jim River is near the Prospect Creek camp on the Dalton Highway. There has been considerable mining and exploration along the lower 6.5 miles of Prospect Creek. The coordinates are about 6 miles upstream on the creek where there was a substantial mining operation in 2001, near the center of section 14, T. 23 N., R. 13 W., of the Fairbanks Meridian.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Although gold was discovered on Prospect Creek in 1909 (Maddren, 1913) and there are numerous test pits and tailings along the lower 6 or 7 miles of the creek that may predate World War II, there were few descriptions of the placers until the 1970s (Kurtak and others, 2002). In the 1970s and 1980s there was much claim staking and and prospecting by several parties. The creek was placer mined in 1993 and 1997 and in 2001 there was a substantial placer mine using mechanized equipment and a washing plant about 6.5 miles above the mouth of the creek. There is no public record of production which may have been substantial from 1993 to 2001.

The placers worked from the late 1990s to 2001 were in elevated bedrock benches; the gold was in blue clay, covered by 3 to 20 feet of gravel on greenstone bedrock. The pay zones assayed 0.004 to 0.007 ounce of gold per cubic yard. Nuggets weighted up to 0.7 ounce.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active?

Workings/exploration:

Although gold was discovered on Prospect Creek in 1909 (Maddren, 1913) and there are numerous test pits and tailings along the lower 6 or 7 miles of the creek that may predate World War II, there were few descriptions of the placers until the 1970s (Kurtak and others, 2002). In the 1970s and 1980s there was much claim staking and and prospecting by several parties. The creek was placer mined in 1993 and 1997 and in 2001 there was a substantial placer mine using mechanized equipment and a washing plant about 6.5 miles above the mouth of the creek. There is no public record of production which may have been substantial from 1993 to 2001.

Production notes:

There is no public record of production which may have been substantial from 1993 to 2001.

Reserves:

None.

Additional comments:

MAS No. 0020390038

References:

Bundtzen, T.K., Swainbank, R.C., Clough, A.H., Henning, M.W., and Hansen, E.W., 1994, Alaska's mineral industry, 1993: Alaska Division of Geological and Geophysical Surveys Special Report 48, 84 p.

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Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Bonanza, Beef

Site type: Prospect

ARDF no.: BT009

Latitude: 66.6301 **Quadrangle:** BT C-1

Longitude: 150.0261

Location description and accuracy:

The Bonanza prospect is near the center of a small hill informally called Windy Knob, which is about 14.8 miles at an azimuth of 302 degrees from the high peak of Dall Mountain. it is about 0.3 mile south-southwest of the center of section 19, T. 21 N., R. 12 W., of the Fairbanks Meridian. Other similar, lower grade deposits are scattered over an area about 1.5 miles wide and 5.5 miles long, which extends east into the adjacent Beaver 1:250,000-scale quadrangle. The coordinates are the center of the Bonanza claim block, which is the locus of the principal mineral showings in the area. The location is accurate.

Commodities:

Main: Mo, Pb, W, Zn

Other: Ag, Cu

Ore minerals: Chalcopyrite, molybdenite, pyrrhotite, scheelite, sphalerite

Gangue minerals: Calc-silicate minerals, garnet, pyroxene, quartz

Geologic description:

The Bonanza prospect was found by BP Exploration in 1976 by following up a stream-sediment anomaly (Kurtak and others, 2002). From 1978 to 1982, the prospect was mapped and sampled by WGM Inc., Union Carbide, and Patino Inc. Six trenches were cut.

The Bonanza prospect is the most significant of several deposits along a 5-mile long, east-striking belt of intermittent skarn mineralization along the north side of the Cretaceous Kanuti Pluton which intrudes Proterozoic and lower Paleozoic sedimentary rocks (Clautice, 1983, 1984, 1987; Kurtak and others, 2002; Patton and others, 2009). At the Bonanza prospect, small masses of limestone are altered to calc-silcate rocks that vary from fine-grained, siliceous pyroxene-garnet skarn to dark green, pyroxene skarn. The skarn contains up to 10 percent pyrrhotite, coarse-grained scheelite, sphalerite, and minor chalcopyrite, molybdenite, and galena. The scheelite commonly occurs as disseminated grains in relatively sulfide-free pyroxene-garnet skarn. Scheelite also occurs on fracture surfaces in calc-silicate schist and less commonly in quartz veins. Molybdenite typically occurs as rosettes and small flakes in quartz veins in biotite-quartz monzonite and less commonly in aplite, pegmatite, and calc-silicate rock. The skarn zones are discontinuous, irregularly shaped, and are up to 16 feet wide and 50 feet long. Kurtak and others (2002) collected several samples that contained up to 1.44 percent tungsten, 1,438 parts per million (ppm) zinc, and 936 ppm lead. Clautice (1983) collected a sample that contained 0.89 percent tungsten, 300 grams of silver per tonne, and 0.65 percent copper.

Kurtak and others (2002) briefly examined similar, lower grade skarn mineralization at the Beef claims, about 1.6 mile east of the Bonanza prospect. Trace molybdenite was identified along fractures in the skarn; a sample contained 521 ppm tungsten and 80 ppm molybdenum.

Alteration:

Calc-silicate skarn.

Age of mineralization:

Cretaceous skarn deposit at the periphery of a felsic pluton.

Generic deposit model:

Deposit model:
W skarn deposit (Cox and Singer, 1986; model 14a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
14a

Production Status: None

Site Status: Probably inactive

Workings/exploration:
The Bonanza prospect was found by BP Exploration in 1976 by following up a stream sediment anomaly (Kurtak and others, 2002). From 1978 to 1982, the prospect was mapped and sampled by WGM Inc., Union Carbide, and Patino Inc. Six trenches were cut.

Production notes:
None.

Reserves:
None.

Additional comments:
The skarn mineralization extends east into the Beaver, 1:250,000-scale, quadrangle.
MAS No. 0020390051

References:

Clautice, K.H., 1978, Mineral deposits of the Kanuti River area--A summary report: U.S. Bureau of Mines Open-File Report 66-78, 15 p.

Clautice, K.H., 1983, Geological sampling and magnetic surveys of a tungsten occurrence, Bonanza Creek area, Hodzana highlands, Alaska: U.S. Bureau of Mines Open-File Report 80-83, 80 p., 4 sheets.

Clautice, K.H., 1984, Methods for finding and evaluating tungsten skarns, a case history of Bonanza Creek, Alaska: University of Alaska, Fairbanks, Master of Science thesis, 114 p.

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Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Patton, W.W., Jr., Wilson, F.H., Labay, K.A., and Shew , Nora, 2009, Geologic map of the Yukon-Koyukuk Basin, Alaska: U.S. Geological Survey Scientific Investigations Map 2909, 26 p., 2 sheets, scale 1:500,000.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (southeast of Sithylemenkat Lake)

Site type: Occurrences

ARDF no.: BT018

Latitude: 66.0265 **Quadrangle:** BT A-3

Longitude: 151.1472

Location description and accuracy:

This record describes several lode occurrences approximately 9 to 10 miles southeast of the center of Sithylemenkat Lake. The occurrences are centered at an elevation of about 2,350 feet, about 0.3 mile east-northeast of the center of section 21, T. 14 N., R.17 W., of the Fairbanks Meridian. Similar lode deposits are about 1 mile south and about 1.5 mile northeast. The location is accurate. (See also the nearby tin placer at the head of Kanuti Kilolitna River (BT020) whose source is probably these lode deposits.)

Commodities:

Main: Sn

Other: As, Bi, Cs, Cu, Nb, Pb, Rb, REE, Ta, W

Ore minerals: Arsenopyrite, cassiterite, galena, hematite, ilmenite, magnetite, molybdenite, monazite?, pyrite, wolframite

Gangue minerals: Chlorite, garnet, quartz, sericite, tourmaline

Geologic description:

The tin lodes and placers in this area were first identified by Asarco in 1975 after a review of geochemical data collected by the U.S. Geological Survey in 1968 and 1969 (Patton and Miller, 1973; Kurtak and others, 2002). From 1975 to 1983 a succession of companies and organizations including the U.S. Bureau of Mines, WGM Inc., British Petroleum, Patino Inc., and Doyon Ltd. mapped and studied the lodes and placers (Bright, 1989; WGM Inc., 1978, 1979a, 1979b, 1980a, 1980b; Patino Ltd., 1981, 1982; Barker and Foley, 1986).

The lode tin prospects are associated with the Early Cretaceous Sithylemenkat granitic batholith (Barker and Foley, 1986; Kurtak and others, 2002). Cassiterite has been identified in chlorite-rich and locally magnetite-bearing greisen zones in the granitic rocks. Mineralized samples exhibit variable effects of greisenization, with tourmaline and magnetite sometimes present. Sericite-quartz veins and altered dikes contain abundant secondary chlorite and may contain up to several percent sulfides. The sulfide minerals include pyrite, arsenopyrite, galena, and molybdenite. The greisen range in color from light to dark green; the highest tin values are in the darker varieties. The extent of the greisen is difficult to determine owing to poor exposures. Some zones have been traced for as much as 1,200 feet, and one greisen zone is up to 10 feet thick (Barker and Foley, 1986).

Thin sections of the greisen show relict porphyritic texture; feldspar phenocrysts are replaced by intergrown quartz and sericite, which in the more altered samples are replaced by chlorite and clay minerals.

Greisen samples contained 25 to 2,300 parts per million (ppm) tin (Barker and Foley, 1986). The analyses also showed up to 5,126 ppm arsenic, 326 ppm, bismuth, 253 ppm cesium, 1,808 ppm copper, 3.4 percent lead, 1,156 ppm rubidium, 135 ppm tungsten, and 4,044 ppm zinc. Other samples contained anomalous tin, zinc, copper, and lead, as well as up to 25.9 ppm silver, 75.6 ppm uranium, and 101 ppm thorium (Kurtak and others, 2002).

Alteration:

Greisenization.

Age of mineralization:

The Sithylemenkat pluton, which is probably the source of the deposits, is Early Cretaceous based on a K/Ar date of 106 +/- 3 my for biotite (Patton and Miller, 1973).

Generic deposit model:

Deposit model:

Sn greisen deposits (Cox and Singer, 1986; model 15c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

15c

Production Status: None

Site Status: Undetermined

Workings/exploration:

Considerable mapping and sampling of the lode tin deposits by several government and private organizations from 1975 to 1983.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS No. 0020390061

References:

Barker, J.C., 1983, Reconnaissance of tin and tungsten in heavy mineral panned concentrates along the Trans-Alaska Pipeline Corridor, north of Livengood, interior Alaska: U.S. Bureau of Mines Open-File Report 59-83, 24 p., 2 sheets.

Barker, J.C., and Foley, J.Y., 1986, Tin reconnaissance of the Kanuti and Hodzana Rivers uplands, central Alaska: U.S. Bureau of Mines Information Circular 9104, 27 p.

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Bundtzen, T.K., Eakins, G.R., and Conwell, C.N., 1982, Review of Alaska mineral resources 1981: Alaska Division of Geological and Geophysical Surveys Annual Report 1981, 48 p.

Foley, J.Y., 1992, Ophiolite and other ultramafic metallogenic provinces in Alaska (west of the 141th meridian): U.S. Geological Survey Open-File Report 92-20-B, 55 p.

Foley, J.Y., Barker, J.C., and Brown, L.L., 1985, Critical and strategic minerals investigation in Alaska - chromium: U.S. Bureau of Mines Open-File Report 97-85, 54 p., 1 sheet.

Foley, J.Y., and McDermott, M.M., 1983, Podiform chromite occurrences in the Caribou Mountain and Lower Kanuti River areas, central Alaska; Part 1--Reconnaissance investigations: U.S. Bureau of Mines Information Circular 8915, 27 p., 1 sheet.

Herreid, G.H., 1969, Geology and geochemistry, Sithylemenkat Lake area, Bettles quadrangle, Alaska:

Alaska Division of Mines and Geology Geologic Report 35, 22 p. 1 sheet, scale 1:50,000.

Hudson, T.L., and Reed, B.L., 1997, Tin deposits of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 450-465.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

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Patino Inc., 1981, 1980 progress report, Block 5-tin: Unpublished report for Doyon Ltd., 11 p. (in files of Doyon Ltd., Fairbanks, Alaska).

Patino Ltd., 1982, 1981 annual report, Sithy I-X project area, Allakaket Block: Unpublished report for Doyon Ltd., 35 p. (in files of Doyon Ltd., Fairbanks, Alaska).

Patton, W.W., Jr., and Miller, T.P., 1973, Bedrock geologic map of Bettles and southern Wiseman quadrangles, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-492, 1 sheet, scale 1:250,000.

Patton, W.W., Jr., Wilson, F.H., Labay, K.A., and Shew , Nora, 2009, Geologic map of the Yukon-Koyukuk Basin, Alaska: U.S. Geological Survey Scientific Investigations Map 2909, 26 p., 2 sheets, scale 1:500,000.

WGM inc., 1978, 1977 annual profess report, Block 4, tin-tungsten-uranium, v. 21: Unpublished report 78-25 for Doyon Ltd., 29 p.

WGM Inc., 1979a, 1978 Block 4 general Doyon Ltd. annual progress report: Unpublished report 79-20 for Doyon Ltd., 11 p. (in files of Doyon Ltd., Fairbanks, Alaska).

WGM Inc., 1979b, Doyon Ltd. annual report, Block 4 uranium: Unpublished report 79-02 for Doyon Ltd., 12 p. (in files of Doyon Ltd., Fairbanks, Alaska).

WGM Inc., 1980a, 1979 annual progress report, Block 4-Allakaket placer tin potential: Unpublished report 80-01 for Doyon Ltd., 26 p. (in files of Doyon Ltd., Fairbanks, Alaska).

WGM Inc., 1980b, 1979 geochemistry of the Sithylemenkat pluton, Block 4: Unpublished report 80-07 for Doyon Ltd., 33 p. (in files of Doyon Ltd., Fairbanks, Alaska).

Primary Reference: Barker and Foley, 1986; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (near Prospect Creek)

Site type: Prospect

ARDF no.: BT019

Latitude: 66.7756 **Quadrangle:** BT D-2

Longitude: 150.591

Location description and accuracy:

This prospect is in the canyon of Prospect Creek, about 4.0 mile east-southeast of the Prospect Creek camp on the Dalton Highway. It is about 0.3 mile east of the center of section 33, T. 23 N., R. 14 W., of the Fairbanks Meridian.

Commodities:

Main: Au,Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, sphalerite

Gangue minerals: Quartz

Geologic description:

An east-trending, vertica l(?), felsic dike or sill, 50 or more feet thick, is exposed in a series of knobs for about 0.8 mile in the canyon of Prospect Creek (Kurtak and others, 2002). The dike locally contains a stockwork of quartz veinlets with minor chalcopyrite, galena, and sphalerite. The rocks on the south side of Prospect Creek are interlayered slate, siltstone, phyllite, and andesite. The rocks on the north side of the creek are Triassic to Jurassic basalt, diabase, and gabbro. Samples of the quartz veinlets contained up to 1,522 parts per million (ppm) zinc, 835 ppm lead, 130 ppm copper, and 24 parts per billion gold. Avalon Development Corporation explored in the area in 1999.

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Mineralized felsic dike with chalcopyrite, galena, and sphalerite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only limited sampling by government and industry.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS No. 0020390066

References:

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Patton, W.W., Jr., Miller, T.P., and Box, S/F., 1989, Road log from Yukon Crossing (mile 56) to South Fork Koyukuk River (mile 156.2) in Mull, C.G., and Adams, K.E., eds., Dalton Highway, Yukon River to Prudhoe Bay, Alaska, Bedrock geology of eastern Koyukuk basin, central Brooks Range and southcentral Arctic Slope, Alaska Division of Geological and Geophysical Surveys, Guidebook 7, v. 1, p. 69.

Primary Reference: Kurtak and others, 2002

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (at head of Kanuti Kilolitna River)

Site type: Prospect

ARDF no.: BT020

Latitude: 66.043 **Quadrangle:** BT A-3

Longitude: 151.2587

Location description and accuracy:

This placer prospect covers about 1.4 mile of an unnamed tributary at the head of Kanuti Kilolitna River. It is about 6.7 miles southeast of the center of Sitylemenkat Lake in the northern half of section 13, T. 14 N., R. 18 W., of the Fairbanks Meridian.

Commodities:

Main: Sn

Other: Cb, REE, Ta, W

Ore minerals: Cassiterite, garnet, hematite, ilmenite, monazite?, pyrite, wolframite

Gangue minerals:

Geologic description:

Tin lodes and placers in this area were first identified by Asarco in 1975 after a review of geochemical data collected by the U.S. Geological Survey in 1968 and 1969 (Patton and Miller, 1973; Kurtak and others, 2002). From 1975 to 1983 a succession of companies and organizations including the U.S. Bureau of Mines, WGM Inc., British Petroleum, Patino Ltd., and Doyon Ltd. mapped and studied the lodes and placers (Bright, 1989; WGM Inc., 1978, 1979a, 1979b, 1980a, 1980b; Patino Ltd., 1981, 1982; Barker and Foley, 1986). The lode tin deposits and the tin placers are associated with the Early Cretaceous Sithylemenkat granitic batholith (Barker and Foley, 1986; Kurtak and others, 2002).

A 1.4-mile section of the upper Kanuti Kilolitna River was drilled and bulk sampled by Patino Ltd. in 1980 and 1981 (Patino Inc., 1981, 1982). Placer samples taken in gravel that averaged about 20 feet thick contained up to 0.4 pound of tin per cubic yard, with lesser tantalum, columbium, tungsten, and rare earth minerals. In addition to cassiterite, the placer concentrates also contained wolframite, pyrite, ilmenite, hematite, garnet, and monazite (?). Patino estimated an 'indicated resource' of 3.5 million cubic yards that contained an average of 0.67 pound of tin per cubic yard. But they concluded the placer was uneconomic because of its small size and low grade.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Alluvial tin placer (Cox and Singer, 1986; model 39e).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39e

Production Status: None

Site Status: Undetermined

Workings/exploration:

Tin lodes and placers in this area were first identified by Asarco in 1975 after a review of geochemical data collected by the U.S. Geological Survey in 1968 and 1969 (Patton and Miller, 1973; Kurtak and others, 2002). From 1975 to 1983 a succession of companies and organizations including the U.S. Bureau of Mines, WGM Inc., British Petroleum, Patino Inc., and Doyon Ltd. mapped and studied the lodes and placers (Bright, 1989; WGM Inc., 1978, 1979a, 1979b, 1980a, 1980b; Patino Ltd., 1981, 1982; Barker and Foley, 1986). A 1.4-mile section of the upper Kanuti Kilolitna River was drilled and bulk sampled by Patino Ltd. in 1980 and 1981 (Patino Ltd., 1981, 1982).

Production notes:

None.

Reserves:

Patino Ltd. (1981, 1982) estimated an 'indicated resource' of 3.5 million cubic yards that contained an average of 0.67 pounds of tin per cubic yard. But they concluded the placer was uneconomic because of its small size and low grade.

Additional comments:

MAS No. 0020390067

References:

Barker, J.C., 1983, Reconnaissance of tin and tungsten in heavy mineral panned concentrates along the Trans-Alaska Pipeline Corridor, north of Livengood, interior Alaska: U.S. Bureau of Mines Open-File Report 59-83, 24 p., 2 sheets.

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Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Herreid, G.H., 1969, Geology and geochemistry, Sithylemenkat Lake area, Bettles quadrangle, Alaska: Alaska Division of Mines and Geology Geologic Report 35, 22 p. 1 sheet, scale 1:50,000.

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Patino Ltd., 1982, 1981 annual report, Sithy I-X project area, Allakaket Block: Unpublished report for Doyon Ltd., 35 p. (in files of Doyon Ltd., Fairbanks, Alaska).

Patton, W.W., Jr., and Miller, T.P., 1973, Bedrock geologic map of Bettles and southern Wiseman quadrangles, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-492, 1 sheet, scale 1:250,000.

Patton, W.W., Jr., Wilson, F.H., Labay, K.A., and Shew , Nora, 2009, Geologic map of the Yukon-Koyukuk Basin, Alaska: U.S. Geological Survey Scientific Investigations Map 2909, 26 p., 2 sheets, scale 1:500,000.

WGM inc., 1978, 1977 annual profess report, Block 4, tin-tungsten-uranium, v. 21: Unpublished report 78-25 for Doyon Ltd., 29 p.

WGM Inc., 1979a, 1978 Block 4 general Doyon Ltd. annual progress report: Unpublished report 79-20 for Doyon Ltd., 11 p. (in files of Doyon Ltd., Fairbanks, Alaska).

WGM Inc., 1979b, Doyon Ltd. annual report, Block 4 uranium: Unpublished report 79-02 for Doyon Ltd., 12 p. (in files of Doyon Ltd., Fairbanks, Alaska).

WGM Inc., 1980a, 1979 annual progress report, Block 4-Allakaket placer tin potential: Unpublished report 80-01 for Doyon Ltd., 26 p. (in files of Doyon Ltd., Fairbanks, Alaska).

WGM Inc., 1980b, 1979 geochemistry of the Sithylemenkat pluton, Block 4: Unpublished report 80-07 for Doyon Ltd., 33 p. (in files of Doyon Ltd., Fairbanks, Alaska).

Primary Reference: Kurtak and others, 2002

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): No Name Creek

Site type: Prospect

ARDF no.: BT021

Latitude: 66.1191 **Quadrangle:** BT A-1

Longitude: 150.0608

Location description and accuracy:

The prospect is about 8 to12 miles up the No Name Creek valley from its confluence with the Ray River. Site for this record is the confluence of the south fork of No Name Creek and a small, unnamed tributary from the north. Accuracy of the location is less than 1,000 feet. The prospect area extends into the Beaver Quadrangle. The prospect area is accessible from the Dalton Highway, which crosses the creek about three miles downstream of the site. This placer prospect is on, and potentially includes much of the lower No Name Creek valley, although the creek is infilled with loess and vegetation and drilling would be required. Mineralized exposures at the site are limited to hand trenches that expose a series of bench channels to both the north and south of the present drainage (Barker, 1991a,b), located in the NW¼, NE ¼ Section 22 and the SW ¼ of the SE ¼ Section 15, T. 15 N., R. 12 W., of the Fairbanks Meridian.

Commodities:

Main: Au, Sn

Other: Nb, REE, Ta, Ti, W, Zr

Ore minerals: Cassiterite, gold, ilmenite, monazite, wolframite, xenotime, zircon

Gangue minerals:

Geologic description:

The No Name Creek drainage, including its southern fork with headwaters in the Ft. Hamlin Hills pluton, flows southwesterly approximately 20 miles, ultimately joining the Ray River at the point where the Ray bends south to join the Yukon River. Much of the No Name Creek drainage downstream of the Dalton Highway is incised into, or has cut through, Miocene-age basalt flows (Albanese, 1987; Barker, 1991a, b) that overlay Tertiary (?) white gravel (Barker, 1991b). At least low grade placer tin, rare earth elements (REE), and gold occur in all heavy mineral samples collected from poorly exposed cutbanks downstream of the Dalton Highway (Barker, 1983, 1991a). At the site, however, remnant channel exposures on several low bench features contain up to six pounds of tin per cubic yard (3,580g/m3) plus significant REE mineral concentrate. Gold is noted in all samples from lower No Name but is absent in the bench channels upstream at the site (Barker, 1991a).

The Fort Hamlin Hills pluton is considered part of the broad northeast-trending peraluminous Ruby Batholith of central Alaska (Chapman and others, 1982; Patton and Miller,1970, 1973; Barker and Foley; 1986; Herreid, 1969). Generally the granitic rocks are coarse-grained, equigranular to porphyritic, orthoclase-biotite-quartz monzonite varying to granite with subordinate phases of aplite, biotite aplite, tourmaline aplite, and fine-grained quartz monzonite. Tourmaline pegmatite phases have been recognized locally. The granitic rocks cut Paleozoic schist, phyllite, quartzite, and lesser greenstone and limestone. The granitic plutons feature alteration zones including chloritic and hematic greisen veins/bodies that are the apparent source of at least some of the detrital cassiterite and REE minerals. Mineralogical examination of heavy mineral concentrates from the remnant bench channels confirmed abundant cassiterite and an anomalously high percentage of xenotime relative to monazite (Mariano, A., mineralogist, 2012, personal communication).

The heavy mineral concentration is enhanced by multiple stages of fluvial downcutting of the No Name

Creek drainage which has repeatedly re-concentrated earlier sediments. The result of this channel down-cutting/reworking/re-deposition at continually lower elevations is a highly concentrated heavy mineral fraction. Remnants of former alluvial terrace deposits occur high on the west and north slopes of the Fort Hamlin Hills and are found to mantle the basalt flows on lower No Name (Albanese, 1987, Barker, 1991b). Each repeated downcutting event removes and transports more of the lighter aggregate downstream, thus potentially upgrading the residual heavy mineral concentrations. Upgrading of the heavy mineral fraction in the alluvial deposits is well exemplified by the series of bench channels on east fork of No Name Creek where the highest grades are in the lowest elevation bench channels.

Remnant (late Tertiary?) terraces as high as 100 meters (320 feet) along the left limit of No Name near the Dalton Highway are evidence of ancient alluvial gravel deposition and though mineralized they contain less REE and tin in heavy mineral fractions than the present creek bed. These high-level channels of ancient No Name Creek have been developed for construction aggregate used along the Trans Alaska Pipeline (Barker, 1991a).

Alteration:

Thermal alteration from the batholith is widespread and silicification extends well into the Paleozoic host rocks. Locally extensive, tourmalization, potassic, carbonate, and argillic styles of advanced alteration can be mapped and generally are associated with regional-scale faulting. Such zones of altered and weakened rock give rise to locally intense large-scale disintegration of the bedrock granite, which has released the contained heavy minerals. Source of the placer tin- and REE- minerals appears to be widespread argillic alteration and greisen vein-like occurrences locally overprinted with chloritic and/or hematic alteration (Herreid, 1969; Barker and Foley, 1986). Greisen samples will generally contain 100 ppm to as much as 2500 ppm Sn and elevated REE. Cassiterite has also been found associated with quartz veins at a few locations in the batholith. The older fluvial deposits as represented by the remnant channels on No Name Creek also exhibit a degree of residual (in-place) concentration that are characterized by feldspar grains altered variably to white and brown clayey quartz-rich sediments that are locally seen to grade upward into unaltered cross-bedded fluvial gravel.

Age of mineralization:

The Ruby batholith region is within the glacial ice-free Quaternary province of Beringia, defined as the non-glaciated intermontane region extending from eastern Siberia and eastward across a then-dry Bering Sea floor, thence transecting interior Alaska, and extending into northwestern Canada. Across the Beringia region, the fluvial processes have generally continued since the Tertiary and consequently the region is historically known for the Pleistocene mammals that survived there, as well as a multitude of placer gold camps and districts such as the Klondike. In the Ruby batholith region, the on-going erosional and mineral concentration processes that concentrated valuable heavy minerals have apparently remained uninterrupted since the late Tertiary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer tin (Cox and Singer, 1986; model 39e).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39e

Production Status: None

Site Status: Active

Workings/exploration:

The No Name Creek prospect has been explored by the U.S. Bureau of Mines as part of the Critical and Strategic Minerals Program in the 1970s-1980s (Barker, 1983, 1991a,b; Barker and Foley, 1986). Gravel samples have been collected and processed from numerous locations along the creek and from the remnant

bench channels at the site. All samples were processed by gravity methods for the analysis of the heavy mineral content (Barker, 1991a). Ucore Rare Metals, Inc. acquired the No Name Creek claim block in 2011 and in 2012 announced additional sample results for heavy mineral concentrates from the bench channels (see data table http://ucore.com/projects/ray-mountains-alaska and (Ucore.com, Ucore Confirms Widespread Rare Earth Mineralogy in Central Alaska, January 16, 2012).

Production notes:

None.

Reserves:

A 'very preliminary' estimate of the tin resource potential for the combined Ray River and No Name Creek drainages was made by the U.S. Bureau of Mines 'for the purpose of land-use management and planning purposes.' A total of 62 to as much as 172 million pounds-tin in 300 million cubic yards of gravel was estimated to be present (Barker, 1991a). Grade is estimated between 0.2 and 0.5 pounds-tin per cubic yard; highest grade values are mostly from upper No Name Creek. No estimate was made for the REE, gold, or other possible placer minerals.

Additional comments:

No Name Creek flows through lands on which the State of Alaska has filed 'Priority Selection' under the land entitlement provision of the 1959 Statehood Act. Various temporary land withdrawals remain to be lifted by the Bureau of Land Management (BLM) before these selections can be processed. The BLM will not issue any permits for surface disturbance activities including exploration under these withdrawals or State Selection status.

References:

Albanese, M.D., 1987, A Basalt Flow in the Fort Hamlin Hills, Bettles A-1 Quadrangle, Alaska: Alaska Division of Geological & Geophysical Surveys, Public Data File 87-25, 8 p.

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Ucore Rare Metals Inc., 2012, Ucore Confirms Widespread Rare Earth Mineralogy in Central Alaska, January 16, 2012; http://www.ucore.com/ (as of January 16, 2012).

Primary Reference: Barker, 1991a

Reporter(s): J.C. Barker

Last report date: 2016-03-15

Site name(s): Gravel Pit Prospect No. 2

Site type: Occurrence

ARDF no.: BT022

Latitude: 66.0286 **Quadrangle:** BT

Longitude: 150.1823

Location description and accuracy:

The site is located about 6.5 miles southeast of the No Name Creek bridge and uphill (easterly) from the Dalton Highway. The site is southeast of the pipeline crossing over Fort Hamlin Hills Creek. The site for this record is a gravel pit adjacent to the Trans-Alaska Pipeline. The occurrence is accessible from the Dalton Highway with permission of the Pipeline security personnel. Accuracy of the location is less than 1000 feet. The site is located in the NE¼, NE ¼ Section 20, T. 14 N., R. 12 W., of the Fairbanks Meridian.

Commodities:

Main: REE, Sn

Other: Nb, Ti, W, Zr

Ore minerals: Cassiterite, monazite, wolframite, xenotime, zircon

Gangue minerals:

Geologic description:

At the site, a bulk channel sample from a well-developed remnant channel exposed in the wall of a gravel pit contained 0.24 pounds of tin per cubic yard (Barker, 1991a). The channel is incised into granite bedrock of the Fort Hamlin Hills pluton. The channel is composed granitic and metasedimentary gravel and semi-rounded granitic boulders, and likely represents an ancient channel of the Fort Hamlin Hills Creek. The Fort Hamlin Hills pluton is considered part of the broad northeast-trending peraluminous Ruby Batholith of central Alaska (Chapman and others, 1982; Patton and Miller, 1973; Barker, 2012; Barker and Foley, 1986; Herreid, 1969). Generally the granitic rocks are coarse-grained equigranular to porphyritic orthoclase-biotite-quartz monzonite varying to granite with subordinate phases of aplite, biotite aplite, tourmaline aplite, and fine-grained quartz monzonite. Tourmaline pegmatite phases have been recognized locally. The granitic rocks cut Paleozoic schist, phyllite, and quartzite within a half-mile downhill to the west.

Alteration:

Thermal alteration from the batholith is widespread and silicification extends well into the Paleozoic host rocks. The source of the placer tin and rare earth element minerals appears to be unexposed greisen zones in the granite in the Fort Hamlin Hills Creek valley. Greisen samples from the Ruby Batholith region will generally contain 100 ppm to as much as 2500 ppm tin and elevated rare earth elements. Cassiterite has also been found associated with quartz veins at a few locations elsewhere.

Age of mineralization:

Quaternary; the occurrence represents ongoing erosional and mineral concentration processes that have concentrated valuable heavy minerals, a process that has apparently continued since the late Tertiary.

Multiple stages of fluvial activity and downcutting of the Ray River drainage and its tributaries has resulted in these streams further incised into local bedrock. The Prospect Pit #2 occurrence represents an ancient channel abandoned as the creek cut new channels to its present level several hundred feet lower than the site (Barker, 1991a,b). Sampling of the present channel of Fort Hamlin Hills Creek was not possible due to infilling of frozen silt and vegetation.

These remnant terraces and channels, as high as 300ft (100 m) above present drainages along the west of the Fort Hamlin Hills pluton, are evidence of ancient (late Tertiary(?)) alluvial gravel deposition and are now perched above present-day channels of the No Name Creek and the Ray River valleys (Barker, 1991a, b, 2012).

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Sn (Cox and Singer, 1986; model 39e).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39e

Production Status: None

Site Status: Inactive

Workings/exploration:

The Gravel Pit Prospect No. 2 occurrence has been mapped and sampled by the U.S. Bureau of Mines as part of the Critical and Strategic Minerals Program in the 1970s-1980s (Barker, 1983, 1991a, 1991b). The occurrence serves as evidence of the evolving development of the accumulated placer minerals in the present active channel of Fort Hamlin Creek, which is infilled with silt and vegetation. All samples were processed by gravity methods for the analysis of the heavy mineral content (Barker, 1991a).

Production notes:

None.

Reserves:

None.

Additional comments:

The site is gated due to the close proximity to the Trans Alaska Pipeline.

References:

Barker, J. C., 1983, Reconnaissance of tin and tungsten in heavy mineral panned concentrates along the Trans-Alaska pipeline corridor, north of Livengood, interior Alaska: U.S. Bureau of Mines Open-File Report
59-83, 24 p., 2 sheets.

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Tanana quadrangle: U.S. Geological Survey Open-File Report 82-734, 20 p., scale 1:250,000.

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Primary Reference: Barker, 1991a

Reporter(s): J.C. Barker

Last report date: 2016-03-15

Site name(s): Gravel Pit Prospect No. 1

Site type: Occurrence

ARDF no.: BT023

Latitude: 66.1212 **Quadrangle:** BT A-1

Longitude: 150.132

Location description and accuracy:

The site is located adjacent to the Trans-Alaska Pipeline about 0.5 miles southeast of its crossing of No Name Creek and east from the Dalton Highway. Site for this record is along the north side of the gravel pit and accurate to within 500 feet. The occurrence is accessible from the Dalton Highway with permission of the pipeline security personnel. Two mineralized ancient channel exposures were mapped and sampled in the pit wall (Barker, 1991a,b). The site is located in the W1/2 SE1/4 Section 17, T. 14 N., R. 12 W., of the Fairbanks Meridian.

Commodities:

Main: REE, Sn

Other: Nb, Ti, W, Zr

Ore minerals: Cassiterite, ilmenite, monazite, wolframite, xenotime, zircon

Gangue minerals:

Geologic description:

At the site, two well-developed remnant channels are exposed in the wall and floor of a gravel pit perched on a prominent basalt bluff facing north toward the present No Name Creek. Channels are oriented to the southwest as is the modern No Name channel. These perched channels are ancestral No Name Creek, which is now located about 2000 feet north and about 150 feet lower. Samples contain trace to 0.12 pounds of tin per cubic yard (Barker, 1991a, b). The channels are filled with coarse gravel including cobbles of mostly granitic rock of the Fort Hamlin Hills pluton, schist, and quartz. Exposures were sampled where the channels are incised into basalt bedrock. The Fort Hamlin Hills pluton is considered part of the broad northeast-trending peraluminous Ruby Batholith of central Alaska (Chapman and others, 1982; Patton and Miller, 1970, 1973; Barker and Foley, 1986; Herreid, 1969). Generally the granitic rocks are coarse-grained equigranular to porphyritic orthoclase-biotite-quartz monzonite varying to granite with subordinate phases of aplite, biotite aplite, tourmaline aplite, and fine-grained quartz monzonite. Tourmaline pegmatite phases have been recognized locally in the nearby granite pluton.

Alteration:

Thermal alteration from the batholith is widespread, and silicification extends well into the Paleozoic host rocks. Source of the placer tin and rare earth element minerals appears to be unexposed greisen zones in the granite in the Fort Hamlin Hills pluton. Greisen samples will generally contain 100 ppm to as much as 2500 ppm tin and elevated levels of rare earth elements. Cassiterite has also been found associated with silicification and quartz veins at a few locations elsewhere.

Age of mineralization:

Quaternary; the occurrence represents ongoing erosional and mineral concentration processes that have concentrated valuable heavy minerals, a process that has apparently continued locally since the late Tertiary. An age-date from a nearby basalt flow indicates an age of 30.59 m.y. +/- 0.92 (Albanese, 1987). Multiple stages of fluvial activity and downcutting of the No Name Creek drainage has obviously occurred near this

site.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer tin (Cox and Singer, 1986; model 39e).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39e

Production Status: None

Site Status: Inactive

Workings/exploration:

The Gravel Pit Prospect No. 1 occurrence has been mapped and sampled by the U.S. Bureau of Mines as part of the Critical and Strategic Minerals Program in the 1970s-1980s (Barker, 1983, 1991a,b, 2012). The occurrence serves as evidence of the evolving development of the accumulated placer minerals in the present active channels of No Name Creek.

All samples were processed by gravity methods for the analysis of the heavy mineral content and the channel samples contain trace to 0.12 pounds of tin per cubic yard (Barker, 1991a). Values for contained REE were not estimated.

Reworking the fluvial sediment from these elevated channels due to downcutting of the modern stream generally will generally increase the grade of the heavy mineral content. By comparison, gravel from a small bar in the modern channel due north of Gravel Pit Prospect #1 contained 0.17 pounds tin per cubic yard. Discontinuous exposures of the ancient channels in Gravel Pit Prospect No. 1 would be expected to be present at similar elevations to the northeast and southwest.

Production notes:

None.

Reserves:

None.

Additional comments:

The site is gated due to the close proximity to the Trans Alaska Pipeline.

References:

Albanese, M.D., 1987, A Basalt Flow in the Fort Hamlin Hills, Bettles A-1 Quadrangle, Alaska: Alaska Division of Geological & Geophysical Surveys, Public Data File 87-25, 8 p.

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Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

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Primary Reference: Barker, 1991a

Reporter(s): J.C. Barker

Last report date: 2016-03-15

Site name(s): Unnamed (east fork of Kilolitna River)

Site type: Prospect

ARDF no.: BT024

Latitude: 66.0395 **Quadrangle:** BT A-3

Longitude: 151.0673

Location description and accuracy:

The prospect is a series of tin, tungsten, and rare earth element placer prospects along the entire 10-mile length of the unnamed creek upstream of its confluence with the Kilolitna River. The site for this record is the confluence of the two principal upper tributaries. Accuracy of the location is less than 1,000 feet. The site is located in the SW¼, NW¼ Section 13, T. 14 N., R. 17 W., of the Fairbanks Meridian, but the prospect includes Sections 2, 7, 9, 10, 11, 13, 14, 15, 16, 17, 18, 23, and 24 of T. 14 N., R. 17 W., continuing west into T. 14 N., R. 18 W. Sections 12, 13, and 14. The prospect area is best accessible by helicopter from the Dalton Highway.

Commodities:

Main: Sn, W

Other: Nb, REE, Ta, Ti, Zr

Ore minerals: Cassiterite, ilmenite, monazite, scheelite, wolframite (ferberite end-member), xenotime, zircon

Gangue minerals:

Geologic description:

The 10-mile long, unnamed creek, referred to by Ucore Rare Metals, Incorporated as the Caribou Heights prospect, drains about one-third of the known extent of the Sithylemenkat pluton (Ucore, 2012, 2014). Geological investigations recognized regional tin potential as early as 1969 (Herreid, 1969; Patton and Miller, 1970, 1973; Barker, 1983; and in early 1980s tin was specifically recognized in the valley of this record (Barker and Foley, 1986; Barker, 2012). Additional regional geochemical sampling by the Alaska Division of Geological and Geophysical Survey was reported in Bachmann, and others (2013).

The Sithylemenkat pluton is considered part of the broad northeast-trending peraluminous Ruby Batholith of central Alaska (Patton and Miller, 1970, 1973; Barker and Foley, 1986; Herreid, 1969). Generally, the granitic rocks are coarse-grained, equigranular to porphyritic, orthoclase-biotite-quartz monzonite varying to granite with subordinate phases of aplite, biotite aplite, tourmaline aplite, and fine-grained quartz monzonite. Tourmaline pegmatite phases have been recognized locally. The granitic rocks cut Paleozoic schist, phyllite, quartzite, and lesser greenstone and limestone. Mineralogical examination of heavy mineral concentrates from the bench channels and streambed samples confirmed abundant cassiterite and rare-earth minerals of monazite and xenotime (Barker and Foley, 1986).

Alteration:

The granitic pluton features alteration zones, including a large central area of argillic alteration enveloping chloritic and hematic greisen veins/bodies that are the apparent source of at least some of the detrital cassiterite, wolframite, and REE minerals. A three-mile long north-northeast trend of these intermittent and cross-cutting greisen veins/zones occurs along the ridges in sections 11, 14, 21, and 22, T. 14 N., R. 17 W., immediately south of this creek (see Figures 6 and 7 in Barker and Foley, 1986).

Thermal alteration from the batholith is widespread and silicification extends well into the Paleozoic host rocks. Locally extensive, tourmalization, potassic, carbonate, and argillic styles of advanced alteration can be mapped and generally are associated with regional-scale faulting. Such zones of altered and weakened

rock give rise to locally intense large-scale disintegration of the bedrock granite, which has released the interstitial or disseminated heavy minerals. The source of the placer tin and rare earth minerals appears to be widespread argillic alteration and greisen vein-like occurrences as described above, locally overprinted with chloritic and/or hematitic alteration (Herreid, 1969; Barker and Foley, 1986). Greisen samples will generally contain 100 ppm to as much as 2500 ppm tin and elevated rare earth elements.Cassiterite has also been found associated with quartz veins at a few locations in the batholith.

Age of mineralization:

The prospect is Quaternary age. The Ruby batholith region is within the glacial ice-free Quaternary province of Beringia, defined as the non-glaciated intermontane region extending from eastern Siberia eastward across a then-dry Bering Sea floor, thence transecting interior Alaska, and extending into northwestern Canada. Across the Beringia region, the fluvial processes have generally continued since the Tertiary and the ongoing erosional and mineral concentration processes continue to concentrate valuable heavy minerals. A few small cirques are evident to the south in the higher elevations of the Ray Mountains, but evidence of glacial disruption of accumulating placer gravel deposits at this site was not seen.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer tin (Cox and Singer, 1986; model 39e).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39e

Production Status: None

Site Status: Active

Workings/exploration:

The prospect valley of the east fork of the Kilolitna River has been explored by the U.S. Bureau of Mines as part of the Critical and Strategic Minerals Program in the 1970s-1980s. In 1970s tin and tungsten potential of the areas adjacent to the Trans-Alaska pipeline were investigated and included 17 sample sites within this prospect area (Barker, 1983) and nearly all were anomalous; Barker and Foley, in 1986, sampled the creek for its placer potential, described the apparent placer prospect, and reported results for 30 concentrated samples. In 2011 Ucore Rare Metals, Incorporated, through their subsidiary Landmark Alaska, LLP, filed a claim block and reported more detailed sample results for 27 heavy mineral concentrates from several specific bench and active channel areas (see data table, Ucore, 2012, 2014). Bucket-size channel samples of an exposed bench deposit along the uppermost right limit of the southern tributary reported as much 9,700 g of rare earth elements plus tin per cubic meter of gravel. Generally anomalous results occur along the length of the creek though frozen ground makes sampling difficult. An additional well-defined mineralized terrace was located along the left limit of the creek in Section 13, T. 14 N., R. 18 W. (Ucore, 2012).

Production notes:

None.

Reserves:

None.

Additional comments:

The creek flows through lands on which the State of Alaska has filed ‘Priority Selection’ under the land entitlement provision of the 1959 Statehood Act. Various temporary land withdrawals remain to be lifted by the Bureau of Land Management (BLM) before these selections can be processed. The BLM will not issue any permits for surface disturbance activities including exploration under these withdrawals or State

Selection status. Mining claims staked in the vicinity of this prospect are located according to the State of Alaska regulations for mineral locations on State Selected land.

References:

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Ucore Rare Metals Inc., 2014, Ucore announces field program at Ray Mountains-Alaska, press release July 21, 2014: http://ucore.com/ucore-announces-field-program-at-ray-mountains-alaska (accessed April 15, 2015).

Ucore Rare Metals Inc., 2012, Ucore confirms widespread rare earth mineralogy in central Alaska, press release January 16, 2012: http://ucore.com/ucore-confirms-widespread-rare-earth-mineralization-in-central-alaska-widespread-rare-earth-mineralization-in-central-Alaska (accessed April 15, 2015).

Primary Reference: Barker and Foley, 1986

Reporter(s): J.C. Barker

Last report date: 2016-03-15

Site name(s): Fort Hamlin Hills Metalliferous Coal

Site type: Occurrence

ARDF no.: BT025

Latitude: 66.0 **Quadrangle:** BT A-1

Longitude: 150.3386

Location description and accuracy:

The site location is the Ray River drainage where the river enters the Bettles quadrangle. The occurrences are found in a series of about six small topographic basins through which the Ray River meanders. Samples of mineralized occurrences begin on the west at 66.0240N, 150.2932W, and mineralized occurrences extend downstream for about twelve miles to at least 65.9331N, 150.0180W, where the occurrence area is covered by Quaternary gravel. It is possible that occurrences extend downstream to within a mile of the confluence with the Yukon River. Accuracy of the site and sample locations presented here is about 1,000 feet. The site location is in the SE¼, NE ¼ Section 32, T.14 N., R. 13 W., of the Fairbanks Meridian. An additional, geologically related occurrence location is reported approximately 10 miles farther upstream of the site report area and is described in the Tanana Quadrangle records (Sample No. 1, located at 65.9852, 150.5560).

Commodities:

Main: Ge, Pb, W

Other: Ag, Au, Cu, Ga, Mo, REE, Sb, U, Zr

Ore minerals:

Gangue minerals: Coal, coal ash

Geologic description:

Metalliferous coal beds occur in small, semi-closed basins along the lower Ray River immediately west of the Fort Hamlin Hills pluton and east of the Ray River pluton (Barker, 2006). Both plutons are considered part of the broad, northeast-trending, peraluminous Ruby Batholith of central Alaska (Patton and Miller, 1973; Barker and Foley, 1986). Generally the granitic rocks are coarse-grained, equigranular to porphyritic, orthoclase-biotite-quartz monzonite varying to granite with subordinate phases of aplite, biotite aplite, tourmaline aplite, and fine-grained quartz monzonite. Tourmaline pegmatite phases have been locally recognized. The granitic rocks cut Paleozoic schist, phyllite, quartzite, and lesser greenstone and limestone. The Ray River coal-bearing basins are part of a regional series of Tertiary basins that occur intermittently along the southeast margin of the batholith.

Along the lower Ray River the small, semi-closed basins, are mapped as graben features and range from several square miles in area to as little as 200 acres (Barker, 1991b, 2006). Metals are found highly concentrated in the calcium-rich coal ash derived from the coal. When prepared according to American Society for Testing Materials (ASTM, 1979) standards, ash samples will contain 0.01 to in excess of 1.0 percent each of germanium, lead, and tungsten. Ash samples also contain up to 0.5 percent total rare earth elements, and up to 0.1 percent antimony, copper, gallium, molybdenum, uranium, and zirconium. Gold and silver values are also present. All samples are variably mineralized within these limits (Barker, 2006). Tungsten in particular is consistently present with over half of the 21 samples analyzed found to contain in excess of 0.25 percent W.

The coal beds are poorly exposed and only several small rubble crops were located. However, during high water events the Ray River will rip coal fragments from the coal beds within the mudstone and conglomerate section that comprises the shallow bedrock under the river alluvium in this region. Most of the

samples comprise random chip collections of fresh material found on gravel bars following spring breakup and the accompanying seasonal high water.

Alteration:

Metal values in coal appear related to a northeast-trending series of geothermal springs that altered and mineralized the organic material during and/or after the coal-forming period, a process that was perhaps accentuated by overlying fissure basalt flows. Phosphoric alteration at the underlying contact of the basalt flows was mapped at an outcrop on the Ray River (Barker, 2006). Known geothermal springs extend about 65 miles N 60 E from Ishtalitna Creek on the southwest to the Dall River on the northeast and are assumed to correlate to a splay of the Porcupine-Kaltag fault.

Age of mineralization:

A sample of tephra from the Coal Creek-Dall River section was dated at 38.6 +/- 1.6 Ma (Barker, 1981). Albanese, 1987, reported an age of 30.59 m.y. +/- 0.92 Ma for the basalt flows at a location nearer the Dalton Highway and immediately east of the Ray River. Coal from the Ft. Hamlin Hills area is estimated to be Eocene in age.

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

The site was explored by the U.S. Bureau of Mines as part of the Critical and Strategic Minerals Program in the 1970s-1980s (Barker, 1981, 1991b, 2006; Barker and Foley, 1986). All coal rank analyses and preparation of 21 coal ash samples were done by the University of Alaska, Mineral Industry Research Laboratory. Metal values were determined by certified commercial laboratories.

Coal in the Fort Hamlin Hills area, when fresh, will break with a conchoidal fracture and will have an apparent rank of high-volatile, lignite A to subbituminous B, generally with a 6-10 weight percent ash yield. Maceral composition is dominated by vitrinite. Higher metal values of the Fort Hamlin area coal beds occur in higher sulfur (greater than 1.4 percent) coals underlying the Ray River valley as compared to nonmineralized low-sulfur coal in the Dall River valley to the northeast and elsewhere in interior Alaska, although mudstone beds stratigraphically above the Dall River coal beds are enriched in these same metals (ARDF number BV005).

Microprobe studies suggest the finely disseminated mineralization found in coal of the Ray River valley mostly occurred in peat bogs prior to, or concurrent with, diagenesis and coal formation (Barker, 2006). Mineralization is likely related to geothermal activity associated with rifting in a granitic terrane and volcanism. Water samples from six of the seven known nearby hot springs/warm springs were tested and determined to contain anomalous levels of tungsten. Mineralization processes affecting the original peat accumulations, or within the coal beds, were likely accentuated due to Oligocene fissure basalts that entrapped the geothermal waters in the coal-forming section. To the northeast mudstones in the Dall River-Coal Creek area contain elevated tungsten likely concentrated during formation of lacustrine deposits in shallow lakes fed by geothermal water and intermittently covered by ash falls; however, associated coal beds were not mineralized (Barker,1981, 2006).

Production notes:

None.

Reserves:

None.

Additional comments:

The Fort Hamlin Hills coal occurrences are on lands on which the State of Alaska has filed 'Priority Selection' under the land entitlement provision of the 1959 Statehood Act. Most of this occurrence lies within the 'inner corridor' of the Trans-Alaska Pipeline as defined by the Bureau of Land Management (BLM). Various temporary land withdrawals remain to be lifted by the BLM before these selections can be processed. The BLM will not issue any permits for surface disturbance activities including exploration.

References:

Albanese, M.D., 1987, A Basalt Flow in the Fort Hamlin Hills, Bettles A-1 Quadrangle, Alaska: Alaska Division of Geological & Geophysical Surveys, Public Data File 87-25, 8 p.

American Society for Testing Materials (ASTM), 1979, Standard specification for classification of coals by rank, in Annual Book of ASTM Standards; Part 26: ASTM International, p. 220-223.

Barker, J.C., 1981, Coal and uranium investigations of the Yukon Flats Cenozoic basin: U.S. Bureau of Mines Open File Report 140-81, 63 p.

Barker, J.C., 1991b, Tin placers associated with the down-cutting of fissure basalts, Ray River drainage, Alaska, in Reger, R.D., ed., Short Notes on Alaskan Geology 1991: Alaska Division of Geological & Geophysical Surveys Professional Report 111A, p. 1-8.

Barker, J.C., 2006, Evidence for geothermal tungsten and germanium mineralization in Eocene coal and associated sediments, Fort Hamlin Hills area, interior Alaska: Alaska Division of Geological & Geophysical Surveys PIR-2006-1, 24p.

Barker, J.C., and Foley, J. Y. 1986, Tin reconnaissance of the Kanuti and Hodzana Rivers Uplands, central Alaska: U.S. Bureau of Mines Information Circular 9104, p. 10.

Patton, W. W., Jr., and Miller, T. P., 1973, Bedrock geologic map of Bettles and southern Wiseman quadrangles, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-492, 1 sheet, scale 1:250,000.

Primary Reference: Barker, 2006

Reporter(s): J.C. Barker

Last report date: 2016-03-15

Site name(s): Bonanza Creek (Beef claims)

Site type:

ARDF no.: BV003

Latitude: **Quadrangle:** BV

Longitude:

Location description and accuracy:

This is one of those cases where the prospect is on the boundary between 1:250,000 quads and two people did them independently. Just one will suffice and it's BT009.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Dall River; Coal Creek

Site type: Occurrence

ARDF no.: BV005

Latitude: 66.3213 **Quadrangle:** BV B-6

Longitude: 149.831

Location description and accuracy:

The Coal Creek uranium-tungsten occurrence outcrops in the south bank of Coal Creek approximately one-half mile above its confluence with the Dall River. The occurrence is in the NE¼NE¼ sec. 11, T. 17 N., R. 11 W., of the Fairbanks Meridian. The site is accurate within 1,000 feet. The Coal Creek occurrence is located about 12 miles east of the Trans Alaska Pipeline.

Commodities:

Main: U, W

Other:

Ore minerals:

Gangue minerals:

Geologic description:

A coal-bearing semi-closed Miocene basin, about four miles across and elongate in a NE-SW orientation, occurs along the Dall River and centers about 66.3384, 149.8300. The crude NE orientation of the basin appears to follow a regional suture feature. At the site interbedded, water-lain, white to green tuff and manganese-coated gray mudstone are exposed in a series of low cutbanks along the south side Coal Creek (Barker, 1981, 2006). A 12-foot vertical section of bedrock was exposed by trenching, then mapped, and sampled. Disseminated grains of carbonized organic matter and increased radioactivity were noted in the mudstone beds. The mudstone layers reported about 400 to 450 cps cf. to background of 70 to 90 cps on a handheld scintillation counter. Associated coal seams were also drilled and reported (Barker, 1981, 2006).

Channel samples that were cut through individual mudstone beds contain 20 to 50 parts per million (ppm) uranium and up to 190 ppm tungsten (Barker, 1981, 2006). Values for arsenic, barium, cerium, cesium, copper, phosphorous, and thorium were elevated as well. Samples cut across the interbedded tuff beds were only slightly elevated with uranium and tungsten. The presence of elevated tungsten is unexplained but may be related to a similar origin as the highly elevated tungsten values in coal ash from coal beds under the Ray River about 20 miles to the southwest (Barker, 2006). A sample tested for phosphorous oxide reported 1.6 percent. Phosphorous as vivianite and hydroxylapatite were identified in the Coal Creek area.

The sedimentary section appears to form the tundra-covered south bank of the creek for at least 1,000 feet to the west before being lost under permafrost silt and thicker tundra. A coal-bearing sequence observed about 800 feet to the west of the site tentatively appears to underlie the mudstone and tuff section. Several auger holes were drilled into the coal and cut 18 feet of subbituminous coal (Barker, 1981).

Rubble exposures of quartz arenite were noted about one-half mile to the northeast where it was exposed in the trace of the old winter trail (Hickel Highway). Slightly radioactive, hematitic sandstone with plant trash (3-5 percent) in a porous groundmass occurs about 2,000 feet to the north of the site and is also exposed as scant rubble along the trace of the old winter trail. Beyond the west margins of the Dall River basin, the sedimentary basin is covered by basalt flows. To the east, the basin appears to daylight and overlie basement Paleozoic phyllite and limestone that is locally intruded by granitic rocks of the Coal Creek pluton. There was no outcrop or rubble to the southeast along the Dall River but a small tributary stream about 4 miles downstream of the site reported 185 ppm uranium in the sediment.

Alteration:

Age of mineralization:

A sample of tephra from the Coal Creek section described above was dated at 38.6 +/- 1.6 million years (Barker, 1981). Albanese, 1987, reported an age of 30.59 m.y. +/- 0.92 for the basalt flows at a location nearer the Dalton Highway.

Generic deposit model:

Deposit model:

Sandstone uranium.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

30c

Production Status: None

Site Status: Inactive

Workings/exploration:

In 1978 and 1979, the U.S. Bureau of Mines (USBM) examined the Dall River area as part of the statewide mineral resource studies of areas proposed for inclusion in federal parks and wildlife refuges. The work was in conjunction with the investigation of tin and REE mineralization including the Coal Creek and Fort Hamlin Hills plutons (Barker and Foley, 1986). The USBM collected rock samples for geochemical analysis, conducted a heavy mineral survey, and mapped mineral occurrences. Sample analyses were provided by the National Uranium Resource Evaluation program and samples were processed in Los Alamos (Averett and Barker, 1981). In the Dall River area the USBM drilled several coal seams and examined the area for sandstone-hosted uranium (Barker, 1981, 2006).

Production notes:

None.

Reserves:

None.

Additional comments:

The entire area of this occurrence is included in the Yukon Flats National Wildlife Refuge and is now off limits to mineral exploration or development.
Splits of most samples collected by the U.S. Bureau of Mines and referenced in this report have been archived at the Alaska Geologic Materials Center, Anchorage, Alaska and are available for review.

References:

Albanese, M.D., 1987, A Basalt Flow in the Fort Hamlin Hills , Bettles A-1 Quadrangle, Alaska: Alaska Division of Geological & Geophysical Surveys , Public Data File 87-25, 8 p.

Averett, W.A. and Barker, J.C. 1981, Report of analyses from mineral resource investigations in central and eastern Alaska: Bendix Field Engineering Corp. Report GJBX 178(81), prepared for the U.S. Department of Energy, 150 p.

Barker, J.C., 1981, Coal and uranium investigations of the Yukon Flats Cenozoic basin: U.S. Bureau of Mines Open File Report 140-81, 63 p.

Barker, J.C., 2006, Evidence for geothermal tungsten and germanium mineralization in Eocene coal and

associated sediments, Fort Hamlin Hills area, interior Alaska: Alaska Division of Geological & Geophysical Surveys PIR-2006-1, 24p.

Cox, D.P., and Singer, D.A., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Primary Reference: Barker, 1981

Reporter(s): J.C. Barker

Last report date: 2016-03-15

Site name(s): Dime Creek; Haycock; Dime Creek Dredging Co.; Dime Creek Mining Co.; Haycock Mining Co.; Moon and Ryan; Smith

Site type:

Mine

ARDF no.: CA002

Latitude: 65.2082 **Quadrangle:** CA A-5

Longitude: 161.1639

Location description and accuracy:

The Dime Creek gold placer is just east of the village of Haycock, which is about 19 miles north of the village of Koyuk on Norton Sound. The gold placer flows through the east half of sections 20 and 29 and the west half of section 21 and 28 of T. 3 S., R. 12 W.

Commodities:

Main: Au

Other: Pt

Ore minerals: Gold, PGE minerals

Gangue minerals:

Geologic description:

There is little rock exposed in the Dime Creek area but the creek appears to generally parallel a fault (?) contact between Paleozoic metamorphosed limestone and Jurassic-Cretaceous andesite flows (Patton, 1967). The flows are intruded by small, mafic and ultramafic plutons.

Bundtzen (2009) tabulated the gold production by year as best the data allows but production records are lacking for many years. He estimates that at least 3,391 ounces of gold was produced by dredging from 1918 to 1941 and at least 36,000 ounces of gold were produced by drift mining and other hand methods from 1915 to 1955, the last year of mining. However, other estimates put the total as high as 60,000 ounces of gold.

The gold occurs both along the modern stream channel and along benches Bundtzen, 2009). The benches are thought to be caused by wave action. The gold in the placers is mainly on metamorphosed andesite bedrock but some is in the overlying 2 to 3 feet of gravel. Harrington (1919) reported gold values as high as $2 per square foot of bedrock. On both creek and bench claims the overburden varies from 10 to 30 feet thick; all of the ground was frozen. Heavy minerals in the concentrate include iron-oxides, abundant chrome spinel, olivine, pyroxene, rare garnet, and rutile (Harrington, 1919).

The placers also contained platinum in about the ratio of one ounce of platinum to 200 ounces of gold (Bundtzen, 2009). Analysis of platinum-group minerals in the placer concentrates showed them to consist of 88.8 percent platinum, 14.7 percent iridium, 4.3 percent osmium and iridium, 1.1 percent rhenium, and 1.1 percent palladium (Mertie, 1969). The placer deposits in the upper portion of the creek produced almost twice as much platinum as the lower claims.

Linux Gold Corp. located 12 mining claims on Dime Creek in March 2005, and initiated surface geology studies and sampling in August 2005. Bundtzen (2009) on behalf of Linus estimated that there remains about 1,125,000 cubic yards of unmined auriferous gravel, but the data is not sufficient to estimate its grade.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au-PGE (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The Dime Creek placers were mined intermittently from 1915 until 1955. The placers were worked mostly by drift and open-cut mining. A small dredge operated from 1918 to 1941. Linux Gold Corp. located 12 mining claims on Dime Creek in March 2005, and initiated surface geology studies and sampling in August 2005.

Production notes:

Bundtzen (2009) tabulated the gold production by year as best the data allows, but production records are lacking for many years. He estimates that at least 3,391 ounces of gold was produced by dredging from 1918 to 1941 and at least 36,000 ounces of gold were produced by drift mining and other hand methods from 1915 to 1955, the last year of mining. However, other estimates put the total as high as 60,000 ounces of gold. If 1 ounce of platinum was recovered for every 200 ounces of gold, Dime Creek produced about 200 to 300 ounces of platinum-group metals.

Reserves:

Bundtzen, (2009) estimated that there remains about 1,125,000 cubic yards of unmined auriferous gravel, but the data is not sufficient to estimate its grade.

Additional comments:

References:

Bundtzen, T.K., 2009: Dime Creek summary report: http://www.linuxgoldcorp.com/pdf/dimecreek_summaryreport.pdf (as of Feb. 17, 2011).

Bundtzen, T.K., Swainbank, R.C., Wood, J.E., Clough, A.H., 1991 (1992), Alaska's Mineral Industry 1991: Alaska Division of Geological & Geophysical Surveys, Special Report 46, 89 p.

Cathcart, S.H., 1920, Mining in northwestern Alaska: U.S. Geological Survey Bulletin 712-G, p. 185-198.

Cathcart, S.H., 1922, Metalliferous lodes in southern Seward Peninsula: U.S. Geological Survey Bulletin 722-F, p. 163-261.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Candle, Holy Cross, Norton Bay, Nulato, and Unalakleet quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-866, 102 p.

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Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Gault, H.R., Killeen, P.L., West, W.S., and others, 1953, Reconnaissance for radioactive deposits in the northeastern part of the Seward Peninsula, Alaska, 1945-47 and 1951: U.S. Geological Survey Circular 250, 31 p.

Harrington, G.L., 1919, The gold and platinum placers of the Kiwalik-Koyuk region: U.S. Geological Survey Bulletin 692-G, p. 369-400.

Harrington, G.L., 1921, Mining on Seward Peninsula: U.S. Geological Survey Bulletin 714-F, p. 229-237.

Linus Gold Corporation, 2007 (Results): http://www.integratir.com/newsrelease.asp?news=2130980809&ticker=LNXGF&lang=EN&title=null (March, 2007).

Mertie, J.B., Jr., 1918, Placer mining on Seward Peninsula: U.S. Geological Survey Bulletin 662-H, p. 451-458.

Mertie, J.B., Jr., 1969, Economic geology of platinum minerals: U.S. Geological Survey Professional Paper

Primary Reference: Bundtzen, 2009

Reporter(s): Anita Williams (Anchorage, AK); Travis L. Hudson (Applied Geology, Inc.); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Gossan

Site type: Prospect

ARDF no.: CA011

Latitude: 65.4201 **Quadrangle:** CA B-5

Longitude: 161.353

Location description and accuracy:

The Gossan prospect is at an elevation of about 780 feet on the south end of Gossan Ridge. It is about 3.7 miles west-southwest of the top of Granite Mountain and about 0.5 mile north-northwest of the center of section 9, T. 1 S., R. 13 W., of the Kateel River Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au, Bi, Cu, Mo, Pb, Sb, Th, U, W, Zn

Other:

Ore minerals: Arsenopyrite, bismuthinite, chalcopyrite, galena, molybdenite, pyrargyrite, pyrite, pyrrhotite, scheelite, sphalerite, stibnite, uranothorianite

Gangue minerals: Carbonates, fluorite, quartz

Geologic description:

As initially described by Miller and Elliott (1969) this prospect is near the border of the mid-Cretaceous Quartz Creek pluton, a hook-shaped, quartz monzonite body at least 16 miles long and up to a mile wide. The pluton is surrounded by an alteration zone 2 to 5 miles wide that is marked by numerous mineral occurrences along the entire length of the pluton. The alteration zone is in Jurassic-Cretaceous andesitic volcanic and sedimentary rocks. Fine-grained dikes of varying composition cut the andesite near the pluton.

In 2005, the Linus Gold Corp. began work in the area and by 2006 had staked 176 Alaska (state) claims that covered this prospect and others along the 'Kiwalik trend' of mineralization that roughly coincides with the Quartz Creek pluton and its alteration zone. Exposures are poor in the area and their initial work relied heavily on soil geochemistry and surface sampling. As described by Adams (2007), there are several types of mineralization, many occurring together, along the Kiwalik trend: 1) sulfide-tourmaline-quartz veins with galena, sphalerite, and pyrite and locally minor arsenopyrite, pyrrhotite, chalcopyrite, and molybdenite; 2) disseminated pyrite and arsenopyrite in hairline veinlets that also locally contain sparse galena, stibnite, and bismuthinite; 3) sulfide-rich veins and veinlets with various assemblages of pyrite, pyrrhotite, chalcopyrite, arsenopyrite, sphalerite, galena, stibnite, molybdenite, and pyrargyrite, 4) pyrite-chlorite-calcite-quartz veins, 5) sulfide-quartz veins and stockworks with pyrite, pyrrhotite, arsenopyrite, galena, stibnite, sphalerite, chalcopyrite, and scheelite, and 6) fluorite-molybdenite-galena-pyrite-uranothorianite veinlets and disseminations. There are several distinct types of alteration: 1) phyllic, 2) silicification, 3) carbonate, 4) argillic, 5) propylitic, 6) tourmalinization, 7) alunitic, and 8) potassic. Gossans with remnant galena and sphalerite are found locally.

In 2006, Linus drilled 2 holes at the Gossan prospect where the surface is mostly rubble crop of andesite, basalt, dacite, epiclastic rocks, and gossan. The rocks at the surface and in the drill holes are characterized by pervasive propylitic alteration of the mafic volcanic rocks, quartz-sericite+/-carbonate alteration of the dacite, and irregular zones of silicification, carbonate alteration, and sericitization of the massive syenite that was intersected at a depth of 880 feet in one hole. The drill holes intersected several types of mineralization: 1) multiple 2- to 20-meter-thick zones of disseminated sulfides and veinlets in interlayered dacite, andesite tuff, and siltstone; 2) ubiquitous disseminated pyrite and pyrite-chlorite -actinolite-calcite-quartz veinlets; 3) sulfide-tourmaline-quartz veins, veined breccias, and massive tourmaline replacement in

zones less than one meter thick; and 4) sulfide-rich veins and breccias in several zones. The sulfides include variable amounts of arsenopyrite, pyrite, galena, and stibnite. The best intercept in the two drill holes was 5 feet that contained 204 parts per billion gold; many intercepts contained significant values in silver, bismuth, molybdenum, copper, thorium, uranium, lead, and antimony.

Alteration:

The rocks in the drill holes at the Gossan prospect are characterized by pervasive propylitic alteration of the mafic volcanic rocks, quartz-sericite+/-carbonate alteration of the dacite, and irregular zones of silicification, carbonate alteration, and sericitization of syenite.

Age of mineralization:

Cretaceous of younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Disseminated and veined, Ag-As-Au-Bi-Cu-Mo-Pb-Sb-Th-U mineralization in several styles that occurs widely for 16 miles along the altered border zone of a Cretaceous quartz monzonite pluton.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The prospect was discovered by the U.S. Geological Survey in the late 1960s (Miller and Elliott, 1969). It was subsequently examined by several companies. In 2005, the Linus Gold Corp. began work in the area and by 2006 had staked 176 Alaska (state) claims that covered this project and others along the 'Kiwalik trend' that roughly coincides with the Quartz Creek pluton and its alteration zone. Exposures are poor in the area and their initial work relied heavily on soil geochemistry and surface sampling. In 2006, Linus drilled two holes on the Gossan prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Adams, D.D., 2007, Geologic report on the Granite Mountain property, Koyuk Mining District, Candle B-5 and C-5 quadrangles, west-central Alaska: Unpublished Technical Report for the Linus Gold Corp., 71 p. (posted on www.sedar.com on February 8, 2008)

Cobb, E.H., 1972, Metallic mineral resources map of the Candle Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-389, 1 sheet, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Candle, Holy Cross, Norton Bay, Nunlato, and Unalakleet quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-866, 102 p.

Miller, T.P., and Elliott, R.L., 1969, Metalliferous deposits near Granite Mountain, eastern Seward Peninsula, Alaska: U.S. Geological Survey Circular 614, 19 p.

Primary Reference: Adams, 2007

Reporter(s): Anita Williams (Anchorage, AK); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Unnamed (upper Peace River)

Site type: Prospect

ARDF no.: CA013

Latitude: 65.4544 **Quadrangle:** CA B-5

Longitude: 161.0809

Location description and accuracy:

This prospect is on the north side of the headwaters of the Peace River, about 4.8 miles east-northeast of the top of Granite Mountain. It is about 0.6 mile southwest of the center of section 25,T. 1 N., R. 12 W., of the Kateel River Meridian. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Mo, Pb, W

Other: Bi, Cr, Th, U, Zn

Ore minerals: Bornite, galena, chalcopyrite, chromite, ferrimolybdite, gold, gummite, molybdenite, pyrite, pyrrhotite, scheelite, sphalerite, tetradymite, uranothorianite

Gangue minerals: Fluorite, hematite, magnetite, quartz

Geologic description:

The upper Peace River area is underlain by a small satellitic stock of the Late Cretaceous Granite Mountain pluton. The stock is composed of several varieties of syenite. Locally, the syenite is cut by quartz veins and contains abundant disseminated pyrite cubes, some fine-grained molybdenite, and abundant magnetite and purple fluorite. A canary-yellow alteration product found both in the veins and in the syenites was identified as ferrimolybdite. The syenite is bleached, oxidized, and contains disseminated pyrite, and where it is cut by quartz-pyrite veins, sporadic molybdenite. The syenite and associated quartz veins locally contain anomalous amounts of molybdenum, bismuth, silver, copper and lead. Numerous rock and soil samples were collected from this area by Miller and Elliott (1969). One rock sample contained: 150 parts per million (ppm) silver, 30 ppm molybdenum, 3,000 ppm lead, 700 ppm copper, and 0.04 ppm gold. Another rock sample contained: 1.5 ppm silver, greater than 2,000 ppm molybdenum, 500 ppm copper, and 300 ppm lead. Both were grab samples of oxidized syenite.

Gault and others (1953) collected pan-concentrate stream-sediment samples from this area in their search for uranium. Their samples contained anomalously high concentrations of uranothorianite and other metallic minerals, including galena, chalcopyrite, bornite, tetradymite, sphalerite, pyrite, and pyrrhotite. Intergrowths of galena, sphalerite, chalcopyrite, pyrite, and gummite were observed in some mineral grains. The mineral associations suggested to them that the uranium minerals are derived from a sulfide-bearing lode (or vein), rather than occurring as accessory minerals in in granitic rocks.

Linux Gold Corp. (2007) located 16 mining claims on this prospect in March 2005 and began mapping the geology at the surface and sampling in August, 2005 (Linux Gold Corporation 2007). As described by Adams (2007), the deposit is associated with a small stock of pinkish, fine- to medium-grained Cretaceous hornblende-biotite nepheline syenite that intrudes undifferentiated volcanic rocks. The exposure in the area is poor but the stock is at least a half mile across. Garnet-bearing syenite crops on the ridge to the northeast.

The mineralization is largely hosted in the syenite but locally occurs in pyroxenite or altered andesite near the contact of the stock. Gossans occur locally. The syenite has undergone weak to strong phyllic alteration and is locally intensely silicified. Five types of mineralization are recognized: 1) weakly altered syenite with sparse disseminated sulfides, 2) altered syenite with well-developed sulfides, 3) altered syenite with quartz-sulfide veinlets, 4) highly altered syenite with sulfide veinlets, and 5) highly silicified syenite

breccia with disseminated sulfides. The sulfides are ubiquitous fine-grained pyrite and locally fine-grained molybdenite, often accompanied by fluorite. Surface oxidation has formed hematitic surface coatings and hematite along fracture fillings; locally, bright-yellow ferromolybdite from the oxidation of molybdenite is abundant. Samples of the syenite contain highly anomalous silver, lead, bismuth, copper, tungsten, antimony, uranium, and thorium. Four samples contained up to 306 parts per billion gold, 83.3 parts per million (ppm) silver, 900 ppm arsenic, 139 ppm bismuth, 6,290 ppm copper, 1,135 ppm molybdenum, 144 ppm lead, 1,001 ppm antimony, 10.9 ppm tin, 137.5 ppm thorium, 46.20 ppm uranium, 190.50 ppm tungsten, and 1,155 ppm zinc.

Adams (2007) considers the mineralization to be a highly fractionated, alkaline porphyry-Mo deposit, prospective for uranium and rare-earth elements.

Alteration:

The syenite that hosts the mineralization has undergone weak to strong phyllic alteration and is locally intensely silicified.

Age of mineralization:

Probably Late Cretaceous.

Generic deposit model:

Deposit model:

Highly-fractionated alkaline porphry-molybdenum deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The area was mapped by the U.S. Geological Survey and examined by various exploration companies beginning in the 1950s. Linux Gold Corp. located 16 mining claims on this prospect in March 2005 and initiated surface geology studies and sampling in August, 2005. Surface and geochemical work continued in 2006.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Adams, D.D., 2007, Geologic report on the Granite Mountain property, Koyuk Mining District, Candle B-5 and C-5 quadrangles, west-central Alaska: Unpublished Technical Report for the Linus Gold Corp., 71 p. (posted on www.sedar.com on February 8, 2008).

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White, M.G., West, W.S., Tolbert, G.E., Nelson, A.E. and Houston, J.R., 1952, Preliminary summary of

Primary Reference: Adams, 2007

Reporter(s): Anita Williams (Anchorage, AK); Travis Hudson (Applied Geology, Inc.); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Unnamed (at head of Quartz Creek); Saddle

Site type: Prospects

ARDF no.: CA016

Latitude: 65.4723 **Quadrangle:** CA B-5

Longitude: 161.3395

Location description and accuracy:
These prospects are at an elevation of about 1,250 feet on a ridge between the headwaters of Kiwalik River and Quartz Creek. The site is in section 22, T. 1 N., R. 13 W., of the Kateel River Meridian. It is location 32, figure 2 of Miller and Elliot (1969).

Commodities:

Main: Ag, Au, Pb, Zn

Other: As, B, Cd, Co, Cu, Mn, W

Ore minerals: Argentiferous galena, arsenopyrite, chalcopyrite, pyrite, pyrrhotite, sphalerite

Gangue minerals: Calcite, quartz, tourmaline

Geologic description:
This area is on the eastern Seward Peninsula where base metal, silver, and some gold-bearing mineralization occurs in a 4 x 16 kilometer belt of hydrothermally altered, hornfelsed andesite and intrusive rocks. The Cretaceous andesitic volcanic rocks are locally intruded by andesitic dikes and elongate stocks of monzonite, syenite, and quartz monzonite. A swarm of subparallel aplite and monzonite dikes and a small rhyolite stock locally intrude the mineralized belt. Mineralization and alteration are localized in structurally down-dropped blocks adjacent to coarse-grained intrusions that include the large, composite Granite Mountain pluton about 3 kilometers to the southeast.

The mineralization was originally discovered by the U.S. Geological Survey in the 1960s (Miller and Elliott, 1969). Greatland Exploration Ltd. explored this prospect in the 1970s and still holds mining claims in the area (Ron Sheardown, oral communication, 2005). This exploration included geologic mapping, stream-sediment surveys, grab sampling of rocks and soils, two local soil geochemical surveys, and four short diamond drill holes. The four drill holes are in one area, total 449 meters in length, and reached vertical depths of 50 to 126 meters. Attempts to obtain geophysical data were inconclusive.

Argentiferous galena, sphalerite, pyrite, arsenopyrite, and minor chalcopyrite occur in veins and disseminations both in volcanic hornfels and intrusive rocks (Miller and Elliott, 1969). The sulfide minerals commonly are in quartz-tourmaline veins and replacements. Massive pyrrhotite with some chalcopyrite locally replaces volcanic hornfels. Sphalerite-, galena-, and chalcopyrite-bearing calcite veins are widely scattered through the mineralized belt. Sulfide mineralization commonly is structurally controlled along fractures, faults, and shear zones that cut all bedrock units. Placer gold was recovered from Quartz Creek for many years.

Highly anomalous lead, zinc, silver, copper and boron are common in stream sediments of upper Quartz Creek and its tributaries. Rock and soil samples from the area contain up to 300 parts per million (ppm) silver, 1 ppm gold, more than 10,000 ppm arsenic, more that 10,000 ppm boron, more than 500 ppm cadmium, 2,000 ppm cobalt, 2,000 ppm copper, more than 5,000 ppm manganese, more than 19 percent lead, 100 ppm scandium, and more than 5 percent zinc. One sample contained more than 10,000 ppm tungsten. Soil surveys identified several highly anomalous zones including one 1.3 x 1.4 kilometer area, open on one side, where lead values exceed 200 ppm and zinc values exceed 300 ppm; many lead and zinc values exceed 1,000 ppm in this area. Gold was commonly not determined in the early geochemical

investigations.

In 2005, Linus Gold Corporation (2007, Anomalies) began work in the area by staking about 30 square miles of claims, followed by a geologic reconnaissance, rock sampling and a geochemical soil survey that defined several anomalous areas in base and precious metals. Linus carried out considerable work in the area in the summer of 2006, including 4 diamond drill holes that totaled 2,970 feet. All the drill holes intersected altered, mineralized volcanic rocks that were cut by dikes or sills of syenite and granodiorite that were in turn cut by thin rhyolite to dacite dikes. A new gold prospect in intensely altered plutonic rocks was found at the surface near Quartz Creek; grab samples contained 114 to 325 parts per billion (ppb) gold, 10.6 to 35.4 ppm silver, up to 872 ppm copper, and 2.1 percent combined lead and zinc. Surface samples at the Saddle prospect contained up to 2.58 grams of gold per ton, 250 grams of silver per ton, and 3.0 percent lead and zinc.

Alteration:

Volcanic hornfels and intrusive rocks are variably altered and are cut by sulfide, calcite, and quartz-tourmaline veins. Volcanic hornfels and intrusive rocks are locally intensely replaced by sericite, pyrite, quartz, and tourmaline. Late carbonate veins and replacements cut intrusive rocks and scapolite is a common alteration mineral in volcanic rocks. Oxidation is extensive and gossan zones characterize the 4 kilometer by 16 kilometer mineralized belt.

Age of mineralization:

Late Cretaceous.

Generic deposit model:

Deposit model:

Sulfides with gold values in altered andesite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The mineralization was originally discovered by the U.S. Geological Survey in the 1960s. Greatland Exploration Ltd. explored this prospect in the 1970s and still holds mining claims in the area. This exploration included geologic mapping, stream-sediment surveys, grab sampling of rocks and soils, two local soil geochemical surveys, and four short diamond drill holes. The four drill holes are in one area, total 449 meters in length, and reached vertical depths of 50 to 126 meters. Attempts to obtain geophysical data were inconclusive.

In 2005, Linus Gold Corporation (2000 began work in the area by staking about 30 square miles of claims, followed by a geologic reconnaissance, rock sampling and a geochemical soil survey that defined several anomalous areas in base and precious metals. Linus carried out considerable work in the area in the summer of 2006, including 4 diamond drill holes that totaled 2,970 feet, and considerable surface work and sampling.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Linus Gold Corporation, 2007 (Anomalies): http://www.integratir.com/newsrelease.asp?news=2130981351&ticker=LNXGF&lang=EN&title=null (as of April, 2007).

Miller, T.P., and Elliott, R.L., 1969, Metalliferous deposits near Granite Mountain, eastern Seward

Primary Reference: Miller and Elliott, 1969; this record

Reporter(s): Anita Williams (Anchorage, Alaska); Travis Hudson, (Applied Geology, Inc.); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Nortz

Site type: Prospect

ARDF no.: CA025

Latitude: 65.5318 **Quadrangle:** CA C-5

Longitude: 161.4002

Location description and accuracy:

This records includes several prospects exposed in outcrops for about a mile and a half along the west side of the south fork of upper Quartz Creek. The center of these occurrences is about 0.5 mile east of the center of section 32, T. 2 N., R. 13 W., of the Kateel River Meridian. The location is accurate.

Commodities:

Main: Ag, Pb, Zn

Other: Au, Cu

Ore minerals: Arsenopyrite, bismuthinite, chalcopyrite, galena, molybdenite, pyrargyrite, pyrite, pyrrhotite, scheelite, sphalerite, stibnite, uranothorianite

Gangue minerals: Carbonates, fluorite, quartz

Geologic description:

Many of the outcrops for about a mile and a half along the west side of the south fork of upper Quartz Creek are mineralized. This mineralization was first recognized by Miller and Elliott (1969) who sampled many of the outcrops. Some of their higher grade samples contained: 1) 7 parts per million (ppm) silver, 1 percent arsenic, 500 ppm copper, 1 percent lead, and 200 ppm zinc; 2) 7 ppm silver, greater than 1 percent arsenic, 150 ppm copper, 0.7 percent lead, and 700 ppm zinc; 3) 50 ppm silver, 2,000 ppm copper, greater than 2 percent lead, and greater than 1 percent lead; 4) up to 200 ppm silver, up to 1,000 ppm copper, greater than 2 percent lead, and greater than 1 percent zinc; 5) 150 ppm silver, 700 ppm copper, 15 ppm molybdenum, greater than 2 percent lead, and greater than 1 percent zinc.

The Nortz prospect is near the border of the mid-Cretaceous Quartz Creek pluton, a hook-shaped, quartz monzonite body at least 16 miles long and up to a mile wide. The pluton is surrounded by an alteration zone 2 to 5 miles wide that is marked by numerous mineral occurrences along the entire length of the pluton. The alteration zone is in Jurassic-Cretaceous andesitic volcanic and sedimentary rocks. Fine-grained dikes of varying composition cut the andesite and sedimentary rocks near the pluton.

The mineralization along Quartz Creek was examined by numerous geologists after its discovery and in 2005 the Linus Gold Corp. began work in the area. By 2006 they had staked 176 Alaska (state) claims that covered this prospect and others along the 'Kiwalik trend' of mineralization that roughly coincides with the Quartz Creek pluton and its alteration zone (Adams, 2007). They drilled several of the prospects along the belt to the south (see CA011, CA051, and CA052) and briefly examined the Nortz prospect at the north end of their claims and collected one sample. They describe the rocks as hornfelsed, highly sheared, highly mineralized, mafic volcanic rocks that are characterized by phyllitic alteration and tourmalinization. The rocks contain zones with abundant veins and stockworks that contain pyrite, calcite, quartz, arsenopyrite, stibnite, and galena. The sample contained 325 parts per billion gold, 34.5 ppm silver, 16,450 ppm lead, 449 ppm antimony, 872 ppm copper, and 4,345 ppm zinc.

Although Linus only briefly described this prospect, it is undoubtedly similar to the others to the south along the Kiwalik trend. Adams (2007) defines several types of mineralization along the belt, many occurring together: 1) sulfide-tourmaline-quartz veins with galena, sphalerite, and pyrite and locally minor

arsenopyrite, pyrrhotite, chalcopyrite, and molybdenite; 2) disseminated pyrite and arsenopyrite in hairline veinlets that also locally contain sparse galena, stibnite, and bismuthinite; 3) sulfide-rich veins and veinlets with various assemblages of pyrite, pyrrhotite, chalcopyrite, arsenopyrite, sphalerite, galena, stibnite, molybdenite, and pyrargyrite, 4) pyrite-chlorite-calcite-quartz veins, 5) sulfide-quartz veins and stockworks with pyrite, pyrrhotite, arsenopyrite, galena, stibnite, sphalerite, chalcopyrite, and scheelite, and 6) fluorite-molybdenite-galena-pyrite-uranothorianite veinlets and disseminations. There are several distinct types of alteration associated with the mineralization: 1) phyllitic, 2) silicification, 3) carbonate, 4) argillic, 5) propylitic, 6) tourmalinization, 7) alunitic, and 8) potassic. Gossans with remnant galena and sphalerite are found locally.

Alteration:

Phyllitic alteration and tourmalinization of the mafic volcanic host rocks.

Age of mineralization:

In the alteration zone of a Late Cretaceous quartz monzonite pluton.

Generic deposit model:

Deposit model:

Disseminated and veined, Ag-As-Au-Bi-Cu-Mo-Pb-Sb-Th-U mineralization in several styles that occurs widely for 16 miles along the altered border zone of a Cretaceous quartz monzonite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The prospect was discovered by the U.S. Geological Survey in 1969 and examined by numerous private geologists in succeeding years. In 2005, Linus Gold Corp. began work in the area and by 2006 had staked 176 Alaska claims that covered this prospect and others along the 'Kiwalik trend' that roughly coincides with the Quartz Creek pluton and its alteration zone. They drilled several of the prospects to the south along the Kiwalik trend and visited and sampled this prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Adams, D.D., 2007, Geologic report on the Granite Mountain property, Koyuk Mining District, Candle B-5 and C-5 quadrangles, west-central Alaska: Unpublished Technical Report for the Linus Gold Corp., 71 p. (posted on www.sedar.com on February 8, 2008)

Cobb, E.H., 1972, Metallic mineral resources map of the Candle Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-389, 1 sheet, scale 1:250,000.

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Miller, T.P., and Elliott, R.L., 1969, Metalliferous deposits near Granite Mountain, eastern Seward Peninsula, Alaska: U.S. Geological Survey Circular 614, 19 p.

Primary Reference: Adams, 2007

Reporter(s): Anita Williams (Anchorage, AK); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Gusty

Site type: Prospect

ARDF no.: CA051

Latitude: 65.4434 **Quadrangle:** CA B-5

Longitude: 161.3749

Location description and accuracy:

The Gusty prospect is about 0.4 mile east of hill 1431 and about 4.6 miles west-northwest of the top of Granite Mountain. It is about 0.3 mile south-southwest of the center of section 33, T. 1 N., R. 13 W, The location is accurate.

Commodities:

Main: Ag, As, Au, Bi, Cu, Mo, Pb, Sb, Th, U, W, Zn

Other:

Ore minerals: Arsenopyrite, bismuthinite, chalcopyrite, galena, molybdenite, pyrargyrite, pyrite, pyrrhotite, scheelite, sphalerite, stibnite, uranothorianite

Gangue minerals: Carbonates, fluorite, quartz

Geologic description:

The Gutsy prospect is near the border of the mid-Cretaceous Quartz Creek pluton, a hook-shaped, quartz monzonite body at least 16 miles long and up to a mile wide. The pluton is surrounded by an alteration zone 2 to 5 miles wide that is marked by numerous mineral occurrences along the entire length of the pluton. The alteration zone extends into Jurassic-Cretaceous andesitic volcanic and sedimentary rocks around the pluton. Fine-grained dikes of varying composition cut the andesite near the pluton.

In 2005, the Linus Gold Corp. began work in the area and by 2006 had staked 176 Alaska claims that covered this prospect and others along the 'Kiwalik trend' of mineralization that roughly coincides with the Quartz Creek pluton and its alteration zone. Exposures are poor in the area and their initial work relied heavily on soil geochemistry and surface sampling. The Gutsy prospect is similar to most of the rest of the deposits along the Kiwalik trend. As described by Adams (2007), there are several types of mineralization, many occurring together: 1) sulfide-tourmaline-quartz veins with galena, sphalerite, and pyrite and locally minor arsenopyrite, pyrrhotite, chalcopyrite, and molybdenite; 2) disseminated pyrite and arsenopyrite in hairline veinlets that also locally contain sparse galena, stibnite, and bismuthinite; 3) sulfide-rich veins and veinlets with various assemblages of pyrite, pyrrhotite, chalcopyrite, arsenopyrite, sphalerite, galena, stibnite, molybdenite, and pyrargyrite, 4) pyrite-chlorite-calcite-quartz veins, 5) sulfide-quartz veins and stockworks with pyrite, pyrrhotite, arsenopyrite, galena, stibnite, sphalerite, chalcopyrite, and scheelite, and 6) fluorite-molybdenite-galena-pyrite-uranothorianite veinlets and disseminations. There are several distinct types of alteration: 1) phyllitic, 2) silicification, 3) carbonate, 4) argillic, 5) propylitic, 6) tourmalinization, 7) alunitic, and 8) potassic. Gossans with remnant galena and sphalerite are found locally.

The Gutsy prospect was discovered by Linus in 2005 (Adams, 2007). The rocks are poorly exposed at the surface, mainly as rubble, but include quartz monzonite cut by syenite and granodiorite dikes and hornfelsed mafic rocks along the contact of the quartz monzonite. A small bedrock exposure nearby in the creek consists of massive hornfelsed basalt with numerous sulfide-calcite-quartz veins. Linus drilled one hole in 2006 to a depth of 767 feet. The mineralization at the surface and in the drill hole consists of localized zones of sulfide-tourmaline-quartz veinlets, sulfide disseminations, and semi-massive sulfide veins. The top of the hole was in altered syenite, the lower portion in granodiorite dikes and hornfels. The rocks are characterized by pervasive silicification and phyllitic alteration in the syenite at the top and by propylitic

alteration and silicification in the volcanic rocks at the bottom. The syenite-hosted mineralization consists of pyrite-arsenopyrite-stibnite disseminations and stockwork veinlets that form a halo around a narrow interval of pyrrhotite-tourmaline-quartz veins. Semi-massive sulfide veins and veined breccia occur in andesite and hornfels below the syenite. The massive sulfides consist of a complex intergrowth of pyrrhotite, chalcopyrite, arsenopyrite, sphalerite, argentiferous galena, and possibly pyrargyrite and stibnite. Two samples collected at the surface contained 10 and 177 parts per billion (ppb) gold, 0.2 and 24.30 parts per million (ppm) silver, 17 and more than 1,000 ppm arsenic, 1.1 and 113.50 ppm bismuth, 264.4 and 1,405 ppm copper, 26.9 and 1,800 ppm lead, 6.1 and 107 ppm antimony, 7 and 7.9 ppm tin, 4 and 2.80 ppm thorium, 1.7 and 1.00 ppm uranium, 1 and 3.50 ppm tungsten, and 115 and 2,010 ppm zinc. The best intercept in the drill hole was 40 feet that contained 84.75 ppb gold, 2.63 ppm silver, 105 ppm copper, 730 ppm lead, 190 ppm antimony, 786 ppm thorium, 3.1 ppm uranium, and 4,461 ppm zinc.

Alteration:

The rocks in the drill hole at the Gutsy prospect are characterized by pervasive silicification and phyllitic alteration in the syenite in the upper part of the hole and by zones of propylitic alteration and silicification in the volcanic rocks in the bottom part.

Age of mineralization:

Cretaceous or younger based on the age of the host rocks; possibly genetically related to nearby Cretaceous plutons.

Generic deposit model:

Deposit model:

Disseminated and veined, Ag-As-Au-Bi-Cu-Mo-Pb-Sb-Th-U mineralization in several styles that occurs widely for 16 miles along the altered border zone of a Cretaceous quartz monzonite pluton.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

In 2005, the Linus Gold Corp. began work in the area and by 2006 had staked 176 Alaska claims that covered this project and others along the 'Kiwalik trend' that roughly coincides with the Quartz Creek pluton and its alteration zone. Exposures are poor in the area and their initial work relied heavily on soil geochemistry and surface sampling. In 2006, Linus drilled one hole to a depth of 767 feet on the Gutsy prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Adams, D.D., 2007, Geologic report on the Granite Mountain property, Koyuk Mining District, Candle B-5 and C-5 quadrangles, west-central Alaska: Unpublished Technical Report for the Linus Gold Corp., 71 p. (posted on www.sedar.com on February 8, 2008).

Primary Reference: Adams, 2007

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Saddle

Site type: Prospect

ARDF no.: CA052

Latitude: 65.4648 **Quadrangle:** CA B-5

Longitude: 161.3861

Location description and accuracy:

The prospect is just east of Weather Ridge in the saddle at the divide between the head of the Kiwalik River and the western headwater tributary to Quartz Creek. It at an elevation of about 1,210 feet, about 0.5 mile north-northwest of the center of section 28, T. 1 N., R. 13 W.

Commodities:

Main: Ag, As, Au, Bi, Cu, Mo, Pb, Sb, Th, U, W, Zn

Other:

Ore minerals:

Gangue minerals: Carbonates, fluorite, quartz

Geologic description:

The Saddle prospect is near the border of the mid-Cretaceous Quartz Creek pluton, a hook-shaped, quartz monzonite body at least 16 miles long and up to a mile wide. The pluton is surrounded by an alteration zone 2 to 5 miles wide that is marked by numerous mineral occurrences along the entire length of the pluton. The alteration zone is in Jurassic-Cretaceous andesitic volcanic and sedimentary rocks. Fine-grained dikes of varying composition cut the andesite near the pluton.

In 2005, the Linus Gold Corp. began work in the area and by 2006 had staked 176 Alaska (state) claims that covered this prospect and others along the 'Kiwalik trend' of mineralization that roughly coincides with the Quartz Creek pluton and its alteration zone. Exposures are poor in the area and Linus's initial work relied heavily on soil geochemistry and surface sampling. The Saddle prospect is similar to most of the rest of the deposits along the Kiwalik trend. As described by Adams (2007), there are several types of mineralization, many occurring together: 1) sulfide-tourmaline-quartz veins with galena, sphalerite, and pyrite and locally minor arsenopyrite, pyrrhotite, chalcopyrite, and molybdenite; 2) disseminated pyrite and arsenopyrite in hairline veinlets that also locally contain sparse galena, stibnite, and bismuthinite; 3) sulfide-rich veins and veinlets with various assemblages of pyrite, pyrrhotite, chalcopyrite, arsenopyrite, sphalerite, galena, stibnite, molybdenite, and pyrargyrite, 4) pyrite-chlorite-calcite-quartz veins, 5) sulfide-quartz veins and stockworks with pyrite, pyrrhotite, arsenopyrite, galena, stibnite, sphalerite, chalcopyrite, and scheelite, and 6) fluorite-molybdenite-galena-pyrite-uranothorianite veinlets and disseminations. There are several distinct types of alteration: 1) phyllic, 2) silicification, 3) carbonate, 4) argillic, 5) propylitic, 6) tourmalinization, 7) alunitic, and 8) potassic. Gossans with remnant galena and sphalerite are found locally.

The Saddle prospect was discovered by Linus in 2005 (Adams, 2007). It is in the east contact zone of the quartz monzonite pluton; the rocks at the surface are a volcanic assemblage of andesitic and dacitic rock and interbedded epiclastic rocks. The rocks are widely chloritized and locally tourmalinated, silicified, and carbonatized. Seven samples collected at the surface contained less than 10 to 2,580 parts per billion (ppb) gold, 0.45 to 250 parts per million (ppm) silver, 5.6 to 12,300 ppm arsenic, 0.6 to 30.3 ppm bismuth, 44.9 to 194 ppm copper, 2.4 to 19.6 ppm molybdenum, 66.40 to 13,700 ppm lead, 19 to 418.1 ppm antimony, 13.7 to 105.3 ppm tin, 0.3 to 12 ppm thorium, 0.2 to 3.2 ppm uranium, 1.2 to 42.6 ppm tungsten, and 354 to 17,100 ppm zinc. In 2006, Linus drilled one hole to a depth of 499 feet. The upper portion of the hole was was in dacitic tuff and siltstone, followed by andesitic tuff that is altered to biotite-tourmaline hornfels at

depth. The middle portion is largely in altered granodiorite. The bottom portion is mostly in biotite-tourmaline hornfels but the bottom of the hole is in granodiorite. Hornfelsing and tourmalination increased dramatically with depth. The drill hole intersected two zones of sulfide-tourmaline-quartz veins with various assemblages of sulfides, mainly pyrrhotite, galena, sphalerite, and arsenopyrite. Some of the better intercepts were 50 feet with 3.9 ppm silver, 1, 722 ppm lead, 15.43 ppm tungsten, and 6,652 ppm zinc; 10 feet with 60 ppb gold, 0.7 ppm silver, 13.2 ppm thorium, and 6.85 ppm uranium; and 10 feet with 46.5 ppm gold, 2.1 ppm silver, 960 ppm lead, 14.5 ppm thorium, 8 ppm uranium, and 8,093 ppm zinc.

Alteration:

The rocks are widely chloritized and locally tourmalinized, silicified, and carbonitized. In one drill hole, hornfelsing and tourmalization increased dramatically with depth.

Age of mineralization:

Cretaceous or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Disseminated and veined, Ag-As-Au-Bi-Cu-Mo-Pb-Sb-Th-U mineralization in several styles that occurs widely for 16 miles along the altered border zone of a Cretaceous quartz monzonite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

In 2005, the Linus Gold Corp. began work in the area and by 2006 had staked 176 Alaska (state) claims that covered this project and others along the 'Kiwalik trend' that roughly coincides with the Quartz Creek pluton and its alteration zone. Exposures are poor in the area and their initial work relied heavily on soil geochemistry and surface sampling. In 2006, Linus drilled one hole to a depth of 499 feet.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Adams, D.D., 2007, Geologic report on the Granite Mountain property, Koyuk Mining District, Candle B-5 and C-5 quadrangles, west-central Alaska: Unpublished Technical Report for the Linus Gold Corp., 71 p. (posted on www.sedar.com on February 8, 2008).

Primary Reference: Adams, 2007

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Mallard Duck Bay; Calcite; Marshinlak

Site type: Occurrences

ARDF no.: CG002

Latitude: 56.231 **Quadrangle:** CG A-2

Longitude: 158.511

Location description and accuracy:

This site represents an area southeast of Chignik Lagoon at the head of Mallard Duck Bay (Berg and Cobb, 1967, locality 2; Cobb, 1972: MF-374, locality 2; MacKevett and Holloway, 1977, locality 2; Cox and others, 1981, locality 8; Nokleberg and others, 1987, locality AP 11). The map site is plotted at an elevation of about 1000 feet, about 0.2 miles southeast of the head of Mallard Duck Bay. The location is accurate to within 1/4 mile.

Commodities:

Main: Ag, Au, Cu, Mo, Pb, Zn

Other: As

Ore minerals: Arsenopyrite, chalcopyrite, galena, gold, pyrite, sphalerite

Gangue minerals: Calcite, quartz, siderite

Geologic description:

This site represents a large propylitically altered zone covering an area 6 miles by 2 1/2 miles at the head of Mallard Duck Bay (Wilson and Cox, 1983). Elevation of the zone varies from sea level to 600 meters. The altered zone is associated with widespread introduction of pyrite and with low-order drainage anomalies (60 ppm copper, 15 ppm molybdenum, 0.3 ppm silver).

Rock types include diorite stocks up to 2000 feet in diameter and a system of northeast-trending quartz-diorite dikes which are up to 1/2 mile in length and up to several hundred feet in thickness. A system of andesite dikes trends N 30 to 40 W and dips vertically across a 4000-foot wide zone. All of these intrusives cut Eocene-Oligocene volcanics of the Meshik Formation which consists of andesite and basalt flows, volcaniclastic breccias, volcaniclastic sediments, and tuffaceous units.

Within the large area of propylitized rock is a zone of intense argillic alteration which covers an area of approximately 2 miles by 1/2 mile. This is referred to as the central argillic zone (Anderson and others 1979). The argillic alteration appears to be related to the northwest-trending andesite dikes because it forms envelopes up to 100 feet wide on either side of the dikes. The altered areas exhibit some silicification and introduction of disseminated pyrite. They also contain coarse stockworks of fractures, some of which contain quartz, pyrite, and rarely molybdenite.

Molybdenum mineralization occurs primarily in a stockwork that lies between two parallel andesite dikes outside of the central argillic zone. The mineralized rock is limonitic and exihibits silicification and minor argillization. As the dikes are approached the alteration increases and the molybdenum mineralization decreases (Anderson and others, 1979). The molybdenum zone has been traced for 100 feet but the total length is unknown. Fields (1977) notes molybdenum values ranging from 2 to 99 ppm in rock samples.

Systems of northwest-trending polymetallic veins are present in the propylitized volcanics. The Calcite and Mallard Duck vein systems occur in an area 1/2 to 1 mile southwest of the central argillic zone. Individual veins are up to 800 feet long and 10 feet wide. Other veins are known to extend along this trend for over 4 miles northwest to the beach exposures at Mallard Duck Bay. The Marshinlak vein system is located approximately 2 miles north of the central argillic zone and has been traced intermittently for over 6500 feet in a northwest direction. These veins are up to 15 feet in thickness. Minor strike trends include

northeast, north-south, and east-west. The veins vary in composition from quartz to quartz-calcite to quartz-siderite and may carry up to 5 percent sulfides, including arsenopyrite, chalcopyrite, galena, pyrite, and sphalerite. Some veins exhibit cockscomb features and some show evidence of repetitive pulsing of quartz and sulfides.

Metal values in the Calcite and Mallard Duck systems range as follows: 3360 ppm to 4.2 percent copper, less than 0.02 ppm to 3.3 ppm gold, 1100 ppm to 4.45 percent lead, 20 ppm to 21 ounces silver ounces per ton, 1100 ppm to 22.7 percent zinc (Butherus and others, 1981). Trace amounts of antimony and mercury were also detected. Copper, lead, and zinc values obtained in the Marshinlak system were all less than 100 ppm. Gold values ranged from 0.48 ppm to 0.163 ounce per ton and silver values from 3.4 ppm to 0.54 ounce per ton.

As recently as 2013 at least, Millrock Resources Inc has made an agreement with Bristol Bay Native Corporation, the mineral land owner, to explore for minerals. By 2013, a regional aeromagnetic survey was completed. There appears to be good correlation between magnetic highs and known porphyry occurrences. Historic work includes reconnaissance surface sampling, regional scale mapping by Full Metal Minerals, an IP survey of one line, and a ground magnetic survey of one line (Beischer, 2013).

Alteration:

Propylitically altered volcanics cover an area of approximately 6 by 2 1/2 miles. Within this altered zone argillic alteration forms envelopes up to 100 feet wide peripheral to northwest-trending andesite dikes, resulting in a central argillic zone which covers an area of approximately 2 by 1/2 miles.

Age of mineralization:

The probable age of mineralization is estimated at 21-27 million years (Cox and others, 1981).

Generic deposit model:

Deposit model:

Porphyry copper; porphyry copper-molybdenum; polymetallic veins (Cox and Singer, 1986; models 17, 21a, 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

17, 21a, 22c

Production Status: None

Site Status: Active?

Workings/exploration:

Gold claims were staked in the early part of the century. Bear Creek Mining Company mapped and sampled this zone in 1975 and 1976. Resource Associates of Alaska did detailed mapping and sampling in 1979, 1981, and 1982.

As recently as 2013 at least, Millrock Resources Inc. has made an agreement with Bristol Bay Native Corporation, the mineral land owner, to explore for minerals. By 2013, a regional aeromagnetic survey was completed. There appears to be good correlation between magnetic highs and known porphyry occurrences. Historic work includes reconnaissance surface sampling, regional scale mapping by Full Metal Minerals, an IP survey of one line, and a ground magnetic survey of one line (Beischer, 2013). In 2014, Millrock completed a geophysical survey or high-resolution airborne magnetic and radiometric data (Millrock Resources Inc., 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

This site is on land patented by or interim conveyed to the Bristol Bay Native Corporation.

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Anderson, G.D., Fitch, G.M., Lappie, D.W., Lindberg, P.A., and Fankhauser, R.E., 1979, Exploration and evaluation of Bristol Bay Native Corporation Lands, Vol. II, Book 1: Prepared for Houston Oil and Minerals Company by Resource Associates of Alaska, 78 p. (Report held by Alaska Earth Sciences, Inc., Anchorage, Alaska.)

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Wilson, F.H., 1980, Late Mesozoic and Cenozoic tectonics and age of porphyry copper prospects, Chignik and Sutwik Island quadrangles, Alaska Peninsula: U.S. Geological Survey Open-File Report 80-543, 94 p.,

5 sheets, scales 1:250,000 and 1 inch = 1,000 feet.

Wilson, F.H., and Cox, D.P., 1983, Geochronology, geochemistry, and tectonic environment of porphyry mineralization in the central Alaska Peninsula: U.S. Geological Survey Open-File Report 83-783, 24 p.

Primary Reference: Anderson and others, 1979

Reporter(s): S.H. Pilcher (Anchorage); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-07-15

Site name(s): Port Heiden

Site type: Occurrence

ARDF no.: CG003

Latitude: 56.7918 **Quadrangle:** CG D-4

Longitude: 159.0709

Location description and accuracy:

This occurrence site consists of 20 miles of beach placers on the northwest coast of the Alaska Peninsula between the Seal Islands and Port Heiden. The coordinates are at about the center of this section of beach near the center of section 24, T. 35 S., R. 62 W., of the Seward Meridian. The location is accurate.

Commodities:

Main: Fe, Ti

Other: Au

Ore minerals: Gold, ilmenite, magnetite

Gangue minerals:

Geologic description:

This occurrence consists of beach placer deposits of ilmenite and titaniferous magnetite in narrow spits and bars along the outer shores of low-lying mud flats. The beaches are sandy gravel, often loosely packed.

Berryhill (1963) collected twenty-four auger samples along 20 miles of beach. They were screened, tabled, and run through a magnetic separator. In the magnetic fraction, the iron content varied from 2.2 to 103.6 pounds per cubic yard, and the titanium oxide content varied from 0.6 to 21.9 pounds. In the non-magnetic fraction, the titanium oxide content varied from 0 to 1.2 pounds per cubic yard. A trace of flour gold was present in 5 samples.

Through at least 2006 and 2007, 7th Sea Holding Company LLC was actively exploring the property (7th Sea Holding Company, 2012) and they had acquired 34 miles of claims and private properties in the area. They identified a 'resource' of 8 billion tonnes of magnetite sands and 3 billion tonnes of explored probable reserves'. The project that they planned to develop in 2007 'has an average raw iron ore grade of 58 percent'. In 2010, Advanced Exploration Inc. (2010) optioned the property from 7th Sea and in May 2011, they announced that they had begun an aerial survey (Advanced Exploration, 2011 [Airborne]). In December, 2011, they terminated the agreement (Advanced Exploration Inc., 2011 [Corporate update].

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Deposit model:

Magnetite beach sands.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The U.S. Bureau of Mines studied and sampled the property in the early 1960s. Through at least 2006 and 2007, 7th Sea Holding Company LLC was actively exploring the property (7th Sea Holding Company, 2012) and they had acquired 34 miles of claims and private properties in the area. Advanced Exploration Inc. (2010) optioned the property from 7th Sea and in May 2011, they announced that they had begun an aerial survey (Advanced Exploration, 2011 [Airborne]). In December, 2011, they terminated the agreement (Advanced Exploration Inc., 2011 [Corporate update].

Production notes:

None.

Reserves:

Through at least 2006 and 2007, 7th Sea Holding Company LLC was actively exploring the property (7th Sea Holding Company, 2012) and they had acquired 34 miles of claims and private properties in the area. They identified a 'resource' of 8 billion tonnes of magnetite sands and 3 billion tonnes of explored probable reserves'. The project that they planned to develop in 2007 'has an average raw iron ore grade of 58 percent'.

Additional comments:

This site is located on state land, part of which is in the Port Heiden Critical Habitat Area.

References:

7th Sea Holding Company, LLC, 2012, Port Heiden Sands: http://7thseacompanies.com/projects.htm (as of Feb 15, 2012)

Advanced Exploration Inc., 2010, Advanced Exploration enters into option agreement to acquire Alaskan iron sands project: http://www.advanced-exploration.com/newsroom/press/Aug1810.html (News Release, Auugust 18, 2010).

Advanced Exploration Inc., 2011, Advanced Explorations Inc. Commences Airborne Magnetic Survey over Alaskan Iron Sands Project: (News release, May 26, 2011).

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Berryhill, R.V., 1963, Reconnaissance of beach sands, Bristol Bay, Alaska: U.S. Bureau of Mines Report of Investigations 6214, 48 p.

Cobb, E.H., 1972, Metallic mineral resources map of the Chignik quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-374, 1 sheet, scale 1:250,000.

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Cobb, E.H., 1980, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in fifteen quadrangles in southwestern and west-central Alaska: U.S. Geological Survey Open-File Report 80-909, 103 p.

Primary Reference: Berryhill, 1963; 7th Sea Holding Company, 2012

Reporter(s): S.H. Pilcher (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Bee Creek; Dry Creek

Site type: Prospect

ARDF no.: CG007

Latitude: 56.5117 **Quadrangle:** CG C-2

Longitude: 158.3846

Location description and accuracy:

This prospect is in T. 42 S., R. 58 W., of the Seward Meridian, located in a northeast facing valley near the headwaters of an unnamed creek entering Dry Creek approximately 1 mile north of Chignik Bay. The location is accurate to 1 mile.

Commodities:

Main: Ag, Au, Cu, Mo

Other: Pb, Zn

Ore minerals: Chalcopyrite, chrysocolla, galena, gold, magnetite, malachite, molybdenite, pyrite, pyrrhotite, sphalerite

Gangue minerals: Gypsum, quartz

Geologic description:

At this prospect sandstone, siltstone, argillite, and conglomerate of the Jurassic Naknek Formation have been intruded by a small dacite stock, which is surrounded by a sulfide system and alteration halo covering approximately 2 square miles (Fields, 1977). The intrusive is mainly dacite, but quartz diorite, andesite, and quartz porphyry have also been reported. The intrusive is part of a nearly east-west trending linear belt extending from Weasel Mountain (CG008) on the east to Cathedral Creek (CG001) on the west. The Bee Creek prospect was explored by Bear Creek Mining Company in 1975 and 1976 and by Resource Associates of Alaska in 1979 and 1981.

The prospect is marked by geochemical and color anomalies. Clusters of arsenic, copper, gold, lead, silver, and zinc anomalies surround the deposit. The main mineralized area is in a steep cirque basin that varies from 500 to 1,500 feet in elevation. Work by Resource Associates of Alaska (Anderson and others, 1979) suggests that mineralization may extend southwest into the McKinsey Valley.

The mineralization is mainly at the border of the dacite stock in arkose, conglomerate, and quartzite. Resource Associates of Alaska (Anderson and others, 1979) state that the hornfelsed sediments near the contact contain the best mineralization and that the mineralization decreases towards the core of the intrusive. The age of the mineralization is between 3.2 and 3.8 million years (Wilson, 1980; Wilson and Cox, 1983).

Chalcopyrite and pyrite occur in a stockwork of hairline fractures containing quartz-sulfide veinlets throughout an area about 2,000 feet in diameter. Disseminated chalcopyrite and pyrite occur in biotitized hornfels and these sulfides replace mafic minerals in the dacite. Molybdenite is finely disseminated in quartz veinlets, in gypsum veinlets, and in clots of chalcopyrite. Pyrite forms a halo on the periphery of the system. Some magnetite veins have been reported; they appear to be early in the mineralization sequence and contain no sulfides. Veins containing lead and zinc values are peripheral to the copper zone. Within the copper zone, richer surface samples contained 500 to 2,000 parts per million (ppm) copper, 0.04 to 0.18 ppm gold, 20 to 220 ppm molybdenum, and 0.4 to 0.18 ppm silver (Fields, 1977).

Secondary biotite is widely distributed both within and beyond the chalcopyrite zone. It replaces mafic minerals and forms fine-grained aggregates both in the pluton and in the surrounding sediments. The biotite zone centers on the stock and extends irregularly southward over an area of 1,500 by 3,400 feet.

Discontinuous zones of sericitic alteration are peripheral to the biotite zone and are locally superimposed on the potassic and propylitic alteration. Propylitic alteration of chlorite and epidote forms an outer alteration zone. A strong zone of argillic alteration located between the phyllic and propylitic zones also has been reported (Butherus and others, 1981).

After drilling at Bee Creek in 2006, Full Metal Minerals and Metallica Resources interpreted the deposit as a multiphase dioritic intrusion within a coincident copper-gold-molybdenum anomaly centered on a magnetic high about 2 kilometers in diameter (Full Metal Minerals, 2008; Metallica Resources, 2008).

Alteration:

The alteration at this prospect appears to be the classic porphyry type with a potassic core grading outward through phyllic, argillic, and propylitic alteration zones although these may not all be developed fully. The best copper mineralization is in the potassic zone (Fields, 1977).

Age of mineralization:

Pliocene (Fields, 1977), between 3.2 and 3.8 Ma (Wilson, 1980).

Generic deposit model:

Deposit model:

Porphyry copper; porphyry copper-molybdenum (Cox and Singer, 1986; models 17, 21a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

17, 21a

Production Status: None

Site Status: Active

Workings/exploration:

Bear Creek Mining Company drilled 5 holes in the copper zone in 1975 and 1976. Four holes averaged 500-1200 ppm copper and 5-28 ppm molybdenum. The best hole averaged 0.25 percent copper, 0.01 percent molybdenum, and 0.06 ppm gold over 500 feet. In 1979 Resource Associates of Alaska discovered two areas of polymetallic quartz veins. Samples of this material contained up to 5700 ppm copper, 4.4 ppm gold, 1.18 percent lead, 530 ppm molybdenum, 4.2 ounces silver per ton, and 1.62 percent zinc (Anderson and others, 1979). A resource of 4.5 to 9 million tonnes grading 0.25 percent copper and 0.01 percent molybdenum has been estimated (Young and others, 1997).

Along with geological mapping, geochemical sampling, and ground-based geophysics, Full Metal Minerals (FMM) and Metallica Resources (Metallica) drilled 2 holes on the Bee Creek porphyry in 2006. Notable intercepts in the two holes were: 1) 34 meters that contained 0.26 percent copper and 0.085 gram of gold per ton, 2) 118 meters that contained 0.31 percent copper and 0.126 gram of gold per ton, including 40 meters that contained 0.51 percent copper and 0.212 gram of gold per ton. The holes were mostly in sedimentary rocks cut by numerous intermediate to felsic dikes (Full Metal Minerals, 2008; Metallica Resources, 2008).

FMM and Metallica conducted field work in 2008, which included vein sampling and an orientation drainage survey employing bulk leach extractable gold (BLEG) analysis and drilled two holes. One grab sample of a quartz-sphalerite-galena vein float in one of the eastern secondary drainages (314322) contained 5.180 parts per million (ppm) gold, 251 ppm silver, 1050 ppm copper, 3.8 percent lead, and 5.9 percent zinc. Results from BLEG analysis were up to 0.232 ppm gold (Lipske and Rotert, 2008).

In 2013, a regional aeromagnetic survey was completed. There appears to be good correlation between magnetic highs and known porphyry occurrences (Gregory Beischer, Millrock Resources, Inc., oral communication, 2013). In 2014, Millrock Resources Inc. completed a high-resolution airborne magnetic survey, which indicated that known mineralization may continue to the southwest below a ridge in that area (Millrock Resources Inc., 2014).

Mineralization, alteration and anomalous copper values in soils and rocks extend over a broad area at the

Dry Creek prospect indicating the potential for a significant porphyry Cu-Mo-Au deposit near surface and potentially at depth. Although several holes have been drilled at the property, few of the geochemical or geophysical anomalies have been tested (Millrock Resources, Inc., 2015).

Production notes:

None.

Reserves:

The prospect contains an estimated resource of 4.5 to 9 million tonnes grading 0.25 percent copper, 0.01 percent molybdenum, and trace gold (Young and others, 1997).

Additional comments:

This prospect is located on land conveyed to or patented by the Bristol Bay Native Corporation. In August 2005, Metallica Resources entered into a joint venture agreement with Full Metal Minerals to explore on BBNC lands.

In 2013, Millrock Resources Inc. made an agreement with the BBNC to explore for minerals (Millrock Resources Inc., 2014).

References:

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Primary Reference: Fields, 1977

Reporter(s): S.H. Pilcher (Anchorage); D.J. Grybeck (Port Ludlow, WA); V.C. Zinno (Alaska Earth Sciences, Inc.); F.H. Wilson, USGS

Last report date: 2016-02-25

Site name(s): Marshinlak; Marshinlak Creek

Site type: Prospect

ARDF no.: CG023

Latitude: 56.2647 **Quadrangle:** CG B-2

Longitude: 158.5109

Location description and accuracy:

The Marshinlak prospect is located near the peak of a north-northwest trending ridge about 1.8 miles from where Marshinlak Creek enters Mallard Duck Bay; 0.3 mile southwest from the center of section 21, T. 45 S., R. 59 W., of the Seward Meridian. This location is accurate to within 1/4 mile of the center of the prospect.

Commodities:

Main: Ag, Au, Cu

Other: As, Sb

Ore minerals: Arsenopyrite, chalcopyrite, gold, pyrite

Gangue minerals: Calcite, quartz

Geologic description:

The Marshinlak Creek precious metal vein prospect is located on Chignik Lagoon Native Corp. (CLNC) lands approximately 4 kilometers north of the porphyry center at the Mallard Duck Bay prospect (CG002). The area was visited briefly by Resource Associates of Alaska (RAA) in 1982. Their efforts were focused on a subparallel set of poorly-exposed silver-gold bearing quartz veins located south of Marshinlak Creek. They collected a total of 25 vein samples, 23 of which contained gold with an average of 0.5 gram per tonne (parts per million (ppm)). The area is prospective for epithermal-style vein mineralization and/or a deep-seated porphyry target (Lipske and Rotert, 2008).

Rock types include diorite stocks up to 2000 feet in diameter and a system of northeast-trending quartz-diorite dikes, which are up to a half mile in length and up to several hundred feet in thickness. A system of andesite dikes trends N 30 to 40 W and dips vertically across a 4000-foot wide zone. All of these intrusives cut Eocene-Oligocene volcanics of the Meshik Formation, which consists of andesite and basalt flows, volcaniclastic breccias, volcaniclastic sediments, and tuffaceous units (Anderson and others, 1979).

South of Marshinlak Creek, a swarm of discontinuous and poorly-exposed quartz ± calcite ± pyrite ± arsenopyrite veins are exposed in subcrops and frost boils. The host andesites bear weak propylitic alteration but are strongly hydrolytized along veins. It is inferred that two or three west-northwest-trending veins are exposed over a zone measuring one kilometer in width by approximately 1.5 kilometers along strike, and at least 300 meters vertically. Subcrops were typically no wider than two meters, though RAA reported vein widths of up to five meters (15 feet). Vein mineralogy consists of white sugary to clear drusy quartz plus accessory calcite, pyrite, and local arsenopyrite. Uppermost vein exposures were dominated by calcite. A 3 kilometer by 1 kilometer area of bleached and oxidized andesite is located immediately north of Marshinlak Creek and comprises variable quartz-sericite-pyrite alteration with a widespread argillic overprint. Minor amounts of high-level advanced argillic alteration characterized by vuggy residual quartz and coarse white mica with local jarosite was recognized via handlens at uppermost levels. The sericitic-argillic alteration zone is haloed by weakly propylitized andesite (Lipske and Rotert, 2008).

A suite of 35 hand samples were submitted for supplemental portable infrared mineral analyzer (PIMA) testing. Through PIMA analyses from 2008 work, mineral species including smectite, illite, kaolinite, dickite, chlorite, and epidote were positively identified. Possible accessory carbonate, silica, and amphibole

were reported in several samples. Based on these results, the hydrothermal alteration at Marshinlak Creek consists of propylitic, argillic, and advanced argillic assemblages (Lipske and Rotert, 2008).

The rock chip and vein sampling completed at Marshinlak Creek in 2008 confirms the high grade results reported from previous workers. A total of 25 vein samples were collected and returned results of up to 84.7 ppm gold, 745 ppm silver, 853 ppm copper, 1490 ppm arsenic, and 155 ppm antimony. The upper range of each is defined by the results of sample 314182, a quartz vein in float that contained 1 to 2 volume percent visible chalcopyrite, arsenopyrite, and an unidentified black sooty sulfide or sulfosalt. The float was observed downslope from a sample location that RAA reported as a 15-foot wide quartz vein. Excluding sample 314182, vein samples averaged 0.511 ppm gold, 0.4 ppm silver, 78.6 ppm copper, and 261 ppm arsenic, which are consistent with the results reported by RAA in Moller et al., 1982 (Lipske and Rotert, 2008).

Alteration:

Propylitic, argillic, sericitic, and silica alteration (Lipske and Rotert, 2008).

Age of mineralization:

The probable age of mineralization is estimated at 21 to 27 million years (Wilson, 1980).

Generic deposit model:

Deposit model:

Porphyry copper; porphyry copper-molybdenum; polymetallic veins (Cox and Singer, 1986; models 17, 21a, 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

17, 21a, 22c

Production Status: None

Site Status: Active?

Workings/exploration:

A field program was performed in by Metallica Resource Inc. with a joint venture agreement with Full Metal Minerals (USA) Inc., on behalf of Bristol Bay Native Corporation (BBNC). This 2008 program entailed preliminary reconnaissance mapping and sampling at Marshinlak (Lipkse and Rotert, 2008).

A total of 31 vein samples and two lines of ground magnetics were collected south of Marshinlak Creek. North of Marshinlak Creek, approximately forty samples were collected on 50 meter centers and four lines of ground magnetics were completed. A suite of 35 hand samples were submitted for supplemental portable infrared mineral analyzer (PIMA) testing (Lipkse and Rotert, 2008).

Production notes:

None.

Reserves:

None.

Additional comments:

This record was created in 2014 to separate Marshinlak from Mallard Duck Bay (CG002), in which this site was previously combined with. The geology, location, and reports all separated these prospects.

References:

Anderson, G.D., Fitch, G.M., Lappie, D.W., Lindberg, P.A., and Fankhauser, R.E., 1979, Exploration and evaluation of Bristol Bay Native Corporation Lands, Vol. II, Book 1: Prepared for Houston Oil and Minerals Company by Resource Associates of Alaska, 78 p. (Report held by Alaska Earth Sciences, Inc.,

Anchorage, Alaska).

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Lipske, Joanna, and Rotert, Joel, 2008, Southwest Alaska Peninsula Report, 2008 Annual Report, Prepared for Bristol Bay Native Corporation, Metallica Resources Alaska Inc., Full Metal Minerals (USA) Inc., Alaska Earth Sciences, Inc., 41 p. (Unpublished report held by Alaska Earth Sciences, Inc., Anchorage, Alaska).

Wilson, F.H., 1980, Late Mesozoic and Cenozoic tectonics and age of porphyry copper prospects, Chignik and Sutwik Island quadrangles, Alaska Peninsula: U.S. Geological Survey Open-File Report 80-543, 94 p., 5 sheets, scales 1:250,000 and 1 inch = 1,000 feet.

Primary Reference: Lipske and Rotert, 2008

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-17

Site name(s): Unnamed (near Siwash Creek)

Site type: Occurrence

ARDF no.: CH002

Latitude: 67.1198 **Quadrangle:** CH A-5

Longitude: 149.4035

Location description and accuracy:

The occurrence is about 4.1 miles east of the junction of Siwash Creek and Mosquito Fork, at an elevation of about 2,300 feet. It is about 0.3 mile southwest of the center of section 3, T. 27 N., R. 8 W.. The location is accurate to within 1 mile.

Commodities:

Main: Cu

Other:

Ore minerals: Azurite, copper sulfides, malachite

Gangue minerals:

Geologic description:

This occurrence was originally described as copper sulfides and copper stains in a small body of chert in Devonian(?) volcanic rocks (Brosgé and Reiser, 1964; DeYoung, 1978). Kurtak and others (2002) describe a bluff about 30 feet high and 100 feet wide of highly silicified pyroxene diorite. The diorite is cut by several quartz veins 1 to 2 inches thick. Analyses of two samples of pyrite-bearing quartz and a sample of the mafic rock did not show any significant base or precious metals.

Alteration:

Age of mineralization:

Insufficient information to assign.

Generic deposit model:

Deposit model:

Insufficient information to assign.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Limited sampling by government agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

See also: West Fork occurrence (CH001).

MAS No. 0020310077

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

DeYoung, J.H., Jr., 1978, Mineral resources map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-878-B, 2 sheets, scale 1:250,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Primary Reference: Brosgé and Reiser, 1964; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Granite Creek

Site type: Prospect

ARDF no.: CH003

Latitude: 67.0227 **Quadrangle:** CH A-6

Longitude: 149.9687

Location description and accuracy:
This prospect is at an elevation of about 1,350 feet ft on a major west headwater tributary of Granite Creek that flows through the east half of section 4, T. 25 N., R. 11 W. The location is accurate to within about a mile.

Commodities:

Main: Au, Cu

Other:

Ore minerals: Chalcopyrite, gold?

Gangue minerals:

Geologic description:
Little is known about this prospect other than that 5 claims were active in this area from 1967 to 1969 and that a suction dredge was in operation in 1969 (DeYoung, 1978). The rocks in the area are Devonian(?) andesite, diorite, and chert adjacent to a large body of of upper Paleozoic or Mesozoic granitic rock (Brosgé and Reiser, 1964). Kurtak and others (2002) investigated the area. None of their panned concentrates showed gold; a float sample of hornfels had a trace of chalcopyrite and assayed 199 ppm copper.

Alteration:

Age of mineralization:
Quaternary.

Generic deposit model:
Placer deposits (Garnett and Bassett, 2005)

Deposit model:
Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: Undetermined

Site Status: Inactive

Workings/exploration:
Little is known about this prospect other than that 5 claims were active in this area from 1967 to 1969 and

that a suction dredge was in operation in 1969 (DeYoung, 1978).

Production notes:

Possibly some.

Reserves:

None.

Additional comments:

MAS No. 0020310116

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

DeYoung, J.H., Jr., 1978, Mineral resources map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-878-B, 2 sheets, scale 1:250,000.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Primary Reference: DeYoung, 1978; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (near Siwash Creek)

Site type: Occurrence

ARDF no.: CH004

Latitude: 67.1333 **Quadrangle:** CH A-6

Longitude: 149.6435

Location description and accuracy:

This occurrence is at an elevation of about 3,000 feet, about 2.4 mile west of the junction of Siwash Creek and Mosquito Fork. It is about 0.2 mile southeast of the center of section 25, T. 27 N., R. 10 W.

Commodities:

Main: Cr, Cu, Ni

Other: Ni

Ore minerals: Azurite, copper sulfides, magnetite, malachite

Gangue minerals:

Geologic description:

This occurrence was originally described as copper sulfides and copper staining at the contact between Devonian(?) black phyllite and slate and Devonian(?) pyroxene diorite and andesite flows (Brosgé and Reiser, 1964). Kurtak and others (2002) indicated that the diorite and andesite flows may be part of a 1,000-foot-wide band of mafic-ultramafic rocks bounded on both sides by chlorite-quartz schist. The mafic-ultramafic rock contains magnetite, is serpentinized at the margins of the band, and may be dunite. Samples of the serpentinized rock averaged 977 parts per million (ppm) nickel and 1,078 ppm chromite.

Alteration:

Age of mineralization:

Insufficient information to assign.

Generic deposit model:

Deposit model:

Insufficient information to assign.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only limited sampling by government agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS No. 0020310085

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

DeYoung, J.H., Jr., 1978, Mineral resources map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-878-B, 2 sheets, scale 1:250,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Slate Creek

Site type: Mine

ARDF no.: CH007

Latitude: 67.2269 **Quadrangle:** CH A-6

Longitude: 149.8969

Location description and accuracy:

Slate Creek is a west-flowing tributary to the Middle Fork Koyukuk River; its mouth is at the old mining town of Coldfoot on the Dalton Highway, the road that parallels the Trans-Alaska Pipeline. The creek was placer mined at various locations for more than 10 miles but the most productive ground was centered in upper Slate Creek at a camp about 5 miles above the mouth of Myrtle Creek. That ground extended for about a mile above and a mile below the camp. Most of the mining was in sections 24 and 26, T. 28 N., R. 11 W.

The most productive ground on Slate Creek is in the upper portion of the creek in the Chandalar A-6 quadrangle; the lower part of the creek that was also placer mined is in the Wiseman A-1 quadrangle.

Commodities:

Main: Ag, Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Slate Creek has been mined for more than 10 miles at various times since 1898 but the most productive ground was centered in upper Slate Creek about 5 miles above the mouth of Myrtle Creek; this ground extended for about a mile below and a mile above this point.

Gold was discovered at the junction of Myrtle Creek and Slate Creek in 1899 (Schrader, 1900) and by 1904 the workings extended for 5 or 6 miles up Mrytle Creek and farther along Slate Creek (Schrader, 1904). Mining continued intermittently along Slate Creek to at least 2000 by a succession of operators using hand methods, heavy equipment, and by drift mining (Kurtak and others, 2002). The gold production from Slate Creek is not well documented; U.S. Bureau of Mines records indicate that Slate Creek may have produced as much as 1,394 ounces of gold and 121 ounces of silver to 1963 (Kurtak and others, 2002).

Most of the mining on upper Slate Creek was along the modern channel. There was also some mining on a low bench on the south side of the creek; the bedrock at the bottom of the bench is only a few feet above the bedrock at the bottom of the modern channel. No deep channels have been found on upper Slate Creek. Mosier and Lewis (1986) analyzed several samples of gold from upper Slate Creek; they varied from 880 to 952 fine.

On lower Slate Creek, gold has been mined in the modern channel in gravel 10 to 40 feet thick. Reed (1938) indicates that it was possible for the early miners to recover $3 to $4 per day of flour gold (approx. 0.15 - 0.20 ounce of gold) by rocker. At least three high channels were identified from the mouth of Slate Creek to the mouth of Myrtle Creek but they did not contain enough gold to justify mining (Reed, 1938).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:
Placer deposits (Garnett and Bassett, 2005)

Deposit model:
Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:
Slate Creek has been mined at various times for over 10 miles upstream from its mouth. Gold was discovered at the junction of Myrtle Creek and Slate Creek in 1899 (Schrader, 1900) and by 1904 the workings extended for 5 or 6 miles up Mrytle Creek and farther along Slate Creek (Schrader, 1904). Mining continued intermittently along Slate Creek to at least 2000 by a succession of operators using hand methods, heavy equipment, and by drift mining (Kurtak and others, 2002). The most productive ground was centered on upper Slate Creek about 5 miles above the mouth of Myrtle Creek; this ground extended for about a mile below and a mile above this point.

Production notes:
The gold production from Slate Creek is not well documented. U.S. Bureau of Mines records indicate that Slate Creek may have produced as much as 1,394 ounces of gold and 121 ounces of silver to 1963 (Kurtak and others, 2002).

Reserves:
Probably none.

Additional comments:
MAS No. 0020310068

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., 1977, Placer deposit map of central Alaska: U.S. Geological Survey Open-File Report 77-168-B, 64 p., 1 map, scale 1:1,000,000.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society

of Economic Geologists, Littleton, Colorado, p. 813-843.

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Holdsworth, P.R., 1955, Report of the Commissioner of Mines for the biennium ended December 31, 1954: Alaska Territorial Department of Mines Annual Report 1954, 110 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Mosier, E.L., and Lewis, J.S., 1986, Analytical results, geochemical signatures, and sample locality map of lode gold, placer gold, and heavy-mineral concentrates from the Koyukuk-Chandalar mining district, Alaska: U.S. Geological Survey Open-File Report 86-345, 172 p.

Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Schrader, F.C., 1900, Preliminary report on a reconnaissance along the Chandalar and Koyukuk Rivers, Alaska, in 1899: U.S. Geological Survey Twenty-first Annual Report, Part 2, p. 441-486.

Schrader, F.C., 1904, A reconnaissance in northern Alaska across the Rocky Mountains, along Koyukuk, John, Anaktuvuk, and Colville rivers and the Arctic coast to Cape Lisburne, in 1901, with notes by W.J. Peters: U.S. Geological Survey Professional Paper 20, 139 p.

Smith, P.S., 1939, Mineral industry of Alaska in 1937: U.S. Geological Survey Bulletin 910-A, p. 1-113.

Smith, P.S., 1939, Mineral industry of Alaska in 1938: U.S. Geological Survey Bulletin 917-A, p. 1-113.

Smith, P.S., 1941, Mineral industry of Alaska in 1939: U.S. Geological Survey Bulletin 926-A, p. 1-106.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Myrtle Creek

Site type: Mine

ARDF no.: CH008

Latitude: 67.2573 **Quadrangle:** CH B-6

Longitude: 149.9805

Location description and accuracy:

The mouth of Myrtle Creek on Slate Creek (CH007) is about 4.6 miles east-southeast of Coldfoot. Myrtle Creek has been placer mined at various locations for more than 6 miles above its mouth but the most productive part extended from 2.5 miles to 5 miles above its mouth. The coordinates are at about the middle of this area, near the center of section 3, T. 28 N., R. 11 W.

The most productive ground on Myrtle Creek is in the upper portion of the creek in the Chandalar A-6 and B-6 quadrangles; the lower part of the creek that was also placer mined is in the Wiseman A-1 quadrangle.

Commodities:

Main: Ag, Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Gold was first discovered on Myrtle Creek in 1899 and by 1904 the workings extended 5 or 6 miles up the creek (Schrader, 1900, 1904; Maddren, 1913; Reed, 1938; Kurtak and others, 2002). By 1906, 80 men were hand mining along Myrtle Creek and hydraulic mining began in 1909. There was mining in open cuts and drift mining most years from 1914 to 1939. The first heavy equipment, a dragline and dozer, started mining in 1940. Mining resumed after World War II and continued at intervals until at least 2000, when a small suction dredge was being used to mine potholes in the creek. Myrtle Creek has produced consistently since 1900. Gold was produced in 27 of the years between 1900 and 1941, every year from 1948 to 1955, and during periods from 1979 to 2000. The records are incomplete, but Mrytle Creek produced 16,952 ounces of gold from 1900 to 1955. The most productive years were 1902 when 2,417 ounces of gold were produced and 1950 when 3,141 ounces of gold were produced (Kurtak and others, 2002). An uncertain amount of gold was also produced after 1955.

The most productive part of Mrytle Creek extended from about 2.5 miles above its mouth to about 5 miles above its mouth (Reed, 1938, Kurtak and others, 2002). Most of the gold came from the modern channel of Myrtle Creek in thawed ground that was 30 to 300 feet wide. The gravel was 2 to 7 feet thick and the gold was generally on bedrock or in crevices that held gold down to a depth of about 3 feet in the schist bedrock. The gold seemed to be evenly distributed across the channel. The gold was coarse, clean, and somewhat flattened; occasional nuggets up to an ounce were found and Smith (1942) reported a 23-ounce nugget. By 1937, the modern channel had largely been mined out.

There are several high bench channels on both sides of lower Mrytle Creek that extend for about 3 miles above its mouth (Reed, 1938; Kurtak and others, 2002). In 1937, they had not been mined to any extent but there were attempts to mine them after World War II. One notable bench along the lower two miles of Myrtle Creek has a channel perched 10 to 15 feet above the modern channel, and is covered by 10 to 30 feet of gravel. The ground on the bench was said to run about 0.01 to 0.023 ounce of gold per square foot of bedrock.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Undetermined

Workings/exploration:

Gold was first discovered on Myrtle Creek in 1899 and by 1904 the workings extended 5 or 6 miles up the creek (Schrader, 1900, 1904; Maddren, 1913; Reed, 1938; Kurtak and others, 2002). By 1906, 80 men were hand mining along Myrtle Creek and hydraulic mining began in 1909. There was mining in open cuts and drift mining most years from 1914 to 1939. The first heavy equipment, a dragline and dozer, started mining in 1940. Mining resumed after World War II and continued at intervals until at least 2000, when a small suction dredge was being used to mine potholes in the creek.

Production notes:

Myrtle Creek has been one of the largest placer gold producers in the Koyukuk district and it produced consistently from 1900 to 1955. The records are incomplete but Mrytle Creek produced 16,952 ounces of gold from 1900 to 1955; the most productive years were 1902 when 2,417 ounces of gold were produced and 1950 when 3,141 ounces of gold were produced (Kurtak and others, 2002). An uncertain amount of gold was produced after 1955.

Reserves:

Probably none of any significant size although pockets of auriferous gravel may remain in potholes along the creek, adjacent to previously mined sections, of the creek, and in the benches along lower Mrytle Creek.

Additional comments:

MAS No. 002031033

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

Bundtzen, T.K., Swainbank, R.C., Clough, A.H., Henning, M.W., and Charlie, K.M., 1996, Alaska's mineral industry, 1995: Alaska Division of Geological and Geophysical Surveys Special Report 50, 72 p.

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nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

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Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Holdsworth, P.R., 1952, Report of the Commissioner of Mines for the Biennium ended December 31, 1952: Alaska Territorial Department of Mines Annual Report 1952, 66 p.

Holdsworth, P.R., 1955, Report of the Commissioner of Mines for the biennium ended December 31, 1954: Alaska Territorial Department of Mines Annual Report 1954, 110 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Roehm, J.C., 1949, Report of investigations and itinerary of J.C. Roehm in the Koyukuk precinct, Alaska: Alaska Territorial Department of Mines Itinerary Report 31-1, 9 p.

Schrader, F.C., 1900, Preliminary report on a reconnaissance along the Chandalar and Koyukuk Rivers, Alaska, in 1899: U.S. Geological Survey Twenty-first Annual Report, Part 2, p. 441-486.

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Smith, P.S., 1942, Mineral industry of Alaska in 1940: U.S. Geological Survey Bulletin 933-A, p. 1-102.

Swainbank, R.C., Bundtzen, T.K., Clough, A.H., Hansen, E.W., and Nelson, M.G., 1993, Alaska's mineral industry, 1992: Alaska Division of Geological and Geophysical Surveys Special Report 47, 80 p.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (near Horse Creek)

Site type: Occurrence

ARDF no.: CH018

Latitude: 67.3985 **Quadrangle:** CH B-4

Longitude: 148.97

Location description and accuracy:

This occurrence is at elevation of about 4,000 feet, a mile south of peak 4792, and about 10 miles southwest of the south end of Chandalar Lake. It is about 0.3 mile north of the center of section 30, T. 30 N., R. 6 W.

Commodities:

Main: Cu, Sb

Other:

Ore minerals: Azurite, copper sulfides, malachite

Gangue minerals:

Geologic description:

Brosgé and Reiser (1972) described this occurrence as copper sulfides and copper staining in small pods and veinlets in Devonian quartz-mica schist intercalated with greenschist and greenstone. Kurtak and others (2002) examined the area but could not find any copper minerals. They did locate a 30-foot-long area of limonite-stained quartz-mica schist that contained 0.84 percent antimony. A rubblecrop sample of a metamorphosed quartz vein that crosscut that schist contained 549 parts per million antimony. No antimony mineral was identified.

Alteration:

Age of mineralization:

Devonian or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Data too sparse to determine.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only limited sampling by the U.S. Geological Survey and Bureau of Land Management.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS No. 0020310076

References:

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Brosgé, W.P., and Reiser, H.N., 1972, Geochemical reconnaissance in the Wiseman and Chandalar districts and adjacent region, southern Brooks Range, Alaska: U.S. Geological Survey Professional Paper 709, 21 p.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Primary Reference: Brosgé and Reiser, 1964; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Dennys Gulch; O'Keefe

Site type: Mine

ARDF no.: CH019

Latitude: 67.3955 **Quadrangle:** CH B-5

Longitude: 149.1413

Location description and accuracy:

This placer mine is at an elevation of about 2,400 feet in Dennys Gulch, which is about 6 miles south of the south end of Twin Lakes. It is at the mine symbol on the 1:63,360-scale topographic map, about 0.4 mile east of the center of section 29, T. 30 N., R. 7 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

This record describes the placer mine in Dennys Gulch. Both this placer and the lode prospect at the head of the gulch (CH123) are associated with Denny O'Keefe, who had claims and explored the area from 1948 to 1957; much of the work on the placer and the lode probably coincided (Kurtak and others, 2002). A magnetometer survey was run over Dennys Gulch and Sawlog Creek in 1951 (Williams, 1952); there was uranium exploration by the U.S. Geological Survey in 1956 (Freeman, 1963); 6 lode claims were staked in 1955 (Heiner and Wolff, 1968); and WGM Inc. explored in the area from 1975 to 1976, and in 1983 (Dashevsky, 1986).

O'Keefe sank several shafts along the gulch, presumably at the mine shown on the 1:63,360-scale topographic map. One shaft hit bedrock at 40 feet and another at 75 feet. Only a little gold was found in these shafts, where it was concentrated in a layer of red gravel (Kurtak and others, 2002). Heiner and Wolff (1968) reported that placer gold has been mined and that coarse nuggets valued as much as $100 were recovered, but that no pay streak was found. (Kurtak and others (2002), however, imply that the coarse nuggets came from the upper part of Dennys Gulch, perhaps at or near the lode prospect there (CH123)).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Undetermined

Workings/exploration:

Both this placer and the lode prospect at the head of the gulch (CH123) are associated with Denny O'Keefe, who had claims and explored the area from 1948 to 1957; much of the work on the placer and the lode probably coincided (Kurtak and others, 2002). A magnetometer survey was run over Dennys Gulch and Sawlog Creek in 1951 (Williams, 1952); there was uranium exploration by the U.S. Geological Survey in 1956 (Freeman, 1963); 6 lode claims were staked in 1955 (Heiner and Wolff, 1968); and WGM Inc. explored in the area from 1975 to 1976, and in 1983 (Dashevsky, 1986).

O'Keefe sank several shafts along the gulch, presumably at the mine shown on the 1:63,360-scale topographic map. One shaft hit bedrock at 40 feet and another at 75 feet. Only a little gold was found in these shafts where it was concentrated in a layer of red gravel (Kurtak and others, 2002). Heiner and Wolff (1968) reported that placer gold has been mined and that coarse nuggets valued as much as $100 were recovered, but that no pay streak was found. Kurtak and others (2002), however, imply that the coarse nuggets came from the upper part of Dennys Gulch, perhaps at or near the lode prospect there (CH123).

Production notes:

Some unknown but probably small amount of gold was produced from 1948 to 1957.

Reserves:

None.

Additional comments:

See also Wizard (CH123) and Sawlog Creek (CH020).

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

Cobb, E.H., 1973, Placer deposits of Alaska: U.S. Geological Survey Bulletin 1374, 213 p.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., 1977, Placer deposit map of central Alaska: U.S. Geological Survey Open-File Report 77-168-B, 64 p., 1 map, scale 1:1,000,000.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

DeYoung, J.H., Jr., 1978, Mineral resources map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-878-B, 2 sheets, scale 1:250,000.

Dashevsky, S.S., 1986, Mines, prospect, and geochemical anomalies on Doyon Ltd. regional overselection lands Alaska, Block 1 - 8, v. 1 or II: Unpublished report for Doyon Ltd., 42 p. (on file at Doyon Ltd., Fairbanks, Alaska).

Eakins, G.R., 1969, Uranium in Alaska: Alaska Division of Mines and Geology Geologic Report 38, 49 p., 2 sheets (scale 1:3,800,000).

Freeman, V.L., 1963, Examination of uranium prospects, 1956, in Contributions to economic geology of Alaska: U.S. Geological Survey Bulletin 1155, p. 29-33.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Heiner, L.E., and Wolff, E.N., eds., 1968, Mineral resources of northern Alaska, Final report, submitted to the NORTH Commission: University of Alaska, Mineral Industry Research Laboratory Report No. 16, 306 p.

Holdsworth, P.R., 1952, Report of the Commissioner of Mines for the Biennium ended December 31, 1952: Alaska Territorial Department of Mines Annual Report 1952, 66 p.

Holdsworth, P.R., 1955, Report of the Commissioner of Mines for the biennium ended December 31, 1954: Alaska Territorial Department of Mines Annual Report 1954, 110 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Williams, J.A., 1952, A magnetometer survey of Denny's Gulch and Sawlog Creek in the Koyukuk-Chandalar region, Alaska: Alaska Territorial Department of Mines Prospect Evaluation 31-2, 28 p., 1 sheet (of traverse lines, scale 1:2,400, 17 line sheets).

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Sawlog Creek

Site type: Mine

ARDF no.: CH020

Latitude: 67.404 **Quadrangle:** CH B-5

Longitude: 149.1656

Location description and accuracy:

Sawlog Creek is a small headwater tributary to the South Fork Koyukuk River; its mouth is about 5 miles south-southwest of the south end of Twin Lakes. The small placer mine on Sawlog Creek is sometimes confused with the nearby one on Dennys Gulch (CH019) because there was placer activity on both in which Denny O'Keefe was involved. For this record, the site is arbitrarily located on upper Sawlog Creek at an elevation of about 2,300 feet. It is about 0.6 mile north-northwest of the center of section 29, T. 30 N., R. 7 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Brosgé and Reiser (1964) reported placer activity about 1 mile upstream from where Sawlog Creek enters the valley of the South Fork Flats. However, this activity my refer to the better known placer and lode work in Dennys Gulch (CH019), just over the low divide at the head of Sawlog Creek. Kurtak and others (2002) note that claims were staked on Sawlog Creek in 1949 and that a magnetic survey was run in 1951 that covered Dennys Gulch and Sawlog Creek. Williams (1952) reported that the results of the magnetometer survey were generally inconclusive. The survey was performed at the request of the property owners, however, which suggests some activity at that time. A placer claim was staked on Sawlog Creek in 1960 (Heiner and Wolff, 1968) and DeYoung (1978) reported placer mining in 1964. Kurtak and others (2002) (briefly?) visited Sawlog Creek in their comprehensive study of the mineral resources of the Koyukuk mining district but found no evidence or past or current mining.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Undetermined

Site Status: Undetermined

Workings/exploration:

Brosgé and Reiser (1964) reported placer activity about 1 mile upstream from where Sawlog Creek enters the valley of the South Fork Flats. However, this activity my refer to the better known placer and lode work in Dennys Gulch (CH019), just over the low divide at the head of Sawlog Creek. Kurtak and others (2002) note that claims were staked on Sawlog Creek in 1949 and that a magnetic survey was run in 1951 that covered Dennys Gulch and Sawlog Creek. Williams (1952) reported that the results of the magnetometer survey were generally inconclusive. The survey was performed at the request of the property owners, however, which suggests some activity at that time. A placer claim was staked on Sawlog Creek in 1960 (Heiner and Wolff, 1968) and DeYoung (1978) reported placer mining in 1964. Kurtak and others (2002) (briefly?) visited Sawlog Creek in their comprehensive study of the mineral resources of the Koyukuk mining district but found no evidence or past or current mining.

Production notes:

Probably none.

Reserves:

None.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310039

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

Cobb, E.H., 1972, Metallic mineral resources map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-457, 1 sheet, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., 1977, Placer deposit map of central Alaska: U.S. Geological Survey Open-File Report 77-168-B, 64 p., 1 map, scale 1:1,000,000.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

DeYoung, J.H., Jr., 1978, Mineral resources map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-878-B, 2 sheets, scale 1:250,000.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Heiner, L.E., and Wolff, E.N., eds., 1968, Mineral resources of northern Alaska, Final report, submitted to

the NORTH Commission: University of Alaska, Mineral Industry Research Laboratory Report No. 16, 306 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Williams, J.A., 1952, A magnetometer survey of Denny's Gulch and Sawlog Creek in the Koyukuk-Chandalar region, Alaska: Alaska Territorial Department of Mines Prospect Evaluation 31-2, 28 p., 1 sheet of traverse lines, scale 1:2,400; 17 line sheets.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Shamrock Creek; Butte Creek

Site type: Prospect

ARDF no.: CH022

Latitude: 67.4828 **Quadrangle:** CH B-5

Longitude: 149.3745

Location description and accuracy:

Shamrock Creek (Butte Creek in older reports) is a short creek that flows into the south side of Bob Johnson Lake (formerly Big Lake) about a mile and a half west of its east end. There is an old report of mining at some unspecified location. For this record, the site is arbitrarily located about a half mile above the mouth of the creek near the center of section 29, T. 31 N., R. 8 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Reed (1938) reported that 'pay' had been found on Shamrock Creek in 1920 but there is no further indication of mining. A placer claim was staked in 1978. Kurtak and others (2002) visited Shamrock Creek in their study of the mineral resources of the Koyukuk mining district. They found no sign of mining and their samples did not show any visible or analytical gold.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Undetermined

Site Status: Inactive

Workings/exploration:

Reed (1938) reported that 'pay' had been found on Shamrock Creek in 1920 but there is no further

indication of mining. A placer claim was staked in 1978. Kurtak and others (2002) visited Shamrock Creek in their study of the mineral resources of the Koyukuk mining district. They found no sign of mining and their samples did not show any visible or analytical gold.

Production notes:

Some gold may have been recovered during prospecting in 1920.

Reserves:

None.

Additional comments:

MAS No. 0020310087

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): California Creek

Site type: Mine

ARDF no.: CH023

Latitude: 67.4719 **Quadrangle:** CH B-5

Longitude: 149.4918

Location description and accuracy:

There was mining on California Creek near the mouth of Jim Pup, about 3.8 miles south-southwest of the north end of Bob Johnson Lake (formerly Big Lake). The mining was in the north half of section 35, T. 31 N., R. 9 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Maddren (1913) reported shovel-and-sluice mining from 1901 to 1909 on California Creek near the mouth of Jim Pup. From 1915 to 1931, a miner sank 18, 18-foot shafts, drove two inclines on a deep channel, and produced a small amount of gold. The records are incomplete but 102 ounces of gold were produced from California Creek from 1901 to 1919. Claims were held during the 1940s and 1950s, and from 1980 to 1986. There was mining in 1985 (Dillon (1987); in 1990 (Swainbank and others, 1991); and from 1999 to at least 2000, when the ground was being worked with a suction dredge and a backhoe (Kurtak and others, 2002). High benches are present but apparently were not mined. (Also see the placers on nearby Jim Pup (CH024) and Wakeup Creek (CH025) which are geologically similar and may be contiguous.)

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

Maddren (1913) reported shovel-and-sluice mining from 1901 to 1909 on California Creek near the mouth of Jim Pup. From 1915 to 1931, a miner sank 18, 18-foot shafts, drove two inclines on a deep channel, and produced a small amount of gold. The records are incomplete but 102 ounces of gold were produced from California Creek from 1901 to 1919. Claims were held during the 1940s and 1950s, and from 1980 to 1986. There was mining in 1985 (Dillon (1987); in 1990 (Swainbank and others, 1991); and from 1999 to at least 2000 when the ground was being worked with a suction dredge and a backhoe (Kurtak and others, 2002). High benches are present but apparently were not mined.

Production notes:

The records are incomplete but 102 ounces of gold were produced from California Creek from 1901 to 1919. Mining continued to 1931, and again in 1985, in 1990, and from 1999 to at least 2000, but there is no record of the amount of gold that was produced.

Reserves:

Apparently none.

Additional comments:

MAS No. 0020310031

References:

Brooks, A.H., 1918, Mineral resources of Alaska, 1916: U.S. Geological Survey Bulletin 662, 469 p.

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., 1987, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial

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Schrader, F.C., 1904, A reconnaissance in northern Alaska across the Rocky Mountains, along Koyukuk, John, Anaktuvuk, and Colville rivers and the Arctic coast to Cape Lisburne, in 1901, with notes by W.J. Peters: U.S. Geological Survey Professional Paper 20, 139 p.

Smith, P.S., 1932, Mineral industry of Alaska in 1929, in Smith, P.S., and others Mineral resources of Alaska, report on progress of investigations in 1929: U.S. Geological Survey Bulletin 824-A, p. 1-81.

Swainbank, R.C., Bundtzen, T.K., and Wood, J.E., 1991, Alaska's mineral industry, 1990: Alaska Division of Geological and Geophysical Surveys Special Report 45, 78 p.

Primary Reference: Maddren, 1913; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Jim Pup; Jim Pup Creek; Jim Gulch; Jim Creek

Site type: Mine

ARDF no.: CH024

Latitude: 67.4726 **Quadrangle:** CH B-5

Longitude: 149.4759

Location description and accuracy:

The lower mile of Jim Pup Creek has been placer mined. The creek is a tributary to California Creek, about 6.7 miles south of the north end of Bob Johnson Lake (formerly Big Lake). Most of the mined area is near the northeast corner of section 35, T. 31 N., R. 9 W. (The creek is labeled 'Jim Pup' on the 1971, 1:63,360-scale topographic map, but was called Jim Gulch, Jim Pup Creek, or Jim Creek in old reports.)

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Gold was discovered on Jim Pup in 1901. There was intermittent mining well into the 1920s and again in 1941; 735 ounces of gold were produced from 1901 to 1941 from the lower mile and a half of the creek. Claims were held during the 1940s and 1950s. There was mining in 1985 (Dillon, 1987); in 1990 (Swainbank and others, 1991); and in 1998 when a suction dredge was being used above the old tailings (Kurtak and others, 2002). There is no record of the amount of gold that was produced after 1941 but some was probably recovered.

The early mining was by hand methods along the modern channel of Jim Pup and tailings are stacked on both sides of the lower mile of the creek. The gold was said to be coarse; a $50 nugget was recovered in the early days (Reed, 1938). The pay streak was about 10 feet wide, and overlain by 3 to 5 feet of gravel over bedrock. Several shafts, one 104 feet deep, were sunk on one or more deep channels on the north side of the creek but they were apparently not mined. (Also see the placers on nearby California Creek (CH023) and Wakeup Creek (CH025), which are geologically similar and may be contiguous.)

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

Gold was discovered on Jim Pup in 1901. There was intermittent mining well into the 1920s and again in 1941; 735 ounces of gold were produced from 1901 to 1941 from the lower mile and a half of the creek. Claims were held during the 1940s and 1950s. There was mining in 1985 (Dillon, 1987); in 1990 (Swainbank and others, 1991); and in 1998 when a suction dredge was being used above the old tailings (Kurtak and others, 2002).

Production notes:

Gold was discovered on Jim Pup in 1901 and there was intermittent mining well into the 1920s and in 1941; 735 ounces of gold were produced from 1901 to 1941 from the lower mile and a half of the creek. There was mining again in 1985 (Dillon, 1987); in 1990 (Swainbank and others, 1991); and in 1998 when a suction dredge was being used above the old tailings (Kurtak and others, 2002) There is no record of the amount of gold that was produced after 1941 but some was probably recovered.

Reserves:

None.

Additional comments:

MAS No. 0020310032

References:

Brooks, A.H., 1918, Mineral resources of Alaska, 1916: U.S. Geological Survey Bulletin 662, 469 p.

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

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284-315.

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Swainbank, R.C., Bundtzen, T.K., and Wood, J.E., 1991, Alaska's mineral industry, 1990: Alaska Division of Geological and Geophysical Surveys Special Report 45, 78 p.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Wakeup Creek

Site type: Mine

ARDF no.: CH025

Latitude: 67.478 **Quadrangle:** CH B-5

Longitude: 149.4798

Location description and accuracy:

Wakeup Creek is a tributary of Jim Pup. It is about 2.4 miles south of the north end of Bob Johnson Lake (formerly Big Lake). The creek has been mined for about 1,500 feet above its mouth, through the east half of section 26, T. 31 N., R. 9 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Although gold was discovered near Wakeup Creek on California Creek (CH023) and Jim Pup (CH024) by 1901, the first reported gold production on Wakeup Creek was in 1926 (Kurtak and others, 2002). Drift mining continued most years until 1941 and a total of 1,795 ounces of gold was produced from 1926 to 1941. Shafts were sunk in 1948 and 1949 and there were active claims at various times until at least 1997.

There are three types of placers on Wakeup Creek: 1) in the modern channel, 2) in a deep channel, and 3) in a high channel. The modern channel rests on older gravel, i.e., it does not go down to bedrock. The early mining was along the modern channel but most of the original shallow gravel has been covered by tailings from later mining. The deep channel, which was the most productive, was drift mined for about 1,500 feet upstream from the mouth of Wakeup Creek. It is probably the continuation of the deep channel on Jim Pup (CH024). Bedrock is about 55 feet deep at the mouth of the creek and deepens to 112 feet upstream. The deep channel is incised into hard, smooth, schist bedrock with five or six gutters, 2 to 4 feet deep, along its bottom The channel is about 25 feet wide at its lower end and narrows upstream to 15 to 20 feet. The gold is generally on the high points of the bedrock between the gutters, but in places is also distributed throughout the gravel. The gold is fine but rough with only a few larger pieces. The ground ran from $3.50 to $4.00 in gold per square foot of bedrock (at $35 per ounce of gold). The high channel appears to be a continuation of a channel on Jim Pup Creek (CH024) that drained into Bob Johnson Lake. The gravel in the high channel was about 20 feet deep when it was explored in 1937. There is no record of gold being produced from the high channel but it was said to run about $0.50 in gold (at $35 per ounce of gold) per square foot of bedrock (Reed, 1938). Kurtak and others (2002) suggest that most of the deep channel has been mined out and that the high channel has low gold values. (Also see the placer on nearby California Creek (CH023) which is geological similar and may be contiguous.)

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:
Placer deposits (Garnett and Bassett, 2005)

Deposit model:
Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:
Although gold was discovered near Wakeup Creek on California Creek (CH023) and Jim Pup (CH024) by 1901, the first reported gold production on Wakeup Creek was in 1926 (Kurtak and others, 2002). Drift mining continued most years until 1941. Shafts were sunk in 1948 and 1949 and there were active claims at various times until at least 1997.

Production notes:
Based on incomplete records, 1,795 ounces of gold were produced from Wakeup Creek from 1926 to 1941, mostly by drift mining. There was activity on the creek from 1948 to 1997 and some gold may have been recovered in during exploration.

Reserves:
Probably none.

Additional comments:
MAS No. 0020310098

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

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Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

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Smith, P.S., 1938, Mineral industry of Alaska in 1936: U.S. Geological Survey Bulletin 897-A, p. 1-107.

Smith, P.S., 1939, Mineral industry of Alaska in 1938: U.S. Geological Survey Bulletin 917-A, p. 1-113.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Lake Creek

Site type: Mine

ARDF no.: CH026

Latitude: 67.4956 **Quadrangle:** CH B-5

Longitude: 149.4524

Location description and accuracy:

Lake Creek flows into the south side of Bob Johnson Lake (formerly Big Lake) about a mile and a half south of its north end. Lake Creek has been mined from about 300 feet to 3,200 feet upstream from its mouth. The coordinates are at the mine symbol on the the 1:63,360-scale topographic map, near the center of section 24, T. 31 N., R. 9 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Gold was discovered on Lake Creek in 1915, followed by hand and drift mining near the mouth of the creek in 1916 (Reed, 1938; Kurtak and others, 2002). In the 1930s, shafts were sunk in upper Lake Creek near the divide with Wakeup Creek (CH025) and there was hydraulic and drift mining nearly every year to 1941 at various places along the creek. From 1949 to 1959 mining continued by hydraulic and sluicing methods on claims that extended the length of Lake Creek. Dillon (1987) reported mining from 1980 to 1986. Lake Creek produced gold in 23 of the years between 1921 and 1955, although never more than 99 ounces of gold a year; the total production during that period was 807 ounces of gold.

Gold was mined from placers along the modern channel of Lake Creek, from benches, and from a deep channel in the upper part of the creek. (Reed, 1938; Kurtak and others, 2002). When Reed visited the creek in 1937, the modern channel had been worked from about 300 feet to about 1,500 feet above its mouth. The channel was 10 to 20 feet wide and the gravel was 9 to 12 feet deep. The stream fill consisted of coarse-grained schist 'slide' rock mixed with fine sand and coarse waterworn gravel (Reed, 1938). The gold was coarse and the ground ran about $0.50 in gold per square foot of bedrock (with gold at $35 per ounce). Several benches were mined along Lake Creek. One bench deposit, exposed in a cut about 0.5 mile from the mouth of the creek, was 75 to 100 feet higher than the modern channel of Lake Creek. The gold was concentrated in a channel about a foot wide on bedrock. Beginning in 1930, shafts were sunk through 30-40 feet of overburden on a deep channel in upper Lake Creek near the divide to Wakeup Creek (CH025). The deep channel may be an extension of the high channel on Wakeup Creek on the other side of the divide. The overburden consisted of thick blue-gray mud and gravel. The gold was in the the bottom foot of the gravel and the ground had about 0.01 ounce of gold per square foot of bedrock.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

Gold was discovered on Lake Creek in 1915, followed by hand and drift mining near the mouth of the creek in 1916 (Reed, 1938; Kurtak and others, 2002). In the 1930s, shafts were sunk in upper Lake Creek near the divide to Wakeup Creek (CH025) and there was hydraulic and drift mining almost every year to 1941 at various places along the creek. From 1949 to 1959 mining continued by hydraulic and sluicing methods on claims that extended the length of Lake Creek. Dillon (1987) reported mining from 1980 to 1986.

Production notes:

Lake Creek produced gold in 23 of the years between 1921 and 1955, although never more than 99 ounces of gold a year; the total production during that period was 807 ounces of gold. There was mining from 1949 to 1959 and from 1980 to 1986 but there is no record of the amount of gold that was produced.

Reserves:

Probably none.

Additional comments:

MAS No. 0020310005

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

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Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., 1987, Upper Koyukuk district land and mining claim status current to 1985: Alaska Division of Geological and Geophysical Surveys Public-Data File 87-11, 1 sheet, scale 1:125,000.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

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mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

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Smith, P.S., 1936, Mineral industry of Alaska in 1934: U.S. Geological Survey Bulletin 868-A, p. 1-91.

Wimmler, N.L., 1925, Placer mining in Alaska in 1925: Alaska Territorial Department of Mines Miscellaneous Report 195-8, 118 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Bore Creek; Boer Gulch; Boer Creek; Boar Creek

Site type: Prospect

ARDF no.: CH027

Latitude: 67.4631

Quadrangle: CH B-6

Longitude: 149.5717

Location description and accuracy:

Bore Creek is one of the headwater tributaries to California Creek. The site is plotted at an elevation of about 2,200 feet near old tailings. It is about 1.0 mile upstream from the mouth of the creek and about 0.4 mile south of the center of section 33, T. 30 N., R. 9 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Maddren (1913) reported small-scale mining in about 1901 at some uncertain location on Bore Creek. The gold recovery was said to be poor, earning only enough to cover wages. Reed (1938) found no evidence of mining, and local miners reported that prospecting had never located ground worth mining. An individual prospected on Bore Creek in 1959 but was unsuccessful. Eight claims were staked in 1977-1978, and in 2001, another group was prospecting their claims (Kurtak and others, 2002).

During their study of the mineral resources of the Koyukuk mining district, Kurtak and others (2002) found an old cabin, various mining equipment, and an area of hand-stacked tailings about 100 feet long, a mile to a mile and a half above the mouth of the creek. They collected several quartz samples in the surrounding area. The samples contained up to 1 percent pyrite, 714 parts per million (ppm) arsenic, 2,000 ppm strontium, 785 ppm copper, and 338 ppm zinc. The best was a sample from a loose quartz boulder that contained 97 parts per billion gold, 1.17 percent lead, and 1.01 percent antimony. However, the sample was found near a cabin and may have been brought in from elsewhere.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes?

Site Status: Undetermined

Workings/exploration:

Maddren (1913) reported small-scale mining in about 1901 at some uncertain location on Bore Creek. Reed (1938) found no evidence of mining, and local miners reported that prospecting had never located ground worth mining. An individual prospected on Bore Creek in 1959 but was unsuccessful. Eight claims were staked in 1977-1978, and in 2001, another group was prospecting their claims (Kurtak and others, 2002).

Production notes:

There is no documented evidence of any significant gold production but the small area of tailings suggests that a small amount of gold may have been produced.

Reserves:

None.

Additional comments:

MAS No. 0020310049

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

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Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

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Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Little Gold Creek

Site type:

ARDF no.: CH028

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

This was a vague site to begin with that only describes an old shaft on a minor unnamed tributary to a well known creek. However, there was mechanical mining in this area as recently as 2001 and what we're really looking at is mining at the far end of Gold Creek that has been mined relatively continuously for more than six miles. Little Gold Creek is referenced in the Gold Creek (CH080) record but events have long overtaken this site.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Sheep Creek; Sheep Gulch

Site type: Mine

ARDF no.: CH029

Latitude: 67.4965 **Quadrangle:** CH B-6

Longitude: 149.8061

Location description and accuracy:

Sheep Creek is a west-flowing tributary to the Middle Fork Koyukuk River. The mine is shown by symbol and label on the 1:63,360-scale topographic map. It is about 0.5 mile west of the center of section 21, T. 31 N., R. 10 W. Placer mining extends for about 0.5 mile downstream and 1 mile upstream from the mine symbol on the map.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

There are several generations of mining on Sheep Creek and much old mining equipment remains on the property (Kurtak and others, 2002). Tailings piles up to 30 feet high are along the creek from 1,500 feet to 2,100 feet elevation. The first production was in 1907, and by 1914, 113 ounces of gold had been produced Maddren, 1913). The creek was mined most years between 1933 and 1942, both by drift mining and by booming and shoveling, along the modern stream channel; 543 ounces of gold was produced. There was mining in 1948 and 1949, and in 2000, Bureau of Land Management geologists found evidence of recent mining.

Reed (1938) reported that the Sheep Creek placers are in both the modern channel and a deep channel. In 1910, the deep channel was discovered along the north side of the creek and mined for about 7,000 feet upstream, beginning where the valley of Sheep Creek opens into the valley of the Middle Fork Koyukuk River. Above this, the deep channel grades into the modern stream stream channel. At the lower end of the deep channel, the gravel was about 90 feet thick and was drift mined. There are few large boulders in the tailings from the deep channel. The gravel from the deep channel ran about $1 per square foot of bedrock in 1937, but some small areas had much more gold. The deep channel could extend west into the relatively flat valley of the Middle Fork Koyukuk River, but it may have been cut off as was the deep channel of Gold Creek (CH080) about a mile to the north.

Reed (1938) implied that mining had then just begun in the modern channel of Sheep Creek, about 1,000 feet upstream from where Sheep Creek valley enters the valley of the Middle Fork. The gravel over the schist bedrock was about 6 feet thick and very coarse with many large schist boulders. The gold was coarse and water worn. The preliminary estimates in 1937 were that the ground had about $0.50 in gold (0.014 ounces) per square foot of bedrock.

Kurtak and others (2002) panned samples along the creek and many contained visible gold. However, they indicated that there is probably little unmined gravel left along the creek.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

There are several generations of mining on Sheep Creek and much old mining equipment remains on the property (Kurtak and others, 2002). Tailings piles up to 30 feet high are along the creek from 1,500 feet to 2,100 feet elevation. The first production was in 1907, and by 1914, 113 ounces of gold had bee produced (Maddren, 1913). The creek was mined most years between 1933 and 1942, both by drift mining and by booming and shoveling along the modern stream channel. There was mining in 1948 and 1949, and in 2000, Bureau of Land Management geologists found evidence of recent mining.

Production notes:

Kurtak and others (2002) document that 780 ounces of gold was produced from 1907 to 1948 but the records are incomplete. Most of the gold was produced from 1907 to 1914 and from 1933 to 1942. There may have been mining as recently as 2000.

Reserves:

Kurtak and others (2002) indicated that there was probably little unmined gravel left along the creek.

Additional comments:

MAS No. 0020310044

References:

Brooks, A.H., 1911, The mining industry in 1910, in Brooks, A.K., and others, Mineral resources of Alaska, report on progress of investigations in 1910: U.S. Geological Survey Bulletin 480-B p. 21-43.

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Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Nugget Creek

Site type: Mine

ARDF no.: CH030

Latitude: 67.4784 **Quadrangle:** CH B-6

Longitude: 149.846

Location description and accuracy:

Nugget Creek flows into the Middle Fork Koyukuk River, about 9 miles northeast of Wiseman. There is little information about mining along Nugget Creek but there was some prospecting and mining below the mouth of Victor Gulch. This site is somewhat arbitrarily located at about the midpoint of the creek between the Middle Fork and the mouth of Victor Gulch, near the southwest corner of section 29, T. 31 N., R. 10 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Kurtak and others (2002) found considerable evidence of mining along Nugget Creek below the mouth of Victor Gulch, including a trench, tailings, sluice boxes, suction dredging equipment, and several cabins. There is little information on the mining, however. Reed (1938) reported that fair prospects had been found although little mining had been done. Claims were staked in the early 1980s. Several placer claims were being worked from 1994 to at least the early 2000s, (Kurtak and others, 2002). Kurtak and others (2002) sampled and panned along the creek; several of the pans contained visible or analytical gold. The ground is shallow along most of the creek; less than 3 feet of gravel covers bedrock.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Undetermined

Workings/exploration:

Kurtak and others (2002) found considerable evidence of mining along Nugget Creek below the mouth of Victor Gulch, including a trench, tailings, sluice boxes, suction dredging equipment, and several cabins. There is little information on the mining, however. Reed (1938) reported that fair prospects had been found although little mining had been done. Kurtak and others (2002) sampled and panned along the creek. Claims were staked in the early 1980s, and from 1994 to at least the early 2000s, several placer claims were being worked (Kurtak and others, 2002).

Production notes:

Possibly some production but probably small.

Reserves:

None.

Additional comments:

MAS No. 0020310148

References:

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Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (near Howard Creek)

Site type: Occurrence

ARDF no.: CH034

Latitude: 67.3779 **Quadrangle:** CH B-6

Longitude: 149.9188

Location description and accuracy:

This occurrence is at an elevation of about 4,900 feet on the ridge east of the head of Howard Creek. It is about 5.4 miles east-southeast of Wiseman and about 0.6 mile southwest of the center of section 36, T. 30 N., R. 11 W.

Commodities:

Main: Cu, Pb, Zn

Other: Ni

Ore minerals: Chalcopyrite, galena, pyrrhotite

Gangue minerals: Quartz

Geologic description:

This occurrence was originally noted by Brosgé and Reiser (1964) as an occurrence of metallic minerals that contained copper and nickel. Mulligan (1974) described it as widely but very sparsely distributed, cherry-sized pods of quartz and pyrrhotite with traces of galena and chalcopyrite in chloritic schist. Goethite stains accompanies these pods. Pyrite veinlets along joints and fractures in the schist contain trace amounts of copper. The rocks in the area are lower Paleozoic to Proterozoic, interlayered quartzite and graphitic albite-chlorite-muscovite-quartz schist near a contact with Lower Paleozoic to Proterozoic calcareous schist and marble (Dillon and Reifenstuhl, 1995). At or near this occurrence, Kurtak and others (2002) investigated about 1.5 miles of the contact of interbedded quartzite and graphitic schist with calcareous schist and marble. They collected 11 samples of marble, schist, and quartz veins. They found no mineralization and the only anomalous metal value was in a sample of pyritic quartz-chlorite schist that contained 455 parts per million zinc.

Alteration:

Oxidized Fe sulfides.

Age of mineralization:

Paleozoic or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Insufficient information to assign.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only limited sampling by the U.S. Geological Survey and Bureau of Land Management.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS No. 0020310075

References:

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Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

Dillon, J.T., and Reifenstuhl, R.R., 1995, Geologic map of the Chandalar C-6 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 105, 1 sheet, scale 1:63,360.

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Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Little Squaw Creek

Site type: Mine

ARDF no.: CH039

Latitude: 67.5702 **Quadrangle:** CH C-3

Longitude: 148.1602

Location description and accuracy:

The main workings of the Little Squaw Creek placer mine are about 2 miles southeast of the southeast end of Squaw Lake. Gold can be found along much of the upper part of the creek but most of the mining to 2004 took place on a lower portion of the creek called the Mello Bench in the southwest quarter of section 26, T. 32 N., R. 3 W., of the Fairbanks Meridian. The coordinates are at about the center of the Mello Bench. The location is accurate.

Commodities:

Main: Au

Other: As, Pb, W

Ore minerals: Arsenopyrite, galena, gold, monazite, scheelite

Gangue minerals:

Geologic description:

The first gold in the Chandalar district was discovered on Little Squaw Creek in 1905 and it has produced about half of the placer gold that has come from the district (Barker and Bundtzen, 2004; Barker, 2007). By 1916, most of the shallow placers in the upper valley of the creek were exhausted by hand mining and most of the mining to 2004 took place on the Mello Bench in the lower part of the creek, just above where the creek flows out on the floor of the Squaw Lake valley. Mining through the 1930s on Mello Bench was was almost entirely by drifting through thick, frozen gravel and until recently there has been little mining with heavy equipment on the creek. The placer concentrates contain pyrite, hematite, arsenopyrite, scheelite, galena, and monazite, in addition to gold. The early drift mining worked ground that contained nearly an ounce of gold per cubic yard and there were cleanups at the Mello camp that contained up to 4.85 ounces of gold per cubic yard. Barker and Bundtzen (2004) estimate that to 2004, Little Squaw Creek produced 29,237 ounces of gold from 30,466 cubic yards of material with an average grade of 0.960 ounce per cubic yard. Almost all of that was produced by Manual Mello and his sons from drift mining on the Mello Bench.

The gold in the lower portions of Little Squaw Creek frequently occurs at several horizons in the gravel; the auriferous horizons are separated by barren glaciofluvial material with clay layers that often serve as false bedrock. Some of the gold is on bedrock in alluvial gravel covered by glacial deposits. The several gold-bearing horizons are the result of the interplay of gold being transported by streams from the lode deposits at the head of Big Squaw Creek, several episodes of Pleistocene glaciation with the the deposition of glacial outwash and drift, and downcutting and readjustment of the drainages in response to several glacial advances.

Placer gold in uncertain amounts was long known to extend in the gravel below the Mello Bench in a broad alluvial fan and in benches where lower grade material extended out from the old drift mines. There were several episodes of drilling below the Mello Bench from the 20s through the late 90s (Barker and Bundtzen, 2004). In 2003, Little Squaw Gold Mining Company estimated that Little Squaw Creek has proven resources of 39,875 cubic yards of material with an average grade of 0.016 ounce of gold per cubic yard, a probable resource of 50,000 cubic yards with an average grade of 0.028 ounce of gold per cubic yard, and a possible resource of 12,030 cubic yards with an average grade of 0.013 ounce of gold per cubic

yard (Barker and Bundtzen, 2004).
In 2007, Little Squaw Gold Mining Company, now Goldrich Mining Company, drilled 110 holes on the lower portion of Little Squaw Creek along drill lines spaced 500 feet apart. As of February 9, 2009, Goldrich (Barker and others, 2009) calculated the measured and indicates resources of lower Little Squaw Creek as 9,101,600 cubic yards of material with an average grade of 0.0243 ounce of gold per cubic yard and an inferred resource of 1,401,666 cubic yards of material with an average grade of 0.0265 ounce of gold per cubic yard. These figures were encouraging enough that Goldrich test mined a portion of the ground with earth-moving equipment in the summer of 2009 (Goldrich Mining Company, 2009). In a period of 27 days, they produced 593.5 ounces of gold from 13,825 cubic yards of material. Goldrich mined in 2010 and produced 1,522 ounces of gold and 259 ounces of silver (Goldrich Mining Company, 2010 [production]).

Alteration:

Age of mineralization:
Quaternary.

Generic deposit model:
Placer deposits (Garnett and Bassett, 2005)

Deposit model:
Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: Yes; small

Site Status: Active

Workings/exploration:
The first gold in the Chandalar district was discovered on Little Squaw Creek in 1905 and it has produced about half of the placer gold that has come from the district (Barker and Bundtzen, 2004; Barker, 2007). By 1916, most of the shallow placers in the upper valley of the creek were exhausted by hand mining and most of the mining to 2004 took place on the Mello Bench in the lower part of the creek, just above where the creek flows out on the floor of the Squaw Lake valley. Mining through the 1930s on Mello Bench was was almost entirely by drifting through thick, frozen gravel and until recently there has been little mining with heavy equipment on the creek.
In 2007, Little Squaw Gold Mining Company, now Goldrich Mining Company, drilled 110 holes on the lower portion of Little Squaw Creek along drill lines spaced 500 feet apart. These figures were encouraging enough that Goldrich test mined a portion of the ground with earth-moving equipment in the summer of 2009 (Goldrich Mining Company, 2009).

Production notes:
Barker and Bundtzen (2004) estimate that to 2004, Little Squad Creek produced 29,237 ounces of gold, almost all by drift mining, from 30,466 cubic yards of material with an average grade of 0.960 ounce per cubic yard. Goldrich Mining Company test mined a portion of the ground with earth-moving equipment in the summer of 2009 and produced 593.5 ounces of gold from 13,825 cubic yards of material (Goldrich Mining Company, 2009). Goldrich mined in 2010 and produced 1,522 ounces of gold and 259 ounces of silver.

Reserves:
Various estimates have been made of the gold resources of Little Squaw Creek. The latest (Barker and others, 2009) is based 110 holes drilled by Goldrich Mining Company in 2007. Lower Little Squaw Creek has a measured and indicated resource of 9,101,600 cubic yards of material with an average grade of

0.0243 ounce of gold per cubic yard and an inferred resource of 1,401,666 cubic yards of material with an average grade of 0.0265 ounce of gold per cubic yard. (Subsequently Goldrich produced 2,115 ounces of gold in 2009 and 2010).

Additional comments:

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Primary Reference: Barker, 2007; Barker and others, 2009

Reporter(s): J.M. Britton (Anchorage, Alaska); Travis Hudson (Applied Geology, Inc.); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Little Squaw Creek

Site type: Mine

ARDF no.: CH039

Latitude: 67.5702 **Quadrangle:** CH C-3

Longitude: 148.1602

Location description and accuracy:

The main workings of the Little Squaw Creek placer mine are about 2 miles southeast of the southeast end of Squaw Lake. Gold can be found along much of the upper part of the creek but most of the mining to 2004 took place on a lower portion of the creek called the Mello Bench in the southwest quarter of section 26, T. 32 N., R. 3 W., of the Fairbanks Meridian. The coordinates are at about the center of the Mello Bench. The location is accurate.

Commodities:

Main: Au

Other: As, Pb, W

Ore minerals:

Gangue minerals:

Geologic description:

The first gold in the Chandalar district was discovered on Little Squaw Creek in 1905 and it has produced about half of the placer gold that has come from the district (Barker and Bundtzen, 2004; Barker, 2007). By 1916, most of the shallow placers in the upper valley of the creek were exhausted by hand mining and most of the mining to 2004 took place on the Mello Bench in the lower part of the creek, just above where the creek flows out on the floor of the Squaw Lake valley. Mining through the 1930s on Mello Bench was was almost entirely by drifting through thick, frozen gravel and until recently there has been little mining with heavy equipment on the creek. The placer concentrates contain pyrite, hematite, arsenopyrite, scheelite, galena, and monazite, in addition to gold. The early drift mining worked ground that contained nearly an ounce of gold per cubic yard and there were cleanups at the Mello camp that contained up to 4.85 ounces of gold per cubic yard. Barker and Bundtzen (2004) estimate that to 2004, Little Squaw Creek produced 29,237 ounces of gold from 30,466 cubic yards of material with an average grade of 0.960 ounce per cubic yard. Almost all of that was produced by Manual Mello and his sons from drift mining on the Mello Bench.

The gold in the lower portions of Little Squaw Creek frequently occurs at several horizons in the gravel; the auriferous horizons are separated by barren glaciofluvial material with clay layers that often serve as false bedrock. Some of the gold is on bedrock in alluvial gravel covered by glacial deposits. The several gold-bearing horizons are the result of the interplay of gold being transported by streams from the lode deposits at the head of Big Squaw Creek, several episodes of Pleistocene glaciation with the the deposition of glacial outwash and drift, and downcutting and readjustment of the drainages in response to several glacial advances.

Placer gold in uncertain amounts was long known to extend in the gravel below the Mello Bench in a broad alluvial fan and in benches where lower grade material extended out from the old drift mines. There were several episodes of drilling below the Mello Bench from the 20s through the late 90s (Barker and Bundtzen, 2004). In 2003, Little Squaw Gold Mining Company estimated that Little Squaw Creek has proven resources of 39,875 cubic yards of material with an average grade of 0.016 ounce of gold per cubic yard, a probable resource of 50,000 cubic yards with an average grade of 0.028 ounce of gold per cubic yard, and a possible resource of 12,030 cubic yards with an average grade of 0.013 ounce of gold per cubic

yard (Barker and Bundtzen, 2004).

In 2007, Little Squaw Gold Mining Company, now Goldrich Mining Company, drilled 110 holes on the lower portion of Little Squaw Creek along drill lines spaced 500 feet apart. As of February 9, 2009, Goldrich (Barker and others, 2009) calculated the measured and indicates resources of lower Little Squaw Creek as 9,101,600 cubic yards of material with an average grade of 0.0243 ounce of gold per cubic yard and an inferred resource of 1,401,666 cubic yards of material with an average grade of 0.0265 ounce of gold per cubic yard. These figures were encouraging enough that Goldrich test mined a portion of the ground with earth-moving equipment in the summer of 2009 (Goldrich Mining Company, 2009). In a period of 27 days, they produced 593.5 ounces of gold from 13,825 cubic yards of material. Goldrich mined in 2010 and produced 1,522 ounces of gold and 259 ounces of silver (Goldrich Mining Company, 2010 [production]).

In 2016, Goldrich Mining Company formed a joint-venture partnership with project manager NyacAU, to form Goldrich NyacAU Placer, LLC. In 2016, Goldrich NyacAU surveyed the area on Little Squaw Creek beyond Line 11 and received a permit to conduct placer mining on Lines 11 to 18 in addition to permits already received to mine Lines 1 to 11. Production in 2016 totaled 10,209 ounces of alluvial gold (8,227 ounces of fine gold), at an estimated cost of approximately $960 per ounce (Athey and Werdon, 2017).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The first gold in the Chandalar district was discovered on Little Squaw Creek in 1905 and it has produced about half of the placer gold that has come from the district (Barker and Bundtzen, 2004; Barker, 2007). By 1916, most of the shallow placers in the upper valley of the creek were exhausted by hand mining and most of the mining to 2004 took place on the Mello Bench in the lower part of the creek, just above where the creek flows out on the floor of the Squaw Lake valley. Mining through the 1930s on Mello Bench was was almost entirely by drifting through thick, frozen gravel and until recently there has been little mining with heavy equipment on the creek.

In 2007, Little Squaw Gold Mining Company, now Goldrich Mining Company, drilled 110 holes on the lower portion of Little Squaw Creek along drill lines spaced 500 feet apart. These figures were encouraging enough that Goldrich test mined a portion of the ground with earth-moving equipment in the summer of 2009 (Goldrich Mining Company, 2009).

Production notes:

Barker and Bundtzen (2004) estimate that to 2004, Little Squad Creek produced 29,237 ounces of gold, almost all by drift mining, from 30,466 cubic yards of material with an average grade of 0.960 ounce per cubic yard. Goldrich Mining Company test mined a portion of the ground with earth-moving equipment in the summer of 2009 and produced 593.5 ounces of gold from 13,825 cubic yards of material (Goldrich Mining Company, 2009). Goldrich mined in 2010 and produced 1,522 ounces of gold and 259 ounces of silver.

Production in 2016 totaled 10,209 ounces of alluvial gold (8,227 ounces of fine gold), at an estimated cost of approximately $960 per ounce. The plant operated approximately 15 hours per day at a processing rate of 183 bank-cubic yards per hour (Athey and Werdon, 2017).

Reserves:

Various estimates have been made of the gold resources of Little Squaw Creek. The latest (Barker and others, 2009) is based 110 holes drilled by Goldrich Mining Company in 2007. Lower Little Squaw Creek has a measured and indicated resource of 9,101,600 cubic yards of material with an average grade of 0.0243 ounce of gold per cubic yard and an inferred resource of 1,401,666 cubic yards of material with an average grade of 0.0265 ounce of gold per cubic yard. (Subsequently Goldrich produced 2,115 ounces of gold in 2009 and 2010).

Additional comments:

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Reporter(s): J.M. Britton (Anchorage, Alaska); Travis Hudson (Applied Geology, Inc.); D.J. Grybeck (Contractor, USGS); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Little Squaw; Cosine; Sine; Crystal; Big Squaw Quartz; Parabola; Engineers Exploration Syndicate; Idaho-Alaska Corp.

Site type: Mine

ARDF no.: CH040

Latitude: 67.5556 **Quadrangle:** CH C-3

Longitude: 148.1909

Location description and accuracy:

The Little Squaw Mine is about 0.7 mile north-northeast of Little Squaw Peak near the center of section 34, T. 32 N., R. 3 W., of the Fairbanks Meridian). The mine is shown by symbol on the USGS 1:63,360-scale topographic map. The location is accurate.

Commodities:

Main: Au

Other: Ag, Pb, Zn

Ore minerals: Arsenopyrite, galena, gold, pyrite, scorodite, sphalerite

Gangue minerals: Quartz

Geologic description:

Placer gold was discovered in the Chandalar area on Little Squaw Creek (CH039) in 1902 (Barker, and Bundtzen, 2004; Barker, 2007; Barker and others, 2009). By 1909, four quartz veins including the Little Squaw vein had been discovered and many more were located prior to WWI. Most of the important properties in the district were consolidated by William Sulzer from 1909 to 1941; the Mikado Mine was one of the prominent deposits of the Chandalar area and was included. Those properties were taken over in 1946 to form the Little Squaw Mining Company in 1959, which in turn became the Little Squaw Gold Mining Company in 1968. From 1967 to 1999, Little Squaw Gold Mining Company leased some of their Chandalar lode and placer ground for mining and/or exploration to a succession of companies, notably the Chandalar Gold Mining and Milling Company (1967-1971), Noranda Mining (1974-1976), the Chandalar Development Corporation (1980-1983), and Gold Dust Mines (1989-1999). There was some earlier small lode production from the district but the first documented gold produced from the lodes was 870 ounces produced from 1967 to 1971 from the Mikado and Summit mines by the Chandalar Gold Mining and Milling Company. Subsequently, Chandalar Development produced 8,169 ounces of lode gold from the Mikado and Summit Mines but recovery was poor. In 2003, Little Squaw Gold Mining Company and its direct descendent Goldrich Mining Company began an aggressive exploration program for lode and placer deposits over a large block of land that covers almost all of the known deposits in the Chandalar area and in early 2010, that effort continued (Goldrich Mining Company, 2010).

The geology of the Chandalar area is dominated by a system of west-northwest-trending regional faults including a prominent thrust fault in the southern part of the district and a series of major high-angle faults through the center of the area (Bundtzen and Laird, 2009a, 2009b). These faults separate the rocks into two principal units, a west-northwest-trending Upper Plate unit about 3 miles wide in the center of the area and a Lower Plate unit to the north and south. The contact of the two units is a thrust fault on the south side of the Upper Plate rocks and a high-angle fault on the north side. Most of the Upper Plate rocks consist of Devonian upper-greenschist-facies metamorphic rocks, mainly carbonaceous schist; quartz-chlorite-muscovite schist, schist and phyllite derived from turbidites that comprise the Mikado Phyllite,

metamorphosed calcareous sandstone, and quartz-muscovite schist. The Lower Plate rocks consist of Devonian, upper-greenschist-facies metamorphic rocks, mainly metamorphosed volcanic agglomerate, chlorite-rich tuffaceous schist, quartz-mica schist derived from mudstone, mica-quartz schist, and quartzite. Both the Upper and Lower Plate rocks are cut by irregular masses, dikes and sills of greenstone, metagabbro, and metadiorite of unknown age. Most of the mineral deposits in the Chandalar area are in the Upper Plate rocks and the deposits often are along the regional, steep-to-vertical, west-northwest-trending faults. There is an additional conjugate set of north-northeast-trending faults that offset the Upper Plate rocks and at least some of the mineralization may be localized at the intersections of the regional west-northwest-trending faults and the conjugate faults. The Little Squaw Mine is in the Upper Plate unit and although it is adjacent to the Little Squaw fault, one of the regional north-northwest faults, it is one of the deposits in the district that is associated with splays off the main fault.

The Little Squaw Mine was discovered by 1909 and by 1911 it had been explored by surface trenches, shafts, and a 64-foot adit. A road from the Little Squaw was built in 1909-10 to a small mill on lower Little Squaw Creek. Twenty-seven tons of ore were processed that recovered about 1.1 ounces of gold. In 1912, a 3-stamp mill was brought to Big Creek to test the Little Squaw ore and used until 1915. In 1933, the vein was described as having a proven length of 200 feet, a depth of 130 feet, and an average grade of 1.86 ounces of gold per ton across a width of 4 feet (Mertie, 1925; Boadway, 1933). Work continued erratically and by 1982, the workings consisted of adits at the 100-foot and 200-foot levels connected by several winzes and raises. An ore reserve of 10,000 tons of material with an average grade of 1.70 ounces of gold was established and a brief period of mining by the Chandalar Development Corporation took place in 1982 Barker and Bundtzen, 2005, Barker, 2006, Barker and others, 2009). In early 2010, this was one of the sites being studied by Goldrich Mining Company in their intensive exploration of the Chandalar area (Goldrich Mining Company, 2010).

The several veins at the Little Squaw Mine splay off the north-northwest-trending Little Squaw Fault are in a sequence of quartz-muscovite-chlorite phyllite, carbonaceous phyllite, quartzite, calcareous rocks, and a buff to red, siderite-bearing exhalative unit (Mertie, 1925; Boadway, 1933; Chipp, 1970; Dillon, 1982; Barker and Bundtzen, 2005, Barker, 2006, Barker and others, 2009). The footwall of the main vein as seen in the underground workings is gray muscovite-chlorite schist and phyllite; the hanging wall is muscovite schist. The gold values in the vein are concentrated in a one-foot band of ribbon quartz along the footwall; the quartz contains disseminated pyrite and arsenopyrite and minor galena and sphalerite. There are several generations of quartz. Massive, coarse-grained quartz is generally early and contains little or no gold; later fine-grained ribbon-banded quartz contains most of the ore minerals. The veins are generally oxidized to a depth of about 75 feet; the principal oxidation products are scorodite and limonite. The gold veins in the Chandalar district are considered mesothermal (Barker and Bundtzen, 2004) by comparison with similar deposits elsewhere and in consideration of fluid inclusion and oxygen and lead isotope studies of the Chandalar mineralization (Ashworth, 1983; Rose and others, 1988; Gacetta and Church, 1989).

On the surface, the mineralization vein can be traced in trenches for about 1,800 feet as discontinuous en echelon segments, with displacements of a few tens of feet. The principal vein is 2 to 8 feet thick, averages about 4 feet, and pinches and swells.

From 1975 to 1980, Callahan Mining Company and the Chandalar Development Corporation drilled 7 holes (Barker and others, 2009). None of the holes cut high-grade mineralization but did intersect several low-grade zones. The drilling showed the sheeted and discontinuous nature of the quartz veining and fault system. Little Squaw Gold Mining Company drilled 10 reverse-circulation holes in 2006; the best intercept was 20 feet that contained 4.21 parts per million (ppm) gold. They also did considerable trench sampling; one 1.9-foot channel sample assayed 129.5 ppm gold.

Alteration:

The veins are generally oxidized to a depth of about 75 feet; the principal oxidation products are scorodite and limonite.

Age of mineralization:

Possibly Middle Cretaceous based on the assertion of Dillon (1982) that the gold-quartz veins of the central Brooks Range are that age. However, there is no definitive data for the age of the veins of the Chandalar area.

Generic deposit model:

Deposit model:
Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
36a

Production Status: Yes; small

Site Status: Active

Workings/exploration:
The Little Squaw Mine was discovered by 1909 and by 1911 it had been explored by surface trenches, shafts, and a 64-foot adit. A road from the Little Squaw was built in 1909-10 to a small near lower Little Squaw Creek and 27 tons of ore were milled. In 1912, a 3-stamp mill was brought to Big Creek to test the Little Squaw ore and used until 1915. Work continued erratically and by 1982, the workings consisted of adits at the 100-foot and 200-foot levels connected by several winzes and raises. The Chandalar Development Corporation did some mining in 1982 (Barker and Bundtzen, 2005, Barker, 2006, Barker and others, 2009). From 1975 to 1980, Callahan Mining Company and the Chandalar Development Corporation drilled 7 holes (Barker and others, 2009). Little Squaw Gold Mining Company drilled 10 reverse-circulation holes in 2006. In early 2010, this was one of the sites being studied by Goldrich Mining Company in their intensive exploration of the Chandalar area (Goldrich Mining Company, 2010).

Production notes:
Limited mining from 1911 to perhaps 1915 and in 1982 by the Chandalar Development Corporation.

Reserves:
Probably none.

Additional comments:
See also the Mikado Mine (CH045). There is some confusion in the media between the Little Squaw Mine and others in the district, the Mikado Mine in particular. From 1959 to 2008, much of the Chandalar district, including the Little Squaw Mine, was owned by the Little Squaw Gold Mining Company (the Goldrich Mining Company since 2008). Much of the activity of the Little Squaw Gold Mining Company and the activity of their lessees was concentrated on the Mikado Mine and several other properties. There was relatively little work on the Little Squaw Mine itself. But especially in the news and trade press, the stories centered on the Little Squaw company, rather than on the work at the Mikado and the several placers on ground that the Little Squaw Company had leased. The distinction between the company and the Little Squaw Mine was often not clear.

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Primary Reference: Barker and others, 2009

Reporter(s): J.M. Britton (Anchorage, Alaska); Travis Hudson (Applied Geology, Inc.); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Summit

Site type: Mine

ARDF no.: CH041

Latitude: 67.5387 **Quadrangle:** CH C-3

Longitude: 148.1853

Location description and accuracy:

The Summit Mine is on the ridge at the head of Big Squaw Creek about 0.6 mile south of Little Squaw Peak. It is at an elevation of about 4,600 feet about 0.5 mile west of the center of section 3, T. 31 N., R. 3 W. The location is accurate.

Commodities:

Main: Ag, Au

Other: As, Cu, Pb, Sb, Sn

Ore minerals: Arsenopyrite, galena, gold, scorodite, sphalerite, stibnite

Gangue minerals: Quartz

Geologic description:

Placer gold was discovered in the Chandalar area on Little Squaw Creek (CH039) in 1902 (Barker, and Bundtzen, 2004; Barker, 2007; Barker and others, 2009). By 1909, four quartz veins including the Mikado vein had been discovered and many more were located prior to WWI. Most of the important properties in the district were consolidated by William Sulzer from 1909 to 1941; the Summit Mine was one of the prominent deposits of the Chandalar area and was included. Those properties were taken over in 1946 to form the Little Squaw Mining Company in 1959, which in turn became the Little Squaw Gold Mining Company in 1968. From 1967 to 1999, Little Squaw Gold Mining Company leased some of their Chandalar lode and placer ground for mining and/or exploration to a succession of companies, notably the Chandalar Gold Mining and Milling Company (1967-1971), Noranda Mining (1974-1976), the Chandalar Development Corporation (1980-1983), and Gold Dust Mines (1989-1999). There was some earlier small lode production from the district but the first documented gold produced from the lodes was 870 ounces produced from 1967 to 1971 from the Mikado and Summit mines by the Chandalar Gold Mining and Milling Company. Subsequently, Chandalar Development produced 8,169 ounces of lode gold from the Mikado and Summit Mines but recovery was poor. In 2003, Little Squaw Gold Mining Company and its direct descendent Goldrich Mining Company began an aggressive exploration program for lode and placer deposits over a large block of land that covers almost all of the known deposits in the Chandalar area and as of early 2012, that effort continued (Goldrich Mining Company, 2012).

The geology of the Chandalar area is dominated by a system of west-northwest-trending regional faults including a prominent thrust fault in the southern part of the district and a series of major high-angle faults through the center of the area (Bundtzen and Laird, 2007 [map]; 2007 [83 p.]. These faults separate the rocks into two principal units, a west-northwest-trending Upper Plate unit about 3 miles wide in the center of the area and a Lower Plate unit to the north and south. The contact of the two units is a thrust fault on the south side of the Upper Plate rocks and a high-angle fault on the north side. Most of the Upper Plate rocks consist of Devonian upper-greenschist-facies metamorphic rocks, mainly carbonaceous schist; quartz-chlorite-muscovite schist, schist and phyllite derived from turbidites that comprise the Mikado Phyllite, metamorphosed calcareous sandstone, and quartz-muscovite schist. The Lower Plate rocks consist of Devonian, upper-greenschist-facies metamorphic rocks, mainly metamorphosed volcanic agglomerate, chlorite-rich tuffaceous schist, quartz-mica schist derived from mudstone, mica-quartz schist, and quartzite.

Both the Upper and Lower Plate rocks are cut by irregular masses, dikes and sills of greenstone, metagabbro, and metadiorite of unknown age. Most of the mineral deposits in the Chandalar area are in the Upper Plate rocks and the deposits often are along the regional, steep-to-vertical, west-northwest-trending faults. There is an additional conjugate set of north-northeast-trending faults that offset the Upper Plate rocks and at least some of the mineralization may be localized at the intersections of the regional west-northwest-trending faults and the conjugate faults. The rocks in the vicinity of the Summit Mine are mainly coarse- to fine-grained, rhythmically layered schist and phyllite of the Upper Plate.

By 1913, a 54-foot-deep shaft had been sunk on the Summit vein and a short adit driven on a 1.5- to 2.5-foot-thick gold-quartz vein (Maddren, 1913). The vein was exposed for 950 feet in a series of trenches. Numerous samples have been taken over the years by numerous companies of the Summit mineralization. Samples containing more than 1 ounce of gold are common, samples over 10 ounces per ton are not uncommon, and samples with visible gold can be found relatively easily. Heiner and Wolff (1968) report that there was some development work in the 1950s and a small mill was built by Ed Toussaint in 1957 and 1958 at the head of Big Creek to process ore from the Summit vein (Buzzell, 2007). It may not have milled any Summit ore although Barker and others (2008) note that it milled some ore from the Indicate vein (CH042) near the mill. Little Squaw Gold Mining Company drilled the Summit property in 2006 (Barker and others, 2009). Three of the holes intersected quartz veins; the best 5-foot intervals contained 5.71, 16.15, 5.52, and 3.24 parts per million gold. Goldrich Mining Corp. (2011) drilled 3 holes in 2011 that totaled 441 meters. Of the four intercepts 2.1 to 10.7 meters long that contained more than 0.50 grams of gold per tonne, the best was 2.1 meters that contained 1.23 ounces of gold per tonne.

The gold mineralization is localized along the Summit fault which strikes about N70-80W, dips 75-80 degrees north, and is marked by 1 to 6 inches of gray to black gouge (Chip 1970, Barker and Bundtzen, 2004, Barker, 2007; Barker and others, 2009). The rocks in the area are black to gray carbonaceous phyllite and schist of the Mikado Phyllite unit of Bundtzen and Laird (2007a, 2007b) overlain by lighter gray, muscovite, chlorite-quartz schist. Ashworth (1983) described two generations of quartz at the Summit lode. The older generation is coarsely crystalline, massive, white quartz. It is in the hanging wall and is as much as 4 feet wide. It contains less than 5 percent sulfides and little gold. The younger generation pinches and swells; it adjoins the older veins, but typically is in the footwall. It is generally finer grained and contains bands accentuated by smeared graphite and arsenopyrite. Scorodite is common, and free gold occurs as blebs and occasional wires. The veins are offset by near-vertical faults. In contrast to some of the other deposits in the area, e.g., the Little Squaw Mine (CH040), the Summit veins are usually moderately to strongly brecciated. The gold veins in the Chandalar district are considered mesothermal (Barker and Bundtzen, 2004; Barker, 2006; Barker, 2007; Barker and others, 2009) by comparison with similar deposits elsewhere and in consideration of fluid inclusion and oxygen and lead isotope studies of the Chandalar mineralization (Ashworth, 1983; Rose and others, 1988; Gacetta and Church, 1989).

The Chandalar Development Corporation mined the Summit vein from 1980 to 1983 (Barker and Bundtzen, 2004; Barker and others, 2009). They produced 1,347 ounces of gold from 1,401 tons of ore that averaged 1.29 ounces of gold per ton. The gold recovery was poor, apparently because the mill was not designed for the large amount of gouge in the ore.

In 2003, Little Squaw Gold Mining Company estimated that the 'probable resource' of the Summit Mine was 1,375 tons with a grade of 3.52 ounces of gold per ton and a 'possible resource' of 3,165 tons with an average grade of 2.13 ounces per ton (Barker and Bundtzen, 2004). However, the extensive trench and drill data collected during the work begun by Little Squaw Gold Mining Company in 2004 and continued by its successor Goldrich Mining Company indicate that the Summit vein is bordered by a wide aureole of lower grade, sheeting veins and disseminated gold. The high-grade veins that have traditionally been the exploration target may have overlooked the substantial potential in the low grade but large body of mineralization peripheral to the high grade veins (Barker and others, 2009).

Alteration:

Oxidation of vein material produced scorodite and limonite.

Age of mineralization:

Possibly mid-Cretaceous based on the assertion of Dillon (1982) that the gold-quartz veins of the central Brooks Range are that age. However, there is no definitive data for the age of the veins of the Chandalar area.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Undetermined

Site Status: Active

Workings/exploration:

By 1913, a 54-foot-deep shaft had been sunk on the Summit vein and a short adit driven on a 1.5- to 2.5-foot-thick gold-quartz vein (Maddren, 1913). The vein was exposed for 950 feet in a series of trenches. Numerous samples have been taken over the years by numerous companies of the Summit mineralization. Heiner and Wolff (1968) report that there was some development work in the 1950s and a small mill was built by Ed Toussaint in 1957 and 1958 at the head of Big Creek to process ore from the Summit vein (Buzzell, 2007). It may not have milled any Summit ore although Barker and others (2008) note that it milled some ore from the Indicate vein (CH042) near the mill. In addition to much surface sampling, trenching, and mapping, Little Squaw Gold Mining Company drilled the Summit property in 2006 (Barker and others, 2009). Goldrich Mining Corp. (2011) drilled 3 holes that totaled 441 meters in 2011.

Production notes:

The Chandalar Development Corporation mined the Summit vein from 1980 to 1983 (Barker and Bundtzen, 2004; Barker and others, 2009). They produced 1,347 ounces of gold from 1,401 tons of ore that averaged 1.29 ounces of gold per ton. The gold recovery was poor, apparently because the mill was not designed for the large amount of gouge in the mine-run ore.

Reserves:

In 2003, Little Squaw Gold Mining Company estimated that the 'probable resource' of the Summit Mine was 1,375 tons of material with a grade of 3.52 ounces of gold per ton and a 'possible resource' of 3,165 tons of material with an average grade of 2.13 ounces per ton (Barker and Bundtzen, 2004). However, the extensive trench and drill data collected during the work begun by Little Squaw Gold Mining Company in 2004 and its successor Goldrich Mining Company indicate that the Summit vein is bordered by a wide aureole of lower grade, sheeting veins and disseminated gold. The high-grade veins that have traditionally been the exploration target may have overlooked the substantial potential in the low grade but large body of mineralization peripheral to the high grade veins (Barker and others, 2009).

Additional comments:

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Reporter(s): J.M. Britton (Anchorage, Alaska); Travis Hudson (Applied Geology, Inc.); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Indicate; Star Group; Tonopah; Rex

Site type: Mine

ARDF no.: CH042

Latitude: 67.5257 **Quadrangle:** CH C-3

Longitude: 148.1813

Location description and accuracy:

The Indicate Mine is on the hillside above Big Creek, about 0.9 mile west-northwest of McLellan Peak. It is about 0.2 mile southwest of the center of section 10, T. 31 N., R. 3 W., of the Fairbanks Meridian. The several surface workings of the Star Group are spread over the hillside to the northwest and south. The location is accurate.

Commodities:

Main: Ag, Au

Other:

Ore minerals: Arsenopyrite, gold, scorodite

Gangue minerals: Quartz

Geologic description:

Placer gold was discovered in the Chandalar area on Little Squaw Creek (CH039) in 1902 (Barker, and Bundtzen, 2004; Barker, 2007; Barker and others, 2009). By 1909, four quartz veins including the Indicate vein and several others in the vicinity, had been discovered and many more were located prior to WWI. Most of the important properties in the district were consolidated by William Sulzer from 1909 to 1941; the Mikado Mine was one of the prominent deposits of the Chandalar area and was included. Those properties were taken over in 1946 to form the Little Squaw Mining Company in 1959, which in turn became the Little Squaw Gold Mining Company in 1968. From 1967 to 1999, Little Squaw Gold Mining Company leased some of their Chandalar lode and placer ground for mining and/or exploration to a succession of companies, notably the Chandalar Gold Mining and Milling Company (1967-1971), Noranda Mining (1974-1976), the Chandalar Development Corporation (1980-1983), and Gold Dust Mines (1989-1999). There was some earlier small lode production from the district but the first documented gold produced from the lodes was 870 ounces produced from 1967 to 1971 from the Mikado and Summit mines by the Chandalar Gold Mining and Milling Company. Subsequently, Chandalar Development produced 8,169 ounces of lode gold from the Mikado and Summit Mines but recovery was poor. In 2003, Little Squaw Gold Mining Company and its direct descendent Goldrich Mining Company began an aggressive exploration program for lode and placer deposits over a large block of land that covers almost all of the known deposits in the Chandalar area and in early 2010, that effort continued (Goldrich Mining Company, 2010).

The geology of the Chandalar area is dominated by a system of west-northwest-trending regional faults including a prominent thrust fault in the southern part of the district and a series of major high-angle faults through the center of the area (Bundtzen and Laird, 2009a, 2009b). These faults separate the rocks into two principal units, a west-northwest-trending Upper Plate unit about 3 miles wide in the center of the area and a Lower Plate unit to the north and south. The contact of the two units is a thrust fault on the south side of the Upper Plate rocks and a high-angle fault on the north side. Most of the Upper Plate rocks consist of Devonian upper-greenschist-facies metamorphic rocks, mainly carbonaceous schist; quartz-chlorite-muscovite schist, schist and phyllite derived from turbidites that comprise the Mikado Phyllite, metamorphosed calcareous sandstone, and quartz-muscovite schist. The Lower Plate rocks consist of Devonian, upper-greenschist-facies metamorphic rocks, mainly metamorphosed volcanic agglomerate,

chlorite-rich tuffaceous schist, quartz-mica schist derived from mudstone, mica-quartz schist, and quartzite. Both the Upper and Lower Plate rocks are cut by irregular masses, dikes and sills of greenstone, metagabbro, and metadiorite of unknown age. Most of the mineral deposits in the Chandalar area are in the Upper Plate rocks and the deposits often are along the regional, steep-to-vertical, west-northwest-trending faults. There is an additional conjugate set of north-northeast-trending faults that offset the Upper Plate rocks and at least some of the mineralization may be localized at the intersections of the regional west-northwest-trending faults and the conjugate faults The rocks around the Indicate Mine are part of the Upper Plate and consist mainly of black carbonaceous phyllite and schist of the Mikado Phyllite.

There are several early reports of lode mineralization that became the Indicate Mine or are near it (Barker and Bundtzen, 2004, Barker, 2006; Barker, 2007). Reed (1930) noted that a 40-foot shaft of a drift mine on Big Creek exposed a wide quartz vein in bedrock. A two-stamp mill was set up in 1909 to process the quartz but there is no record of its production except that the recovery was poor and the ore grade was low. Anderson (1944) and Strandberg (1990) note an old report of a 20-foot-wide quartz vein that contained arsenopyrite, pyrite, and free gold. McKee (1939) reported a 15-foot-deep shaft near Big Creek that exposed a quartz vein with free gold; a dump sample contained 0.32 ounce of gold per ton. There was considerable trenching in the area and at least some production, probably until the late 1950s, when a small mill was set up by Ed Toussaint at the head of Big Creek (Buzzell, 2007). Barker (2007) indicates that it processed ore that contained about a third of an ounce per ton, probably from the Indicate vein (although Buzzell associated it with work at the Summit Mine (CH041)). Most of the area is covered by tundra and scree that has obscured many of the old trenches. But several on the Indicate vein were reopened in 1982; samples contained 1.7 and 6.0 ounces of gold per ton. The work in the early 1900s was able to follow the vein for about 350 feet.

The nearby Star Group prospects exposed an 8-to 10-foot wide vein in the early 1900s. Some of the trenches were reopened in 1982; samples contained up to 0.74 ounce of gold per ton. A prospect pit on the Star property exposed a 6-foot-wide, partly vuggy quartz vein containing visible arsenopyrite and scorodite (Chipp, 1970). The vein trends approximately N70W and dips 70 to 90 degrees northeast. A grab sample assayed 11 parts per million gold. Another pit exposed vuggy, brown-stained quartz containing phyllite inclusions and minor arsenopyrite. On the Tonopah claim (west of the airstrip on upper Big Creek) trenching has exposed a 50-foot-wide fracture zone containing numerous east-west-trending, vuggy, iron-stained, quartz-filled fractures two inches or less in width. Chipp (1970) suggests that this zone is probably the continuation of the Star vein system.

The gold veins in the Chandalar district are considered mesothermal (Barker and Bundtzen, 2004) by comparison with similar deposits elsewhere and consideration of the fluid inclusion and oxygen and lead isotope studies of the Chandalar mineralization (Ashworth, 1984; Rose and others, 1988; Gacetta and Church, 1989).

Alteration:

Oxidation of sulfides in the quartz veins.

Age of mineralization:

Possibly Middle Cretaceous based on the assertion of Dillon (1982) that the gold-quartz veins of the central Brooks Range are that age. However, there is no definitive data for the age of the veins of the Chandalar area.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Considerable trenching in the early 1900s and investigations of quartz veins found on bedrock in the placer workings. A period of activity sometime between WWII and 1962 may have resulted in some gold production. There was some exploration in the early 1980s; in early 2010, this was one of the areas being studied by Goldrich Mining Company in their intensive exploration of the Chandalar area (Goldrich Mining Company, 2010).

Production notes:

No records of production but some gold probably was recovered about 1909 and some between the end of WWII and 1962.

Reserves:

None.

Additional comments:

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Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Big Creek

Site type: Mine

ARDF no.: CH043

Latitude: 67.5201 **Quadrangle:** CH C-3

Longitude: 148.2076

Location description and accuracy:

About a mile and a half of Big Creek has been placer mined. The coordinates are at the mine symbol on the USGS 1:63,3600-scale topographic map. The mining took place in sections 10, 15, and 16, T. 31 N., R. 3 W., of the Fairbanks Meridian.

Commodities:

Main: Au

Other: Ag, As, Cu, Mo, Pb, REE, Sb, Th, Ti, U, W

Ore minerals: Gold

Gangue minerals:

Geologic description:

Big Creek is one of the major placer gold producers in the Chandalar district. The placers along the creek were worked only by small-scale methods and drift mining from about 1907 until WWII (Adney, 1945). From 1953 or 1954 and for a few years afterward, lower Big Creek was mining with heavy equipment. There was another period of placer mining with heavy equipment from 1993 to 1999.

As described by Reed (1930a, 1930b), the gravel in Big Creek mined in the 1920s was relatively shallow, averaging about 12 feet deep on the uppermost portion of the creek and deepening to about 20 to 22 feet on the lower portion of the creek. The gold occurred in the lower 3 to 5 feet of the gravel and there was very little gold on bedrock. The gravel was fairly coarse with numerous greenstone boulders as much as 3 feet in diameter. There is only one generation of placers in the drainage. The gold is reported to be bright yellow, generally irregular, and shot-like to flattened, but some occurs as crystals. The gold averages 1 millimeter with many 2- to 3-millimeter nuggets. A few nuggets include quartz, limonite, and goethite. It is also reported that the concentrates contain a large suite of heavy minerals in addition to the gold (Mertie, 1925; White, 1952). These heavy minerals include monazite, magnetite, hematite, rutile, pyrite, arsenopyrite, chalcopyrite, galena, stibnite, molybdenite, scheelite, and uranothorianite. A panned-concentrate sample had eU of 0.05 percent (White, 1952).

Barker and Bundtzen (2004) reported that the production from Big Creek was by: 1) hand mining before 1954 that produced 7,257 ounces of gold from gravel with an average grade of 0.209 ounce of gold per cubic yard, 2) drift mining before 1954 that produced 7,588 ounces of gold, 3) mechanical mining from 1954 to about 1960 that produced 7,954 ounces of gold from gravel that averaged 0.026 ounce per cubic yard, and 4) mechanical mining from 1993 to 1999 that produced 2,541 ounces of gold. This totaled 25,340 ounces of gold. (These figures include the production from St. Mary's Gulch (CH044)).

Strandberg (1990) estimated that the resource of Big Creek was 2.4 million cubic yards of gravel with an average grade of 0.0154 ounce of gold per cubic yard, or 35,505 ounces of gold.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:
Placer deposits (Garnett and Bassett, 2005)

Deposit model:
Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: Yes; medium

Site Status: Active

Workings/exploration:
Big Creek was mined by hand mining and by drifting for many if not most years from 1907 to the beginning of World War II. Mining with heavy equipment began in 1953 or 1954, continued until about 1960, and then resumed from 1993 to 1999.

Production notes:
Barker and Bundtzen (2004) reported that the production from Big Creek was by: 1) hand mining before 1954 that produced 7,257 ounces of gold from gravel with an average grade of 0.209 ounce of gold per cubic yard; 2) drift mining before 1954 that produced 7,588 ounces of gold; 3) mechanical mining from 1954 to about 1960 that produced 7,954 ounces of gold from gravel that averaged 0.026 ounce per cubic yard; and 4) mechanical mining from 1993 to 1999 that produced 2,541 ounces of gold. This totaled 25,340 ounces of gold. These figures include the production from St. Mary's Gulch (CH044).

Reserves:
Strandberg (1990) estimated that the resource of Big Creek was 2.4 million cubic yards of gravel with an average grade of 0.0154 ounce of gold per cubic yard, or 35,505 ounces of gold. (But note that 2,541 ounces of gold was subsequently produced from Big Creek from 1993 to 1999).

Additional comments:
The first recorded occurrence of monazite in Alaska was from Big Creek (Mertie, 1925).

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Primary Reference: Barker and Bundtzen, 2004

Reporter(s): J.M. Britton (Anchorage, Alaska); Travis Hudson (Applied Geology, Inc.); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): St Marys Creek; St Marys Gulch

Site type: Mine

ARDF no.: CH044

Latitude: 67.521 **Quadrangle:** CH C-3

Longitude: 148.2086

Location description and accuracy:

St Marys Creek is an informal name for the mile-long creek that flows southeast into upper Big Creek; the mouth of St Marys Creek is about 1.2 miles east of McLellan Mountain. Much of the creek in the southeast quarter of section 9, T. 32 N., R. 3 W., was mined. The location is accurate.

Commodities:

Main: Au

Other: As, Cu, Mo, Pb, REE, Sb, Th, Ti, U, W

Ore minerals:

Gangue minerals:

Geologic description:

Maddren (1913) noted that most of the gold produced in the Chandalar district had come from upper Big Creek and St Marys Gulch. Despite its early production, there is little information describing St Marys Creek in particular; most of the mining was done during the same time and/or in conjunction with the much more extensive mining on Big Creek and the production records for Big Creek probably include the production from St Marys Creek (Adney, 1945). Anderson (1956) noted that St Marys Creek was very rich. Some of the open cuts and drift mine worked ground that ran up to $8 in gold per square foot of bedrock (at $20.67 per ounce of gold). On the claim where St Marys Creek enters the valley of Big Creek, drift mining was working ground that ran about $2 in gold per square foot of bedrock in gravel that was 15 to 20 feet deep and 25 feet wide. Mining on St Marys Creek is mentioned only in passing after 1956. However, Bundtzen and Barker (2004) noted that several quartz veins (that became the St Marys lode prospect (CH113) were uncovered during placer mining on St Marys Creek in 1993.

Chipp (1970) noted that pan samples from Big Creek and St. Marys Gulch show the gold to be bright yellow and shot-like to flattened; a few crystals occur. The average grain size of the gold is said to be about 1 mm, and there are many 2- to 3-mm nuggets. Some nuggets include quartz crystals and iron oxides. In addition to the gold the concentrates contain a large suite of heavy minerals including monazite, magnetite, hematite, rutile, pyrite, arsenopyrite, chalcopyrite, galena, stibnite, molybdenite, scheelite, and uranothorianite.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: Yes; medium

Site Status: Active

Workings/exploration:
Gold was being mined on St Marys Creek from open cuts and by drift mining by 1913 and it may have continued to WWII as part of the much more extensive efforts on Big Creek (CH043). However, there is little production data on St Marys Creek specifically. Barker and Bundtzen (2004) mentioned in passing that several quartz veins were uncovered during placer mining on St Marys Creek in 1993.

Production notes:
Some production from the earliest mining in the district; mechanical mining with heavy equipment in 1993 and perhaps a few years more. But there is no data is available on St Marys Creek specifically; the production is probably included with that from Big Creek (CH043).

Reserves:
Probably none.

Additional comments:

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Primary Reference: Chipp, 1970; Bundtzen and Barker, 2004

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Mikado; Little Mikado; Big Tobin; Carter; Eclipse; Overlook; Engineers Exploration Syndicate; Idaho-Alaska Corp.; St. Mary's

Site type:

Mine

ARDF no.: CH045

Latitude: 67.5335

Quadrangle: CH C-3

Longitude: 148.2528

Location description and accuracy:

The portal of the Mikado Mine is on the north side of the upper end of the east branch of Tobin Creek. It is at an elevation of about 4,600 feet, approximately 1.6 miles southwest of Little Squaw Peak and about 0.6 mile south-southeast of the center of section 5, T. 31 N., R. 3 W., of the Fairbanks Meridian. The location of the mine is well known and accurately located. The Mikado vein extends up to a mile to the southeast where it is known as the St. Mary's vein (CH113).

Commodities:

Main: Au

Other: Ag, As, Pb, Sb, Zn

Ore minerals: Arsenopyrite, galena, gold, pyrite, sphalerite, stibnite

Gangue minerals: Dolomite, quartz, siderite

Geologic description:

Placer gold was discovered in the Chandalar area on Little Squaw Creek (CH039) in 1902 (Barker and Bundtzen, 2004; Barker, 2007; Barker and others, 2009). By 1909, four quartz veins including the Mikado vein had been discovered and many more were located prior to WWI. Most of the important properties in the district were consolidated by William Sulzer from 1909 to 1941; the Mikado Mine was one of the prominent deposits of the Chandalar area and was included. Those properties were taken over in 1946 to form the Little Squaw Mining Company in 1959, which in turn became the Little Squaw Gold Mining Company in 1968. From 1967 to 1999, Little Squaw Gold Mining Company leased some of their Chandalar lode and placer ground for mining and/or exploration to a succession of companies, notably the Chandalar Gold Mining and Milling Company (1967-1971), Noranda Mining (1974-1976), the Chandalar Development Corporation (1980-1983), and Gold Dust Mines (1989-1999). There was some earlier small lode production from the district but the first documented gold produced from the lodes was 870 ounces produced from 1967 to 1971 from the Mikado and Summit mines by the Chandalar Gold Mining and Milling Company. Subsequently, Chandalar Development produced 8,169 ounces of lode gold from the Mikado and Summit Mines but recovery was poor. In 2003, Little Squaw Gold Mining Company and its direct descendent Goldrich Mining Company began an aggressive exploration program for lode and placer deposits over a large block of land that covers almost all of the known deposits in the Chandalar area. As of early 2012 that effort continued (Goldrich Mining Company, 2012).

The geology of the Chandalar area is dominated by a system of west-northwest-trending regional faults including a prominent thrust fault in the southern part of the district and a series of major high-angle faults through the center of the area (Bundtzen and Laird, 2007 [map], 2007 [technical report]). These faults separate the rocks into two principal units: a west-northwest-trending Upper Plate unit about 3 miles wide in the center of the area and a Lower Plate unit to the north and south. The contact of the two units is a thrust fault on the south side of the Upper Plate rocks and a high-angle fault on the north side. Most of the Upper

Plate rocks consist of Devonian upper-greenschist-facies metamorphic rocks, mainly carbonaceous schist, quartz-chlorite-muscovite schist, schist and phyllite derived from turbidites that comprise the Mikado Phyllite, metamorphosed calcareous sandstone, and quartz-muscovite schist. The Lower Plate rocks consist of Devonian, upper-greenschist-facies metamorphic rocks, mainly metamorphosed volcanic agglomerate, chlorite-rich tuffaceous schist, quartz-mica schist derived from mudstone, mica-quartz schist, and quartzite. Both the Upper and Lower Plate rocks are cut by irregular masses, dikes and sills of greenstone, metagabbro, and metadiorite of unknown age. Most of the mineral deposits in the Chandalar area are in the Upper Plate rocks and the deposits often are along the regional, steep-to-vertical, west-northwest-trending faults. There is an additional conjugate set of north-northeast-trending faults that offset the Upper Plate rocks and at least some of the mineralization may be localized at the intersections of the regional west-northwest-trending faults and the conjugate faults.

The Mikado Mine is the most productive lode deposit in the Chandalar area and has been a center of attention from the earliest days of the Chandalar district (Barker and Bundtzen, 2004; Barker and others, 2009). The Mikado vein was discovered in 1909. Soon after, Maddren (1913) reported open cuts that exposed auriferous quartz in six places over a strike length of 3,000 feet. Underground workings, including a 100-foot shaft and 160-foot adit, were completed by 1913. In the following decades, the Mikado was frequently visited by industry and government. The underground workings were reopened in 1960, and over the next 24 years, there was considerable underground exploration, surface exploration and trenching, exploration and mining. Chandalar Gold Mining and Milling Company operated the Mikado Mine from 1967 to 1971 and produced 685 ounces of gold from ore that averaged 1.64 ounces of gold per ton (Barker and others, 2009); Callahan Mining mined in 1975 and recovered 185 ounces of gold from ore that averaged 0.85 ounce of gold per ton. Chandalar Development produced 6,822 ounces of gold from 1980 to 1983 from ore that averaged 0.93 ounce of gold per ton, although the mill recovery was poor. Since 2004, Little Squaw Gold Mining Company and its successor Goldrich Minerals have continued to explore the property (Barker and others, 2009; Goldrich Mining Company, 2011).

In 2011, Goldrich drilled 11 holes totaling 2,127 meters on the Mikado vein near the main portal of the old mine and about a half mile to the southeast on the vein's extension that is often called the St. Mary's vein (Goldrich Mining Company, 2011). The best intercepts were 0.9 meters with 4.58 grams of gold per tonne, 0.9 meters with 4.64 grams of gold per tonne, 0.9 meters with 10.25 grams of gold per tonne, 0.9 meters with 9.44 grams of gold per tonne, and 0.9 meters with 14.7 grams of gold per tonne.

As described by early workers, the Mikado vein is along a shear zone about 50 feet wide that contains sub-parallel, highly faulted and brecciated, steeply dipping gold-quartz veins and lenses up to 6 feet thick which have been exposed for over 3,000 feet along the Mikado fault (Maddren, 1913). Although the Mikado vein is said to average 6 feet in thickness over a 500-foot strike length, most of the ore shoots are discontinuous and generally are a few tens or hundreds of feet long. According to Boadway (1933), the Mikado vein in the underground workings consists of lenses of auriferous quartz, mostly on the hanging wall of the gouge-filled Mikado fault. The vein there appeared to be approximately 35 inches or less in width in the upper levels and narrowed to 16 inches at a depth of 99 feet. Ore shoots in the vein reportedly assayed from $37 per ton to as high as $439 per ton (at $20.67 per ounce of gold), and one ore shoot averaged $49.50 per ton over a 35-inch width (Chipp, 1970). Chipp indicated that white, crystalline to microcrystalline quartz is the dominant gangue mineral and that crystals of quartz are commonly found in small vugs. Banding in the quartz veins is produced by shearing and by elongate cavities in the veins parallel to the walls. Siderite occurs in minor amounts. Ashworth (1983) described three generations of quartz in the Mikado deposit: 1) lenses and pods of quartz plus or minus pyrite plus or minus dolomite, these are possibly pre-faulting metamorphic segregations; 2) massive, white, coarsely crystalline quartz with less than 5 percent sulfides and trace gold; and 3) 'main stage' quartz, which is fine grained, white, and in places vuggy. The sulfide assemblage in main stage quartz consists in decreasing order of abundance: arsenopyrite, galena, sphalerite, stibnite, and pyrite. Native gold, as flakes or wires, is common in the Mikado; the gold typically occurs along the borders of sulfide grains or in quartz near sulfides. Sulfides generally form less than 5 percent of the main-stage veins. The gold veins in the Chandalar district are considered mesothermal (Barker and Bundtzen, 2004; Barker, 2006; Barker 2007; Barker and others, 2009) by comparison with similar deposits elsewhere and from fluid inclusion and oxygen and lead isotope studies of the Chandalar mineralization (Ashworth, 1983; Rose and others, 1988; Gacetta and Church, 1989).

The Mikado Mine is in a distinctive band of gray, carbonaceous phyllite, a major part of the Mikado Phyllite unit. Barker and Bundtzen (2004) note that the Mikado deposit is distinct in the district in that the

structure in which the vein occurs, which may be tens of feet thick, is unusually thick and intensely sheared with abundant gouge. They also emphasize several generations of quartz veining, accompanied by faulting during, prior to, and after the mineralization event(s). Barker and others (2009) suggests that while rich pockets of ore were mined at the Mikado, they might better be considered as rich lenses along a 4,000-foot zone of mineralization that extends to the St. Marys deposit (CH113) and is open at both ends. The potential of this zone may be the extensive lower grade and probably more continuous mineralization that surrounds and extends beyond the smaller rich segments of the belt such as those that were mined in the Mikado.

Alteration:

Oxidation of vein material produces scorodite and limonite.

Age of mineralization:

Possibly mid-Cretaceous based on the assertion of Dillon (1982) that the gold-quartz veins of the central Brooks Range are that age. However, there are no definitive data for the age of the veins of the Chandalar area.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; medium

Site Status: Active

Workings/exploration:

The Mikado is the most productive lode deposit in the Chandalar area and has been a center of attention from the early history of the area. Maddren (1913) reported open cuts that exposed auriferous quartz in six places over a strike length of 3,000 feet. Underground workings, including a 100-foot shaft and 160-foot adit, reportedly were completed by 1913. The underground workings were reopened in 1960, and over the next 24 years, there was considerable underground exploration, surface exploration, trenching, and mining. Chandalar Gold Mining and Milling Company operated the Mikado Mine from 1967 to 1971 (Barker and others, 2009); Callahan Mining mined in 1975; and Chandalar Development mined from 1980 to 1983. In 2004, Little Squaw Gold Mining Company and its successor Goldrich Minerals began an aggressive exploration program in the district that included work at the Mikado (Barker and others, 2009; Goldrich Minerals, 2011). In 2011, Goldrich drilled 11 holes totaling 2127 meters on the Mikado vein in the vicinity of the main portal of the old mine and about a half mile to the southeast on the vein's extension that is often called the St. Mary's vein (Goldrich Mining Company, 2011).

Production notes:

The amount of gold produced from the Mikado vein prior to 1960 is unknown. There may have been some early production as a small stamp mill was constructed on Spring Creek by 1913 to process ore from the Mikado and Little Squaw Mines. The Mikado is the most productive lode deposit in the Chandalar area. Chandalar Gold Mining and Milling Company operated the Mikado Mine from 1967 to 1971 and produced 685 ounces of gold from ore that averaged 1.64 ounces of gold per ton (Barker and others, 2009); Callahan Mining mined in 1975 and recovered 185 ounces of gold from ore that averaged 0.85 ounce of gold per ton. Chandalar Development produced 6,822 ounces of gold that averaged 0.93 ounce of gold per ton, although the mill recovery was poor. As of the end of 2011, there had been no additional production (Barker and others, 2009).

Reserves:

Over the years, various geologists and engineers people have cited different reserve or resource figures for the Mikado Mine or the Chandalar district where the Mikado was the best known and largest deposit. For examples see Nokleberg and others (1987), Baggs and others (1), and Swainbank and others(1998). However the most recent estimate in 2005 after several periods of mining from 1967 to 1983 was by the Little Squaw Gold Mining Company (now Goldrich Mining Company) was that the Mikado Mine had 110 tons of proven resources with an average grade of 1.10 ounce of gold per ton and 5,200 tons of probable resources with an average grade of 1.05 ounce of gold per ton (Barker and Bundtzen, 2004; Barker and others, 2009).

Additional comments:

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Primary Reference: Barker and Bundtzen, 2004; Barker and others, 2009

Reporter(s): J.M. Britton (Anchorage, Alaska); Travis Hudson (Applied Geology, Inc.); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Eneveloe; Bonanza; Jupiter; Woodchuck; Chandalar; Big Squaw

Site type:

Prospect

ARDF no.: CH046

Latitude: 67.5457 **Quadrangle:** CH C-3

Longitude: 148.203

Location description and accuracy:

The Eneveloe prospect is at an elevation of about 4,700 feet, approximately 1/4 mile south of Little Squaw Peak and about 0.7 mile northwest of the center of section 3, T. 31 N., R. 3 W., of the Fairbanks Meridian. The location is accurate. This site includes several other smaller veins and prospects nearby south of Little Squaw Peak including the Bonanza, Jupiter, Woodchuck, Chandalar, and Big Squaw.

Commodities:

Main: As, Au

Other: Ag, Cu, Pb, Sb, Zn

Ore minerals: Arsenopyrite, galena, gold, pyrite, scorodite, sphalerite

Gangue minerals: Quartz

Geologic description:

Placer gold was discovered in the Chandalar area on Little Squaw Creek (CH039) in 1902 (Barker, and Bundtzen, 2004; Barker, 2007; Barker and others, 2009). By 1909, four quartz veins including the Mikado vein had been discovered and many more were located prior to WWI. Most of the important properties in the district were consolidated by William Sulzer from 1909 to 1941; the Mikado Mine was one of the prominent deposits of the Chandalar area and was included. Those properties were taken over in 1946 to form the Little Squaw Mining Company in 1959, which in turn became the Little Squaw Gold Mining Company in 1968. From 1967 to 1999, Little Squaw Gold Mining Company leased some of their Chandalar lode and placer ground for mining and/or exploration to a succession of companies, notably the Chandalar Gold Mining and Milling Company (1967-1971), Noranda Mining (1974-1976), the Chandalar Development Corporation (1980-1983), and Gold Dust Mines (1989-1999). There was some earlier small lode production from the district but the first documented gold produced from the lodes was 870 ounces produced from 1967 to 1971 from the Mikado and Summit mines by the Chandalar Gold Mining and Milling Company. Subsequently, Chandalar Development produced 8,169 ounces of lode gold from the Mikado and Summit Mines but recovery was poor. In 2003, Little Squaw Gold Mining Company and its direct descendent Goldrich Mining Company began an aggressive exploration program for lode and placer deposits over a large block of land that covers almost all of the known deposits in the Chandalar area and in early 2012 that effort continued (Goldrich Mining Company, 2012).

The geology of the Chandalar area is dominated by a system of west-northwest-trending regional faults including a prominent thrust fault in the southern part of the district and a series of major high-angle faults through the center of the area (Bundtzen and Laird, 2007 [map]; 2007 [83 p.]). These faults separate the rocks into two principal units, a west-northwest-trending Upper Plate unit about 3 miles wide in the center of the area and a Lower Plate unit to the north and south. The contact of the two units is a thrust fault on the south side of the Upper Plate rocks and a high-angle fault on the north side. Most of the Upper Plate rocks consist of Devonian upper-greenschist-facies metamorphic rocks, mainly carbonaceous schist; quartz-chlorite-muscovite schist, schist and phyllite derived from turbidites that comprise the Mikado Phyllite, metamorphosed calcareous sandstone, and quartz-muscovite schist. The Lower Plate rocks consist of

Devonian, upper-greenschist-facies metamorphic rocks, mainly metamorphosed volcanic agglomerate, chlorite-rich tuffaceous schist, quartz-mica schist derived from mudstone, mica-quartz schist, and quartzite. Both the Upper and Lower Plate rocks are cut by irregular masses, dikes and sills of greenstone, metagabbro, and metadiorite of unknown age. Most of the mineral deposits in the Chandalar area are in the Upper Plate rocks and the deposits often are along the regional, steep-to-vertical, west-northwest-trending faults. There is an additional conjugate set of north-northeast-trending faults that offset the Upper Plate rocks and at least some of the mineralization may be localized at the intersections of the regional west-northwest-trending faults and the conjugate faults. The Eneveloe Mine and several nearby prospects are in the Upper Plate rocks.

An 165-foot adit was driven on the Eneveloe vein before 1913 (Maddren, 1913). Another adit was opened on the nearby Woodchuck claim, but there is no description of its extent. The property has also been explored for 1,000 feet along strike by open cuts and other shallow workings.

The Eneveloe lode consists of at least two discontinuous quartz veins up to 4 to 6 feet or more thick. The Eneveloe deposit is along a fault zone that trends N 65-80 W and dips steeply north (Chip, 1970; Barker and Bundtzen, 2005; Barker, 2006, Barker and others, 2009). According to Maddren (1913), a sample from a surface outcrop on the Last Chance claim assayed $198 (approximately 9.6 ounces of gold per ton). Prospect pits nearby on the Jupiter claim exposed quartz containing minor arsenopyrite and scorodite. At the Bonanza claim, prospect pits expose small and discontinuous quartz veins containing minor galena and scorodite.

The high-grade portion of the Eneveloe vein is similar to most of the quartz veins in the district. They are discontinuous along the regional fault on which they occur and usually pinch out within within a few hundred feet or less. Widths vary from a few inches to several feet but are generally less than 10 feet. The quartz veins exhibit evidence of shearing, which indicates that the veins were emplaced before or during fault movement. Sulfide content of the veins is typically less than 5 percent; the sulfides, in order of abundance are arsenopyrite, galena, sphalerite, and pyrite. Much of the gold occurs as native gold. Weathering near the surface has oxidized and leached the sulfides to produce scorodite and limonite. The gold veins in the Chandalar district are considered mesothermal (Barker and Bundtzen, 2004) by comparison with similar deposits elsewhere and consideration of fluid inclusion and oxygen and lead isotope studies of the Chandalar mineralization (Ashworth, 1983; Rose and others, 1988; Gacetta and Church, 1989).

In 1982, the Chandalar Development Company drove short adits at the 100-foot and 200-foot levels on the Eneveloe mineralization (Barker and Bundtzen, 2005; Barker 2006; Barker and others, 2009). The lower adit intersected the west end of the Eneveloe vein and then drifted on it for 500 feet. A high grade quartz lens 70 feet long was found that assayed 0.5 to 10.0 ounces of gold per ton. The upper adit was driven toward a massive quartz outcrop. The workings hit finely ground-up quartz on the north side of the massive quartz that assayed more than 2 ounces of gold per ton. (Both adits were caved in 2005.) Chandalar Development Company also diamond drilled 6 drill holes that totaled 1,113 feet. The core recovery was so poor that few assays were possible, but the drilling suggested parallel veins. Little Squaw Gold Mining Company trenched west of the 100-level adit but were unsuccessful in locating the vein.

There are several prospects nearby that are often considered part of the Eneveloe property (Barker, 2007). The Jupiter vein was trenched in 1981; samples from a 3-foot quartz vein contained up to 0.36 ounce of gold per ton. In 2006, three holes were drilled; two of the holes were unsuccessful in hitting the vein and the best intercept in the third was 10 feet that averaged 2.31 parts per million (ppm) gold. Samples from the Chandalar vein assayed up to 49.98 ounces of gold per ton. Old working were reopened in 2004; an 18-inch section of a 3-foot wide vein contained 33.6 ppm gold. At the Bonanza prospect, a composite 9-foot-wide band of mineralization that extends for 500 feet consists of crushed quartz, scorodite-stained clay and quartz, graphitic clay gouge, and massive quartz. Channel samples across the band contained an average of 2.71 ppm gold. At the Woodchuck prospect, a 3- to 6-foot vein can be traced for about 100 feet. Samples cited in the old reports contained 0.04 and 0.06 ounce of gold per ton. At the Big Squaw prospect west of the Eneveloe, a vein 7- to 12-feet wide was trenched and a short adit was driven on it. A sample taken in 2004 contained 0.30 ppm gold. In 2011, Goldrich Mining Corp. (2011) drilled 2 holes totaling 203 meters on the Bonanza vein about 0.4 mile south-southeast of Little Squaw Peak. Two intervals were cut that contained more than 0.50 ounce of gold per tonne; the best was 0.9 meter that contained 4.74 grams of gold per tonne.

Alteration:

Not specifically noted. However, many of the veins in the area such as Eneveloe are aligned along major faults that are marked by much clay and gouge.

Age of mineralization:

Possibly mid-Cretaceous based on the assertion of Dillon (1982) that the gold-quartz veins of the central Brooks Range are that age. However, there is no definitive data for the age of the veins of the Chandalar area.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Undetermined

Site Status: Active

Workings/exploration:

An 165-foot adit was driven on the Eneveloe vein before 1913 (Maddren, 1913). Another adit was opened on the nearby Woodchuck claim, but there is no description of its extent. The property has also been explored for 1,000 feet along strike by open cuts and other shallow workings. In 1982, The Chandalar Development Company drove short adits at the 100-foot and 200-foot levels and diamond drilled 6 holes that totaled 1,113 feet (Barker and Bundtzen, 2005; Barker 2006; Barker and others, 2009). The core recovery was so poor that few assays were possible. Little Squaw Gold Mining Company trenched west of the 100-level adit but were unsuccessful in locating the vein. In early 2010, this was one of the sites being studied by Goldrich Mining Company in their intensive exploration of the Chandalar area (Goldrich Mining Company, 2010).

Production notes:

None.

Reserves:

None.

Additional comments:

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Primary Reference: Barker, 2007; Barker and others, 2009

Reporter(s): J.M. Britton (Anchorage, Alaska); Travis Hudson (Applied Geology, Inc.); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Squaw Creek; Big Squaw Creek

Site type: Mine

ARDF no.: CH047

Latitude: 67.5424 **Quadrangle:** CH C-3

Longitude: 148.2267

Location description and accuracy:

Some placer mining took place at the head of Big Squaw Creek (Squaw Creek on the USGS topographic maps); the coordinates are the likely location of this mining, about 0.7 mile southwest of Little Squaw Creek near the center of section 4, T. 31 N., R. 3 W. However, there may have been other small-scale mining on Big Creek that date back to before WWI.

Commodities:

Main: Au

Other: Ag, Mo, Pb, Sb, Th, U

Ore minerals: Arsenopyrite, galena, gold, molybdenite, monazite, pyrite, stibnite, uranothorianite, zircon

Gangue minerals:

Geologic description:

Placer gold was discovered in the Chandalar area on Little Squaw Creek (CH039) in 1902 (Barker, and Bundtzen, 2004; Barker, 2007; Barker and others, 2009). By 1909, four quartz veins including the Mikado vein had been discovered and many more were located prior to WWI. Most of the important properties in the district were consolidated by William Sulzer from 1909 to 1941; the Mikado Mine was one of the prominent deposits of the Chandalar area and was included. Those properties were taken over in 1946 to form the Little Squaw Mining Company in 1959, which in turn became the Little Squaw Gold Mining Company in 1968. From 1967 to 1999, Little Squaw Gold Mining Company leased some of their Chandalar lode and placer ground for mining and/or exploration to a succession of companies, notably the Chandalar Gold Mining and Milling Company (1967-1971), Noranda Mining (1974-1976), the Chandalar Development Corporation (1980-1983), and Gold Dust Mines (1989-1999). There was some earlier small lode production from the district but the first documented gold produced from the lodes was 870 ounces produced from 1967 to 1971 from the Mikado and Summit mines by the Chandalar Gold Mining and Milling Company. Subsequently, Chandalar Development produced 8,169 ounces of lode gold from the Mikado and Summit Mines but recovery was poor. In 2003, Little Squaw Gold Mining Company and its direct descendent Goldrich Mining Company began an aggressive exploration program for lode and placer deposits over a large block of land that covers almost all of the known deposits in the Chandalar area and in early 2010, that effort continued (Goldrich Mining Company, 2010).

In spite of the proximity of Big Squaw Creek to many of the gold-bearing veins in the Chandalar district, the placer mining on this creek appears to be limited to near the head of the creek, just below the Jupiter claim on the Eneveloe prospect (CH046) (Chipp, 1970). The mining was from small-scale surface workings by hand methods. Mining in 1923 was in gravel 3 to 4 feet deep. Mining was reported as late as 1928, but there is no information on any later activity. On the lower creek early efforts at mining the deeper gravels were thwarted because the gravels were thawed and drift mining through shafts was not possible because of water inflow and lack of support.

Strandberg (1994) postulated a possible ancestral auriferous channel of Big Squaw Creek near the airstrip on lower Big Creek. He estimated a possible 1,500,000 cubic yards of gravel with an average grade of 0.06 ounce per cubic yard in a bench near the airstrip. The data to justify Strandberg's estimate is unavailable

(Barker and Bundtzen, 2004). In 1997, Daglow Exploration drilled three holes to a depth of 96 feet on lower Big Squaw Creek near the airstrip (Fitch, 1997). Only traces of gold were recovered, but the holes did not reach bedrock. Testing the possibility that there might be a placer in lower Big Squaw Creek similar to the one in the pre-glacial fan in Lower Little Squaw Creek (CH039), Little Squaw Gold Mining Company drilled two test holes near the Squaw Lake airstrip (Barker and others, 2009). The gold particles that were recovered and the accompanying heavy mineral assemblage were to those in the Little Squaw Creek fan. The gold was scattered through the fluvial gravel but seemed to be more abundant at depth.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The only mining on Little Squaw Creek was from small-scale surface workings by hand methods. Mining in 1923 was in gravel 3 to 4 feet deep. Mining was reported as late as 1928, but there is no information on any later activity. There have been several generations of drilling on lower Big Squaw Creek near the airport, the latest in 2008, to test the possibility of gold bearing gravel in the valley of Squaw Lake similar to that in the lower part of Little Squaw Creek. Trace to some gold was found in the few holes.

Production notes:

Some small production that cannot be documented.

Reserves:

Strandberg (1994) estimated a possible resource of 1,500,000 cubic yards of gravel with an average grade of 0.06 ounce per cubic yard in a bench near the airstrip. The data to justify Strandberg's numbers are unavailable.

Additional comments:

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Primary Reference: Barker and Bundtzen, 2004; Barker and others, 2009

Reporter(s): J.M. Britton (Anchorage, Alaska); Travis Hudson (Applied Geology, Inc.); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Tobin Creek

Site type: Mine

ARDF no.: CH048

Latitude: 67.5309 **Quadrangle:** CH C-3

Longitude: 148.313

Location description and accuracy:

About a mile and a half of the headwaters of Tobin Creek has been placer mined. The workings include the lower part of the north tributary locally known as Woodchuck Creek and the northeast tributary that leads to the Mikado Mine (CH045). The coordinates are at the junction of these tributaries near the southwest corner of section 5, T. 32 N., R. 3 W., of the Fairbanks Meridian). The location is accurate.

Commodities:

Main: Au

Other: Pb, REE, W

Ore minerals: Galena, gold, magnetite, monazite, pyrite, scheelite

Gangue minerals:

Geologic description:

Placer gold was discovered in the Chandalar area on Little Squaw Creek (CH039) in 1902 (Barker, and Bundtzen, 2004; Barker, 2007; Barker and others, 2009). Most of the important properties in the district were consolidated by William Sulzer from 1909 to 1941. Those properties were taken over in 1946 to what became the Little Squaw Mining Company in 1959 and the Little Squaw Gold Mining Company in 1968. In 2008, the Little Squaw Gold Mining Company became the Goldrich Mining Company, the operator as of early 2010 (Goldrich Mining Company, 2010). From 1967 to 1999, Little Squaw Gold Mining Company leased some of their Chandalar lode and placer ground for mining and/or exploration to a succession of companies, notably the Chandalar Gold Mining and Milling Company (1967-1971), Noranda Mining (1974-1976), the Chandalar Development Corporation (1980-1983), and Gold Dust Mines (1989-1999). In 2003, Little Squaw Gold Mining Company and its direct descendent Goldrich Mining Company began an aggressive exploration program for lode and placer deposits over a large block of land that covers almost all of the known deposits in the Chandalar area and as of early 2010, that effort continued (Goldrich Mining Company, 2010).

A total of about a mile and a half of the headwaters of Tobin Creek and two of its headwater tributaries, Woodchuck Creek and the tributary that leads to the Mikado Mine (CH045) have been mined (Barker and Bundtzen, 2004; Bundtzen and Laird, 2009a, 2009b; Barker, 2007; Barker and others, 2009). Prospecting on Tobin Creek began in 1930 with encouraging results and a rich pay streak was found in 1934. About 1,000 ounces of gold was produced from 1932 to 1966 from shafts and by open-cut mining. From 1966 to 1970, the Chandalar Gold Mining and Milling Company and Canalaska began mechanical mining with heavy equipment and produced 7,500 ounces of gold from material that ran about 0.535 ounce of gold per cubic yard. From 1979 to 1993, another 12,599 ounces of gold was produced by Gold Dust Mines from gravel that averaged about 0.021 ounce per cubic yard . In addition to gold, concentrates contain hematite, monazite, scheelite, pyrite, magnetite, rutile, and galena (White, 1952).

Strandberg (1990) estimated that Tobin Creek contained 2.5 million cubic yards with an average grade of 0.0283 ounce of gold per cubic yard. Barker and Bundtzen (2009) suggested that most of the high-grade has been mined and estimated the 'possible' resource as 91,333 ounces of gold in 2,352,000 cubic yards of gravel with an average grade of 0.060 ounce per cubic yard.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

A total of about a mile of the headwaters of Tobin Creek and two of its headwater tributaries, Woodchuck Creek and the tributary that leads to the Mikado Mine (CH045) have been placer mined (Barker and Bundtzen, 2004; Bundtzen and Laird, 2009a, 2009b; Barker and others, 2009). Prospecting on Tobin Creek began in 1930 with encouraging results and a rich pay streak was found in 1934. About 1,000 ounces of gold was produced from 1932 to 1966 from shafts and by open-cut mining. From 1966 to 1970, the Chandalar Gold Mining and Milling Company and Canalaska began mechanical mining with heavy equipment and produced 7,500 ounces of gold. From 1979 to 1993, another 12,599 ounces of gold was produced, mainly by Gold Dust Mines.

Production notes:

About 1,000 ounces of gold was produced from 1932 to 1966 from shafts and by open-cut mining. From 1966 to 1970, the Chandalar Gold Mining and Milling Company and Canalaska began mechanical mining with heavy equipment and produced 7,500 ounces of gold. From 1979 to 1993, another 12,599 ounces of gold was produced, mainly by Gold Dust Mines.

Reserves:

Strandberg (1990) estimated that Tobin Creek contained 2.5 million cubic yards of gravel with an average grade of 0.0283 ounce of gold per cubic yard. Barker and Bundtzen (2004) suggested that most of the rich gravel has been mined and estimated the possible resource as 91,333 ounces of gold in 2,352,000 cubic yards of gravel with an average grade of 0.060 ounce per cubic yard.

Additional comments:

References:

Barker, J.C., 2006, Chandalar Mining District, a report of findings and recommendations, 2005: Unpublished report for Little Squaw Gold Mining Company, 93 p. (on the Internet at http://www.goldrichmining.com/Files/corporate/2005AnnualReport011906.pdf as of February 14, 2010)

Barker, J.C., 2007, Chandalar Mining District, Annual Report of findings for 2006; Unpublished report for Little Squaw Gold Mining Company, 124 p. (On the Internet at http://www.goldrichmining.com/Files/chandalar/chandalar_barker_rpt_2007.pdf as of February 14, 2010).

Barker, J.C., and Bundtzen, T.K., 2004, Gold deposits of the Chandalar Mining District, Northern Alaska: An information review and recommendations: Unpublished report for the Little Squaw Gold Mining

Company, 165 p. (in files of the Goldrich Mining Company).

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Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

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Smith, P.S., 1938, Mineral industry of Alaska in 1936: U.S. Geological Survey Bulletin 897-A, p. 1-107.

Smith, P.S., 1939, Mineral industry of Alaska in 1938: U.S. Geological Survey Bulletin 917-A, p. 1-113.

Smith, P.S., 1941, Mineral industry of Alaska in 1939: U.S. Geological Survey Bulletin 926-A, p. 1-106.

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Strandberg E.O. Jr., 1990, Description of Properties, Chandalar Mining District, Alaska: Unpublished company report, 143 p. 14 plates.

White, M.G., 1952, Radioactivity of selected rocks and placer concentrates from northeastern Alaska: U.S. Geological Survey Circular 195, 12 p.

Primary Reference: Barker and Bundtzen, 2004; Barker and others, 2009

Reporter(s): J.M. Britton (Anchorage, Alaska); Travis Hudson (Applied Geology, Inc.); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Kelty

Site type: Prospect

ARDF no.: CH049

Latitude: 67.5551 **Quadrangle:** CH C-3

Longitude: 148.2756

Location description and accuracy:

The Kelty prospect is in the pass at the head of the east fork of the McNett Fork and about 2.2 miles southwest of the junction of McNett Fork and Big Squaw Creek (which is called Squaw Creek on the USGS topographic maps). It is about 0.4 mile west of the center of section 32, T. 32 N., R. 3 W. The location is accurate.

Commodities:

Main: Au

Other: As

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

Placer gold was discovered in the Chandalar area on Little Squaw Creek (CH039) in 1902 (Barker, and Bundtzen, 2004; Barker, 2007; Barker and others, 2009). By 1909, four quartz veins including the Mikado vein had been discovered and many more were located prior to WWI. Most of the important properties in the district were consolidated by William Sulzer from 1909 to 1941; the Mikado Mine was one of the prominent deposits of the Chandalar area and was included. Those properties were taken over in 1946 to form the Little Squaw Mining Company in 1959, which in turn became the Little Squaw Gold Mining Company in 1968. From 1967 to 1999, Little Squaw Gold Mining Company leased some of their Chandalar lode and placer ground for mining and/or exploration to a succession of companies, notably the Chandalar Gold Mining and Milling Company (1967-1971), Noranda Mining (1974-1976), the Chandalar Development Corporation (1980-1983), and Gold Dust Mines (1989-1999). There was some earlier small lode production from the district but the first documented gold produced from the lodes was 870 ounces produced from 1967 to 1971 from the Mikado and Summit mines by the Chandalar Gold Mining and Milling Company. Subsequently, Chandalar Development produced 8,169 ounces of lode gold from the Mikado and Summit Mines but recovery was poor. In 2003, Little Squaw Gold Mining Company and its direct descendent Goldrich Mining Company began an aggressive exploration program for lode and placer deposits over a large block of land that covers almost all of the known deposits in the Chandalar area and as of early 2010, that effort continued (Goldrich Mining Company, 2010).

The geology of the Chandalar area is dominated by a system of west-northwest-trending regional faults including a prominent thrust fault in the southern part of the district and a series of major high-angle faults through the center of the area (Bundtzen and Laird, 2009a, 2009b). These faults separate the rocks into two principal units, a west-northwest-trending Upper Plate unit about 3 miles wide in the center of the area and a Lower Plate unit to the north and south. The contact of the two units is a thrust fault on the south side of the Upper Plate rocks and a high-angle fault on the north side. Most of the Upper Plate rocks consist of Devonian upper-greenschist-facies metamorphic rocks, mainly carbonaceous schist; quartz-chlorite-muscovite schist, schist and phyllite derived from turbidites that comprise the Mikado Phyllite, metamorphosed calcareous sandstone, and quartz-muscovite schist. The Lower Plate rocks consist of Devonian, upper-greenschist- facies metamorphic rocks, mainly metamorphosed volcanic agglomerate,

chlorite-rich tuffaceous schist, quartz-mica schist derived from mudstone, mica-quartz schist, and quartzite. Both the Upper and Lower Plate rocks are cut by irregular masses, dikes and sills of greenstone, metagabbro, and metadiorite of unknown age. Most of the mineral deposits in the Chandalar area are in the Upper Plate rocks and the deposits often are along the regional, steep-to-vertical, west-northwest-trending faults. There is an additional conjugate set of north-northeast-trending faults that offset the Upper Plate rocks and at least some of the mineralization may be localized at the intersections of the regional west-northwest-trending faults and the conjugate faults.

There is little information about the Kelty prospect. Maddren (1913) described it as an extension of the Eneveloe property (CH046). Dillon (1982) described it as steeply dipping (65SE) gold-quartz veins in schistose rock. In their extensive work on the Chandalar district beginning in 2004, Little Squaw Gold Mining Company and its successor Goldrich Mining Company visited the property. The Kelty deposit consists of a series of altered fault zones with thin quartz veins; samples contained minor gold values and anomalous arsenic. Soil from a mineral seep on the slope below contained 0.595 part per million (ppm) gold. Several small prospect pits that they identify as the Mercury, Caribou Gulch, and Caribou Gulch South are scattered for about a mile to the east along what is locally called Caribou Gulch. No vein material were identified at any of the pits although the fines from one pit contained 1.54 ppm gold. These scattered small deposits at the outer edge of the Chandalar mineralized area are probably similar in origin to the other gold-quartz veins in the Chandalar district. (e.g., the Mikado Mine (CH045). The gold veins in the Chandalar district are considered mesothermal (Barker and Bundtzen, 2004; Barker, 2006; Barker 2007; Barker and others, 2009) by comparison with similar deposits elsewhere and in consideration of fluid inclusion and oxygen and lead isotope studies of the Chandalar mineralization (Ashworth, 1984; Rose and others, 1988; Gacetta and Church, 1989).

Alteration:

Age of mineralization:

Possibly Middle Cretaceous based on the assertion of Dillon (1982) that the gold-quartz veins of the central Brooks Range are that age. However, there is no definitive data for the age of the veins of the Chandalar area.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

None other than few scattered prospect pits. Visited by several industry and government geologists over the years but apparently no work beyond limited sampling.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Ashworth, (Lamal) Kate, 1984, Fluid inclusion study of the Eneveloe Vein, Chandalar Mining District: Private Report, Chandalar Development Associates, 8 pages (in files of the Goldrich Mining Company.

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Primary Reference: Barker, 2007; Barker and others, 2009

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Boulder Creek

Site type: Mine

ARDF no.: CH050

Latitude: 67.5599 **Quadrangle:** CH C-3

Longitude: 148.4085

Location description and accuracy:

This placer mine is on Boulder Creek which flows west into the North Fork Chandalar River; the mouth is is about a half mile north of Chandalar Lake. The mine is about 0.5 mile north of the center of section 34, T. 32 N., R. 4 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Kurtak and others (2002) noted a trommel, loader, and a backhoe at a large area of tailings about a mile and a half from the mouth of Boulder Creek There was also a camp and airstrip nearby and they noted 'current mining operations'. Placer claims were active on Boulder Creek in 1969 and during the 1990s. Apparently the first mining on Boulder Creek was in 1989 (Bundtzen and others, 1990).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Undetermined

Workings/exploration:

Kurtak and others (2002) noted a trommel, loader, and a backhoe at a large area of tailings about a mile and a half from the mouth of Boulder Creek There was also a camp and airstrip nearby and they noted

'current mining operations'. Placer claims were active on Boulder Creek in 1969 and during the 1990s. Apparently the first mining on Boulder Creek was in 1989 (Bundtzen and others, 1990).

Production notes:

The first placer mining on Boulder Creek apparently was in 1989. There was probably mining in the late 1990s and possibly in the 2000s. The amount of gold that was produced is unknown.

Reserves:

None?

Additional comments:

MAS No. 0020310063

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

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Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Arsine

Site type: Prospect

ARDF no.: CH052

Latitude: 67.6593 **Quadrangle:** CH C-4

Longitude: 148.6657

Location description and accuracy:

The Arsine prospect is at an elevation of about 5,100 feet near the head of Anderson Creek, a south-flowing tributary of Baby Creek. It is about 0.6 miles west-northwest of the center of section 27, T. 33 N., R. 5 W. The location is accurate within one mile.

Commodities:

Main: Cu, Mo

Other: As, Sb

Ore minerals: Unspecified copper and molybdenum sulfides and an unspecified arsenic mineral; magnetite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

The Arsine prospect is near a thrust fault in lower Paleozoic metamorphic rocks between two masses of the Devonian(?) Baby Creek granitic batholith (Brosgé and Reiser, 1964) The prospect was staked in 1964 by the Oil Development Company of Texas based on soil samples with anomalous copper, arsenic, and antimony (Kurtak and others, 2002). Little is known about the exploration of the property other than that there is an indication that the target was gold and arsenic mineralization (DeYoung, 1978).

Kurtak and others (2002) found conspicuous, iron-oxide-stained gneiss with about 2 percent disseminated pyrite, pyrrhotite, and magnetite, that extends for about 2 miles along a contact of the granitic rocks with quartz-mica schist. A sample of siliceous, metamorphosed intrusive rock collected nearby contained 138 ppm copper and 135 ppm molybdenum. Kurtak and others (2002) suggest that the prospect may be a metamorphosed copper-molybdenum porphyry deposit.

Alteration:

Iron-staining of gneiss from oxidization of disseminated pyrite, pyrrhotite, and magnetite.

Age of mineralization:

Data too sparse to determine.

Generic deposit model:

Deposit model:

Data to sparse to classify.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

No indication of industry work beyond claim staking in 1964. Sampled by Bureau of Land Management (Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

MAS No. 0020310024

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey, Miscellaneous Geologic Investigations Map I-375, 2 sheets, scale 1:250,000.

DeYoung, J.H., Jr., 1978, Mineral resources map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-878-B, 2 sheets, scale 1:250,000.

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Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (at head of Geroe Creek); MAS

Site type: Prospect

ARDF no.: CH053

Latitude: 67.6804 **Quadrangle:** CH C-4

Longitude: 148.814

Location description and accuracy:

This deposit is best exposed in cliffs at the head of the west, headwater tributary of Geroe Creek, in the southwest quarter of section 13, T. 33 N., R. 6 W. A block of 239 claims was staked over this deposit in the mid-1970s.

Commodities:

Main: Au, Cu, Mo

Other: Pb

Ore minerals: Chalcopyrite, molybdenite, pyrite

Gangue minerals: Chlorite, quartz, sericite

Geologic description:

Placid Oil Company staked a block of 239 claims over this prospect in 1975-1976. There apparently has been little industry work since then although the the area was examined by the Bureau of Land Management in their study of the Koyukuk mining district (Kurtak and others, 2002).

This prospect is one of several quartz stockworks and altered zones in the northeast-trending belt of Devonian peraluminous biotite-muscovite granite of the Baby Creek batholith and Devonian, metaluminous biotite-hornblende granite and granodiorite of the Horace Mountain pluton (Brosgé and Reiser, 1964; Newberry and others, 1986). Porphyritic phases occur locally in these plutons, and DeYoung and others (1997) report that the mineralizing intrusives are porphyritic meta-granodiorite and biotite meta-granite. The country rocks are mainly Paleozoic schist and marble, and peraluminous meta-granodiorite. DeYoung and others (1997) note the absence of skarn in the calcareous rocks adjacent to these plutons. The veinlets in the stockworks at this prospect contain disseminated molybdenite, chalcopyrite, and pyrite, accompanied by intense quartz-sericite-chlorite-(+/- epidote) alteration. Eakins and others (1983) report grades of up to 0.1 percent molybdenum, Nokleberg and others (1987) report that zones as much as several meters thick in the plutons contain 0.6 percent copper, 0.02 percent molybdenum, and 0.1 gram of gold per tonne. Kurtak and others (2002) identified a limonite-stained, altered area about 2,000 feet wide at the head of Geroe Creek that has disseminated pyrite and a gray mineral that is probably molybdenite. A sample contained 5,212 parts per million (ppm) molybdenum and 106 ppm lead. Minor chalcopyrite and copper staining are found occasionally and a float sample contained 1,457 ppm copper and 37 parts per billion gold.

Alteration:

Sericitization and propylitization of porphyritic host rocks; veinlets in stockworks are accompanied by intense quartz-sericite-chlorite-(+/- epidote) alteration.

Age of mineralization:

Devonian or younger based on Early Devonian Pb/Pb zircon ages from the Baby Creek batholith and Horace Mountain plutons that are similar to the igneous rocks that hosts this deposit (Dillon and others, 1996).

Generic deposit model:

Deposit model:

Porphyry Cu-Mo (Cox and Singer, 1986; model 21a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

21a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Placid Oil Company staked a block of 239 claims over this prospect in 1975-1976. There has apparently been little industry work since then although the area was examined and sampled by the Bureau of Land Management in their study of the Koyukuk mining district (Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

MAS No. 0020310026

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey, Miscellaneous Geologic Investigations Map I-375, 2 sheets, scale 1:250,000.

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Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Newberry, R.J., Dillon, J.T., and Adams, D.D., 1986, Regionally metamorphosed calc-silicate-hosted deposits of the Brooks Range, northern Alaska: Economic Geology, v. 81, p. 1728-1752.

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Young, L.E., St. George, P., and Bouley, B., 1997, Porphyry copper deposits in relation to the magmatic history and palinspastic restoration of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral deposits of Alaska: Economic Geology Monograph 9, p. 306-333.

Primary Reference: Newberry and others, 1986; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (near Willow Creek)

Site type: Occurrence

ARDF no.: CH055

Latitude: 67.6436 **Quadrangle:** CH C-4

Longitude: 148.8936

Location description and accuracy:

This occurrence is at an elevation of about 4,000 feet on a hillside about 1.6 mile east-southeast of the junction of Willow Creek and Little Spruce Creek. It is about 0.5 mile west of the center of section 34, T. 33 N., R. 6 W.

Commodities:

Main: Au, Sb, Zn

Other:

Ore minerals: Gold, pyrite, pyrrhotite, sphalerite

Gangue minerals:

Geologic description:

Brosgé and Reiser (1972) collected samples with anomalous zinc in Devonian(?) albite-chlorite-mica schist near the contact with calcareous schist and marble (Brosgé and Reiser, 1964). Two of the rock samples contained 0.8 to 5.6 parts per million gold. There or nearby, Kurtak and others (2002) found knobs of resistant marble and hornfels in rubble crop of chlorite-muscovite schist. The hornfels contains a small amount of disseminated sphalerite, pyrite, and pyrrhotite. Six samples of hornfels contained 36 ppm to 3.09 percent zinc. A sample of hornfels in float contained 1.56 percent antimony and 153 parts per billion gold.

Alteration:

Masses of hornfels developed in chlorite-muscovite schist.

Age of mineralization:

Devonian or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Hornfels with zinc, antimony, and gold.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Only limited sampling by government agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS No. 0020310074

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

Brosgé, W.P., and Reiser, H.N., 1972, Geochemical reconnaissance in the Wiseman and Chandalar districts and adjacent region, southern Brooks Range, Alaska: U.S. Geological Survey Professional Paper 709, 21 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Big Jim Creek; Suklak Creek

Site type: Mine

ARDF no.: CH056

Latitude: 67.5349 **Quadrangle:** CH C-5

Longitude: 149.0484

Location description and accuracy:

Big Jim Creek flows into the north end of the southern of the Twin Lakes. Most of Big Jim Creek flows across the southern halves of section 1 and 2, T.31 N., R. 7 W. There is an early reference to placer mining along the creek at some unstated location. For this record, the site is arbitrarily plotted at an elevation of about 2,360 feet along the creek.

Commodities:

Main: Au

Other: Cu

Ore minerals: Copper, gold

Gangue minerals:

Geologic description:

Reed (1938) noted that this small placer mine produced native copper nuggets as well as gold. The amount of production was unknown, but probably was quite small. Kurtak and others (2002) visited the creek and panned samples. Their samples did not contain any gold nor did they find any sign of mining along the creek other than a cabin. Dillon (1987) reported a mining claim on the creek.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Probably inactive

Workings/exploration:

Worked by rocker and panning sometime before 1938; Kurtak and others (2002) found no sign of recent

mining.

Production notes:

A small amount of placer gold and copper nuggets were produced prior to 1938.

Reserves:

None.

Additional comments:

Suklak Creek is the old name for this stream and it was worked by 'Big Jim' Edwards. Much of the information in Reed (1938) is hearsay.

MAS No. 0020310090

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Robert Creek; Sheep Creek

Site type: Prospects

ARDF no.: CH058

Latitude: 67.6359 **Quadrangle:** CH C-5

Longitude: 149.1891

Location description and accuracy:

Robert Creek is one of the principal tributaries to the Bettles River, and Sheep Creek is a major south-flowing tributary to Robert Creek. The creeks are many miles long. There is reference to early prospecting on Robert Creek, Sheep Creek, and their tributaries but no indication where. This site is arbitrarily plotted at the junction of Robert Creek and Sheep Creek near the southwest corner of section 32, T. 33 N., R. 7 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Maddren (1913) reported that placer gold prospects had been found on Sheep Creek and 'especially those tributary to Robert Creek', as well as on a number of other creeks in the headwaters of the Bettles River. Maddren also noted that the gold was found on the lower parts of the tributaries to Roberts Creek. Maddren (1913) did not visit this area; his reports are based on Schrader (1900) and information from local prospectors. The only other placer gold occurrence in tributaries to Robert Creek is Willow Creek (CH109). (Reed (1938) pointed out that Maddren (1913) incorrectly identified Sheep Creek as Spruce Creek and Willow Creek as Sheep Creek.)

Kurtak and others (2002) sampled and panned along several miles of Sheep Creek. They found no indication of past or recent mining and there was no visible gold in their pans. However, analyses of some of their panned concentrates found a small amount of gold.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Inactive

Workings/exploration:

Maddren (1913) reported that gold prospects had been found on Sheep Creek and 'especially those tributary to Robert Creek', as well as in a number of other creeks in the headwaters of the Bettles River. Maddren also noted that the gold was found on the lower parts of the tributaries to Roberts Creek. Kurtak and others (2002) sampled and panned along several miles of Sheep Creek. They found no indication of recent mining and there was no visible gold in their pans.

Production notes:

Possibly a small amount of gold was produced during prospecting before 1913.

Reserves:

None.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310045

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Schrader, F.C., 1900, Preliminary report on a reconnaissance along the Chandalar and Koyukuk Rivers, Alaska, in 1899: U.S. Geological Survey Twenty-first Annual Report, Part 2, p. 441-486.

Primary Reference: Maddren, 1913

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Evelyn Lee

Site type: Prospect

ARDF no.: CH059

Latitude: 67.6587 **Quadrangle:** CH C-5

Longitude: 149.2571

Location description and accuracy:

The Evelyn Lee prospect is about 2.4 miles northwest of the mouth of Sheep Creek on Robert Creek. It is about 0.2 mile northwest of the center of section 25, T. 33 N., R. 8 W. Kurtak and others (2002) include a detailed map of the prospect and a map showing the regional geology of the area and the location of this and the other deposits of the Chandalar Copper Belt.

Commodities:

Main: Ag, Au, Cu

Other:

Ore minerals: Bornite, chalcopyrite, gold?, pyrite

Gangue minerals:

Geologic description:

The Evelyn Lee prospect was discovered by Bear Creek Mining Company in 1967 along what would would become known as the Chandalar Copper Belt (Kurtak and others, 2002). Bear Creek and several other companies (Midwest Oil Company, WGM Inc., Arctic Resources Inc., and Ventures Resource Corp.) explored the property into the 1990s. The work consisted mainly of mapping. geochemical and geophysical surveys, and sampling. Bear Creek diamond drilled two holes, 512 and 183 feet deep, and drilled two core holes, 18 and 23 feet deep, with a packsack drill.

The Evelyn Lee prospect is one of a number of copper skarn deposits in the Chandalar area which have been described by Newberry and others (1986). They are located northwest of Devonian(?) Horace Mountain belt of metamorphosed granitic rocks, which are probably genetically related to the deposits. Many of the copper skarns exhibit both prograde garnet/pyroxene and retrograde epidote and actinolite mineral assemblages. Newberry and others (1986) concluded that the deposit's mineralogy, mineralization, and alteration suggested continental-margin, porphyry-related copper skarns.

Dillon and others (1996) mapped the area as Devonian, Horace Mountain granite gneiss and Devonian felsic schists with proximal tactite and calcareous hornfels. They interpreted the Devonian felsic schists as hypabyssal to plutonic in origin. The Evelyn Lee deposit consists of chalcopyrite, bornite, and pyrite in isolated skarn bodies intercalated with marble of the Skajit Limestone, argillite, and quartz-mica schist, near or at the contact with weakly mineralized Devonian hornblende-granodiorite porphyry that covers an area about 1,000 feet wide and 4,000 feet long (Kurtak and others, 2002). The skarn bodies reportedly are up to 300 feet long and 30 feet wide. Outcrop samples contain as much as 10 percent copper. The meta-granodiorite is altered and pyritized near the skarns. One of the drill holes cut 18 feet of skarn with 2.0 percent copper; another cut 23.5 feet of skarn with 3.5 percent copper. A notable 7-foot-thick zone of sulfides in skarn contained 9.9 percent copper and 8.17 ounces of silver per tonne, and a 5-foot-long surface sample contained 5.6 percent copper and 0.04 ounce of gold per ton. Kurtak and others (2002) sampled 700 feet of outcrop with prominent copper staining on the south-southwest side of the prospect; eight select samples averaged 4.06 percent copper and 11.9 ppm silver.

DeYoung (1978) estimated that the Evelyn Lee deposit has a resource of about 1 million metric tons with an average grade of 5 percent copper. Ventures Resource Corp. (1999) estimated the resource as 'tens of

million of tons that graded 2 percent to 5 percent copper with gold and silver credits'.

Alteration:

Propylitic alteration of the meta-granodiorite, with local areas of sericitic to potassic alteration. Hornfels and skarn developed in adjacent calcareous rocks.

Age of mineralization:

Devonian(?) based on Early Devonian Pb/Pb zircon ages from the nearby Baby Creek batholith and Horace Mountain plutons (Dillon and others, 1996).

Generic deposit model:

Deposit model:

Porphyry copper and related copper-skarn deposits (Cox and Singer, 1986; models 17 and 18a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

17 and 18a

Production Status: None

Site Status: Undetermined

Workings/exploration:

The Evelyn Lee prospect was discovered by Bear Creek Mining Company in 1967 along what would would become known as the Chandalar Copper Belt (Kurtak and others, 2002). Bear Creek and several other companies (Midwest Oil Company, WGM Inc., Arctic Resources Inc., and Ventures Resource Corp.) explored the property into the early 1990s. The work consisted mainly of mapping. geochemical and geophysical surveys, and sampling. Bear Creek diamond drilled two holes, 512 and 183 feet deep, and drilled two core holes, 18 and 23 feet deep, with a packsack drill.

Production notes:

None.

Reserves:

DeYoung (1978) estimated that the Evelyn Lee deposit has a resource of about 1 million metric tons with an average grade of 5 percent copper. Ventures Resource Corp. (1999) estimated the resource as 'tens of million of tons grading 2 percent to 5 percent copper with gold and silver credits'.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310062

References:

Adams, D.D., and Dillon, J.T., 1985, Geochemical investigations in the Chandalar C-5 and C-6 quadrangles, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigation RI 88-15, 37 p., 3 sheets, scale 1:63,360.

Adams, D.D., and Dillon, J.T., 1988, Geochemical investigations in the Chandalar C-5 and C-6 quadrangles, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 88-15, 140 p., 3 sheets, scale 1:63,360.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected

nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

DeYoung, J.H., Jr., 1978, Mineral resources map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-878-B, 2 sheets, scale 1:250,000.

Dillon, J.T., Reifenstuhl, R.R., and, Harris, G.W., 1996, Geologic map of the Chandalar C-5 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 104, 2 sheets, scale 1:63,360.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Newberry, R.J., Allegro, G.L., Cutler, S.E., Hagen-Levelle, D.D., Adams, D.D., Nicholson, L.C., Weglarz, T.B., Bakke, A.A., Clautice, K.H., Coulter, G.A., Ford, M.J., Myers, G.L., and Szumigala, D.J., 1997, Skarn deposits of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 355-395.

Newberry, R.J., Dillon, J.T., and Adams, D.D., 1986, Regionally metamorphosed calc-silicate-hosted deposits of the Brooks Range, northern Alaska: Economic Geology, v. 81, p. 1728-1752.

Nichol, D.L., 1983, Evaluation of the mineral potential of Doyon Ltd.'s Blocks 5 and 22: Unpublished report for Doyon Ltd. (on file at Doyon Ltd., Fairbanks, Alaska).

Nicholson, L.M., 1990, Porphyry copper, copper skarn, and volcanogenic massive sulfide occurrences in the Chandalar copper district, Alaska: Fairbanks, University of Alaska, M.Sc. thesis, 164 p.

Ventures Resource Corp., 1999, 1999 Annual report: Ventures Resource Corporation, 36 p.

WGM Inc., 1973, Progress report 1973, Chandalar district: Unpublished report for Midwest Oil Corporation, 46 p.

WGM inc., 1974, Chandalar district progress report 1974: Unpublished report for AMOCO Minerals, 37 p.

WGM Inc., 1978, 1977 Annual progress report, Doyon Ltd. project, v. II, Luna area: Unpublished report 78-04 for Doyon Ltd., 15 p. (on file at Doyon Ltd., Fairbanks, Alaska).

WGM Inc., 1979, 1978 Doyon Ltd. annual progress report, Block 5 Luna volcanogenic massive sulfide and associated base-metal deposits and anomalies of the Chandalar Copper Belt: Unpublished report 79-21 for Doyon Ltd., 35 p. (on file at Doyon Ltd., Fairbanks, Alaska).

WGM Inc., 1980, 1979 annual profess report, Block 5-Wiseman Chandalar Cop[er Belt: Unpublished report 80-06 for Doyon Ltd., 28 p. (on file at Doyon Ltd., Fairbanks, Alaska).

Young, L.E., St. George, P., and Bouley, B., 1997, Porphyry copper deposits in relation to the magmatic history and palinspastic restoration of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral deposits of Alaska: Economic Geology Monograph 9, p. 306-333.

Primary Reference: Ventures Resource Corporation, 1998; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Ginger

Site type: Prospect

ARDF no.: CH060

Latitude: 67.7085 **Quadrangle:** CH C-5

Longitude: 149.2818

Location description and accuracy:

The Ginger prospect is along the ridge between Big Spruce Creek and Sheep Creek, about 3.7 miles northwest of the west peak of Horace Mountain. It is about 1.0 mile south of peak 5147 and about 0.5 mile north-northeast of the center of section 11, T. 33 N. R. 8 W. The location is accurate. Kurtak and others (2002) include a map showing the regional geology of the area and the location of this and the other deposits of the Chandalar Copper Belt.

Commodities:

Main: Ag, Au, Cu

Other:

Ore minerals: Azurite, chalcopyrite, magnetite, malachite, pyrite

Gangue minerals:

Geologic description:

The Ginger prospect was discovered by Bear Creek Mining Company in 1967 in what would would become known as the Chandalar Copper Belt (Kurtak and others, 2002). Bear Creek explored the property until 1970 and from then to the 1980s WGM studied the deposit in conjunction with their work along the Copper Belt. Apparently, the work at the Ginger prospect consisted only of mapping and sampling, and geochemical and geophysical surveys. (Kurtak and others, 2002).

The Ginger prospect is a skarn deposit in Devonian Skajit Limestone that structurally overlies Ordovician phyllite, marble, and calcareous schist (Kurtak and others, 2002). Discontinuous masses of skarn crop out for 2.5 miles from peak 4109 to peak 5147. The Ginger prospect is in skarn that covers an area about 1,000 feet by 3,000 feet, about a mile south of peak 5147. The skarn contains zones of rubblecrop up to 50 by 100 feet in area with chalcopyrite, pyrite, and copper staining. Eight samples contained an average of 1.8 percent copper and 12.2 parts per million (ppm) silver. Three of the samples contained 548 to 1,201 parts per billion gold. Three samples of quartz-sericite schist next to the skarn contained 5,467 ppm copper and 3.3 ppm silver. Newberry and others (1986) concluded that the mineralogy, mineralization, and alteration of the skarns in the Chandalar Copper Belt suggest that they are continental-margin, porphyry-related copper skarns. The deposits along the belt are generally considered to be Devonian and genetically related to several meta-granodiorite plutons along the belt, notably the Horace Mountain pluton to the southeast (Dillon and others, 1996).

Alteration:

Copper skarn developed in limestone and calcareous rocks.

Age of mineralization:

Devonian(?) based on Early Devonian Pb/Pb zircon ages from the nearby Baby Creek batholith and Horace Mountain plutons (Dillon and others, 1996).

Generic deposit model:

Deposit model:
Cu skarn deposits (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
18b

Production Status: None

Site Status: Undetermined

Workings/exploration:
The Ginger prospect was discovered by Bear Creek Mining Company in 1967 in what would would become known as the Chandalar Copper Belt. Bear Creek explored the property until 1970 and from then to the 1980s WGM studied the deposit in conjunction with their work along the Copper Belt. Apparently, the work at the Ginger prospect consisted of mapping and sampling and geophysical and geochemical surveys (Kurtak and others, 2002).

Production notes:
None.

Reserves:
None.

Additional comments:
This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310059

References:

Dillon, J.T., Reifenstuhl, R.R., and, Harris, G.W., 1996, Geologic map of the Chandalar C-5 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 104, 2 sheets, scale 1:63,360.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Newberry, R.J., Allegro, G.L., Cutler, S.E., Hagen-Levelle, D.D., Adams, D.D., Nicholson, L.C., Weglarz, T.B., Bakke, A.A., Clautice, K.H., Coulter, G.A., Ford, M.J., Myers, G.L., and Szumigala, D.J., 1997, Skarn deposits of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 355-395.

Newberry, R.J., Dillon, J.T., and Adams, D.D., 1986, Regionally metamorphosed calc-silicate-hosted deposits of the Brooks Range, northern Alaska: Economic Geology, v. 81, p. 1728-1752.

Nicol, D.L., 1983, Evaluation of the mineral potential of Doyon Ltd.'s Block 5 and 22 (unpublished report 83-04 for Doyon Ltd., (on file at Doyon Ltd., Fairbanks, Alaska).

Nicholson, L.M., 1990, Porphyry copper, copper skarn, and volcanogenic massive sulfide occurrences in the Chandalar copper district, Alaska: Fairbanks, University of Alaska, M.Sc. thesis, 164 p.

WGM Inc., 1979, 1978 Doyon Ltd. annual progress report, Block 5 Luna volcanogenic massive sulfide and associated base-metal deposits and anomalies of the Chandalar Copper Belt: Unpublished report 79-21 for

Doyon Ltd., 35 p. (on file at Doyon Ltd., Fairbanks, Alaska).

WGM Inc., 1980, 1979 annual profess report, Block 5-Wiseman Chandalar Cop[er Belt: Unpublished report 80-06 for Doyon Ltd., 28 p. (on file at Doyon Ltd., Fairbanks, Alaska).

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Deimos

Site type: Prospect

ARDF no.: CH061

Latitude: 67.7263 **Quadrangle:** CH C-5

Longitude: 149.2323

Location description and accuracy:

The Deimos prospect is above the head of Sheep Creek about 0.7 mile east of peak 6031 and about 4.4 miles at an azimuth of 347 degrees from the west peak of Horace Mountain. It is about 0.5 mile west of the center of section 31, T. 34 N., R. 7 W. Kurtak and others (2002) include a map showing the regional geology of the area and the location of this and the other deposits of the Chandalar Copper Belt.

Commodities:

Main: Cu

Other: Ag?

Ore minerals: Chalcopyrite, magnetite, pyrite

Gangue minerals: Epidote, garnet, quartz

Geologic description:

The Deimos prospect was discovered by Bear Creek Mining Company in 1967 in what would would become known as the Chandalar Copper Belt. Bear Creek explored the property until 1970 and from then to the 1980s WGM studied the deposit in conjunction with their work along the Copper Belt. The exploration at the Deimos prospect included geologic mapping, geophysical and geophysical surveys, and sampling (Kurtak and others, 2002).

The Deimos prospect is one of a number of skarn deposits in the Chandalar area which have been described by Newberry and others (1986). These skarns are all northwest of a belt of Devonian(?) granitic rocks informally named the Horace Mountain plutons that are probably genetically related to the skarns. Many of the skarns exhibit both prograde and retrograde mineral assemblages. Newberry and others (1986) stated that the mineralogy, mineralization, and alteration of the deposits indicate they are continental-margin, porphyry-related copper skarns.

The rocks at the Deimos prospect are Devonian Skajit Limestone that structurally overlies Ordovician phyllite, marble, and calcareous schist (Dillon and others, 1996). Nicol (1983) describes garnet-epidote skarn with pyrite, chalcopyrite, and minor magnetite that crops out over an area about 50 feet by 100 in size. The skarn is iron and copper stained and cut by quartz veins. A sample of skarn with 10 percent pyrite and chalcopyrite contained 1 part per million (ppm) gold, 46 ppm silver, and 2.64 percent copper. However, most of the samples contained 0.5 to 0.9 percent copper. Geochemical and geophysical surveys suggest that the skarn is no larger than what is exposed in outcrop. Kurtak and others (2002) re-examined the area but did not find any additional mineralization. They resampled what they though was Nicol's skarn; a select sample contained 3,871 ppm copper, 5 ppm silver, and 56 parts per billion gold.

Alteration:

Masses of skarn developed in limestone and calcareous rocks.

Age of mineralization:

Devonian(?) based on Early Devonian Pb/Pb zircon ages from the nearby Baby Creek batholith and Horace Mountain plutons (Dillon and others, 1996).

Generic deposit model:

Deposit model:

Cu skarn deposit (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b

Production Status: None

Site Status: Undetermined

Workings/exploration:

The Deimos prospect was discovered by Bear Creek Mining Company in 1967 in what would would become known as the Chandalar Copper Belt. Bear Creek explored the property until 1970 and from then to the 1980s WGM studied the deposit in conjunction with their work along the Copper Belt. The exploration at the Deimos prospect included geologic mapping, geophysical and geophysical surveys, and sampling (Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

References:

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

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WGM Inc., 1979, 1978 Doyon Ltd. annual progress report, Block 5 Luna volcanogenic massive sulfide and associated base-metal deposits and anomalies of the Chandalar Copper Belt: Unpublished report 79-21 for Doyon Ltd., 35 p. (on file at Doyon Ltd., Fairbanks, Alaska).

WGM Inc., 1980, 1979 annual progress report, Block 5-Wiseman Chandalar Cop[er Belt: Unpublished report 80-06 for Doyon Ltd., 28 p. (on file at Doyon Ltd., Fairbanks, Alaska).

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Hurricane-Diane

Site type: Prospect

ARDF no.: CH062

Latitude: 67.7223 **Quadrangle:** CH C-5

Longitude: 149.1827

Location description and accuracy:

The Hurricane-Diane prospect is on the ridge east of the head of Sheep Creek, about 0.3 mile north-northwest of peak 4452. It is about 0.5 mile south-southwest of the center of section 32, T. 34 N., R. 7 W. Kurtak and others (2002) include a map showing the regional geology of the area and the location of this and the other deposits of the Chandalar Copper Belt.

Commodities:

Main: Cu

Other: Ag, Au

Ore minerals: Chalcopyrite, magnetite, pyrite, pyrrhotite

Gangue minerals: Actinolite, epidote, garnet

Geologic description:

The Hurricane-Diane prospect was discovered by Bear Creek Mining Company in 1967 in what would would become known as the Chandalar Copper Belt. Bear Creek explored the property until 1970 and WGM Inc. continued the exploration to the 1980s in conjunction with their other work along the Copper Belt. The exploration at the Hurricane-Diane prospect included geologic mapping, geophysical and geochemical surveys, and sampling. (Kurtak and others, 2002).

The Hurricane-Diane prospect consists of a northeast-trending line of resistant knobs of garnet-epidote skarn, about 40 feet wide and 1.5 miles long (Kurtak and others, 2002). Most of the prospect is tundra covered but the rocks in the vicinity are Ordovician phyllite, marble, and calcareous schist (Dillon and others, 1996). A geochemical survey suggests that the skarn and the mineralization is probably continuous below the tundra (WGM, Inc. 1979). Several samples of epidote-calc-silicate skarn with pyrite, pyrrhotite, and chalcopyrite collected by Nicol (1983) contained up to 930 parts per billion gold (ppb), 8.3 parts per million (ppm) silver, 3.76 percent copper, and 200 ppm arsenic. Six skarn samples with pyrite, chalcopyrite, pyrrhotite, and magnetite collected by Kurtak and others (2002) averaged 2.54 percent copper and 20.15 ppm silver; two chip samples averaged 1,286 ppb gold.

The Hurricane-Diane prospect is one of a number of skarn deposits in the Chandalar area which have been described by Newberry and others (1986). These skarns are northwest of a belt of Devonian(?) granitic rocks informally named the Horace Mountain plutons that are probably genetically related to the skarns. Many of the skarns exhibit both prograde and retrograde mineral assemblages. Newberry and others (1986) stated that their mineralogy, mineralization, and alteration indicate that most of these skarn deposits are continental-margin, porphyry-related copper skarns. However, the association of epidote, garnet, and actinolite in the Hurricane-Diane skarn is a retrograde assemblage and the deposit is probably distal mineralization in the Chandalar Copper Belt. An analysis of a sample they collected contained 1.5 percent copper, 105 ppm silver, 0.2 percent zinc, and 0.07 lead. Because the zinc and lead values are low, they classified it as a calcic copper skarn.

Alteration:

Age of mineralization:

Devonian(?) based on Early Devonian Pb/Pb zircon ages from the nearby Baby Creek batholith and Horace Mountain plutons (Dillon and others, 1996).

Generic deposit model:

Deposit model:

Cu skarn deposit (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b

Production Status: None

Site Status: Inactive

Workings/exploration:

The Hurricane-Diane prospect was discovered by Bear Creek Mining Company in 1967 in what would would become known as the Chandalar Copper Belt. Bear Creek explored the property until 1970 and WGM Inc. continued the exploration to the 1980s in conjunction with their other work along the Copper Belt. The exploration at the Hurricane-Diane prospect included geologic mapping, geophysical and geochemical surveys, and sampling (Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310058

References:

Adams, D.D., and Dillon, J.T., 1985, Geochemical investigations in the Chandalar C-5 and C-6 quadrangles, Alaska: Alaska Division of Geological and Geophysical Surveys Public-Data File 85-26, 37 p., 3 sheets, scale 1:63,360. Superseded by RI 88-15.

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Newberry, R.J., Dillon, J.T., and Adams, D.D., 1986, Regionally metamorphosed calc-silicate-hosted deposits of the Brooks Range, northern Alaska: Economic Geology, v. 81, p. 1728-1752.

Nicol, D.L., 1983, Evaluation of the mineral potential of Doyon Ltd.'s Block 5 and 22 (unpublished report 83-04 for Doyon Ltd., (on file at Doyon Ltd., Fairbanks, Alaska).

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WGM Inc., 1979, 1978 Doyon Ltd. annual progress report, Block 5 Luna volcanogenic massive sulfide and associated base-metal deposits and anomalies of the Chandalar Copper Belt: Unpublished report 79-21 for Doyon Ltd., 35 p. (on file at Doyon Ltd., Fairbanks, Alaska).

WGM Inc., 1980, 1979 annual progress report, Block 5-Wiseman Chandalar Copper Belt: Unpublished report 80-06 for Doyon Ltd., 28 p. (on file at Doyon Ltd., Fairbanks, Alaska).

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Eva

Site type: Prospect

ARDF no.: CH063

Latitude: 67.6603 **Quadrangle:** CH C-5

Longitude: 149.4244

Location description and accuracy:

The Eva prospect is at an elevation of about 3,300 feet on the east side of the ridge between Big Spruce Creek and Mathews River. It is about 1.1 mile north-northwest of peak 4737 and about 0.6 mile west-northwest of the center of section 29, T. 33 N., R. 8 W. A map showing the geology of the area and the location this and the other deposits of the Chandalar Copper Belt is Figure C-1 of Kurtak and others (2002).

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, magnetite?, pyrite

Gangue minerals:

Geologic description:

The Eva prospect was discovered by Bear Creek Mining Company in 1967 along what would would become known as the Chandalar Copper Belt (Kurtak and others, 2002). Bear Creek and several other companies (Midwest Oil Company, WGM Inc., Arctic Resources Inc., and Venture Resources Corp.) explored the property into the 1990s. Their work included geological mapping, sampling, and geochemical and geophysical surveys.

The Eva prospect is one of several Cu deposits in the Chandalar area which have been described by Newberry and others (1986) as mostly copper skarn deposits. They are all northwest of a belt of Devonian(?) metamorphosed granodioritic rocks informally named the Horace Mountain plutons that are probably genetically related to these deposits. Many of these copper skarns exhibit both prograde garnet and pyroxene and retrograde epidote and actinolite mineral assemblages. Newberry and others (1986) stated that the mineralogy, mineralization, and alteration of these skarns tend to place them in the category of continental-margin, porphyry-related copper skarns.

Some of the descriptions of the Eva prospect include it with the nearby Victor (CH064) and Venus prospects (CH065) (DeYoung, 1978; Cobb and Cruz, 1983). The Venus prospect in particular is characterized as a porphyry deposit. Cobb and Cruz (1983) classify the Eva deposit as either a porphyry or skarn, whereas Newberry and others, (1086) classify it as a copper skarn, and the Eva prospect thus has been characterized as a porphyry copper and (or) copper skarn deposit (Cobb and Cruz, 1983). Newberry and others (1986), however, classified it as a Cu skarn.

Kurtak and others (2002) de-emphasize the skarn interpretation and describe the Eva prospect as restricted to a belt about a half mile long of conspicuous red-stained muscovite schist, associated with quartz-sericite schist, calcareous schists, calc-silicate schist, and some small metamorphosed igneous bodies. The mineralization is concentrated in the muscovite schist and consists of erratically-distributed, malachite-and-azurite-stained pods and lenses with disseminated chalcopyrite. A select sample contained 68 parts per billion (ppb) gold, 2.1 parts per million (ppm) silver, 2,835 ppm copper, 306 ppm lead, and 93 ppm zinc. The mineralization in the quartz-sericite schist, calcareous schist, and calc-silicate schist is relatively weak and spotty. However, a sample of calcareous schist with pyrite stringers contained 9.7 ppm silver, 3,395 ppm lead, 3,933 ppm zinc, and 23 ppb gold. A sample of calc-silicate schist contained an average of 64 ppb

gold, 2.45 ppm silver, and 4,740 ppm copper. The metamorphosed igneous rocks contain only a trace of sulfide minerals.

Nicholson (1990) estimated that the Eva and nearby Victor(CH064) prospects have a resource of 50,000 tons with an average grade of 2 percent copper. However, Kurtak and others (2002) note that the mineralization at the Eva prospect appears to be 'limited to small, discontinuous outcrops'.

Alteration:

Propylitic and sericitic alteration of the meta-granodiorite and retrograde epidote/actinolite alteration of the skarns.

Age of mineralization:

Probably related to a belt of Devonian(?) intrusive rocks.

Generic deposit model:

Deposit model:

Pods and lenses of copper mineralization in muscovite schist and copper skarn.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

The Eva prospect was discovered by Bear Creek Mining Company in 1967 along what would would become known as the Chandalar Copper Belt (Kurtak and others, 2002). Bear Creek and several other companies (Midwest Oil Company, WGM Inc., Arctic Resources Inc., and Venture Resources Corp.) explored the property into the 1990s. Their work included geological mapping, sampling, and geochemical and geophysical surveys.

Production notes:

None.

Reserves:

Nicholson (1990) estimated that the Eva and nearby Victor(CH064) prospects have a resource of 50,000 tons with an average grade of 2 percent copper. However, Kurtak and others (2002) note that the mineralization at the Eva prospect appears to be 'limited to small, discontinuous outcrops'.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310140

References:

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

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Ventures Resource Corp., 1999, 1999 Annual report: Ventures Resource Corporation, 36 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Victor

Site type: Prospect

ARDF no.: CH064

Latitude: 67.6305 **Quadrangle:** CH C-5

Longitude: 149.3837

Location description and accuracy:

The Victor prospect is at an elevation of about 4,200 feet on the ridge between Big Spruce Creek and Mathews River. It is about 4.2 miles north of the mouth of Limestone Creek on the Bettles River, and about 0.2 mile north of the center of section 5, T. 32 N., R. 8 W. A map showing the geology of the area and the location of this and the other deposits of the Chandalar Copper Belt is Figure C-1 of Kurtak and others (2002).

Commodities:

Main: Cu

Other: Au?

Ore minerals: Bornite?, chalcocite, chalcopyrite, digenite, magnetite, molybdenite

Gangue minerals: Quartz

Geologic description:

The Victor prospect was discovered by Bear Creek Mining Company in 1967 along what would would become known as the Chandalar Copper Belt (Kurtak and others, 2002). Bear Creek and several other companies (Midwest Oil Company, WGM Inc., Arctic Resources Inc., and Venture Resources Corp.) explored the property into the 1990s. The work apparently consisted mainly of mapping, sampling, and geochemical and geophysical surveys but there is an reference to some drilling.

The Victor prospect is one of several Cu deposits in the Chandalar area which have been described by Newberry and others (1986) as mostly skarn deposits. They are all northwest of a belt of Devonian(?) granitic rocks informally named the Horace Mountain plutons that are probably genetically related to these deposits (Dillon and others, 1996). Many of these Cu skarns exhibit both prograde garnet and pyroxene and retrograde epidote and actinolite mineral assemblages. Newberry and others (1986) stated that the mineralogy, mineralization, and alteration of these skarns tend to place them in the category of continental-margin, porphyry-related copper skarns.

The deposits at the Victor prospect are copper skarns that are exposed at several places near the contact of metamorphosed, Early Devonian hornblende granodiorite that has intruded Ordovician calcareous schist and limestone (Dillon and others, 1996; Kurtak and others, 2002). The skarns contain chalcopyrite, pyrite, pyrrhotite, magnetite, and minor bornite, in disseminations, stringers, and pods. The meta-granodiorite contains only a trace of copper but shows propylitic and sericitic alteration. The skarn is retrograded and consists mainly of garnet, clinopyroxene, actinolite, epidote, calcite, quartz, and chlorite (Nicholson, 1990).

A hand specimen from the Victor prospect, described in Newberry and others (1986), contained 1.1 percent copper, 5.5 parts per million (ppm) silver, less than 0.14 ppm gold, and negligible lead and zinc. Young and others (1997) reported that hundreds of meters of samples assayed 0.1 to 0.6 percent copper, with some values as high as 5.5 percent copper, 150 ppm molybdenum, and 0.41 ppm gold. Kurtak and others (2002) sampled several areas of skarn with chalcopyrite, pyrite, and pyrrhotite; the best two samples averaged 6.22 percent copper, 18.5 ppm silver, and 354 parts per billion gold. Nicholson (1990) estimated that skarn pods at the Victor and Eva (CH063) prospects have a resource of 50,000 tons with an average grade of 2 percent copper.

Alteration:

The Devonian meta-granodiorite shows propylitic and sericitic alteration; the skarns near the intrusive show retrograde alteration.

Age of mineralization:

Devonian(?) based on Early Devonian Pb/Pb zircon ages from the nearby Baby Creek batholith and Horace Mountain plutons (Dillon and others, 1996).

Generic deposit model:

Deposit model:

Copper skarn (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b

Production Status: None

Site Status: Undetermined

Workings/exploration:

The Victor prospect was discovered by Bear Creek Mining Company in 1967 along what would would become known as the Chandalar Copper Belt (Kurtak and others, 2002). Bear Creek and several other companies (Midwest Oil Company, WGM Inc., Arctic Resources Inc., and Venture Resources Corp.) explored the property into the 1990s. The work apparently consisted mainly of mapping, sampling, and geochemical and geophysical surveys but there is an reference to some drilling.

Production notes:

None.

Reserves:

Nicholson (1990) estimated that skarn at the Victor and Eva (CH063) prospects have a resource of 50,000 tons with an average grade of 2 percent copper.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310065

References:

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

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Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Newberry, R.J., Allegro, G.L., Cutler, S.E., Hagen-Levelle, D.D., Adams, D.D., Nicholson, L.C., Weglarz, T.B., Bakke, A.A., Clautice, K.H., Coulter, G.A., Ford, M.J., Myers, G.L., and Szumigala, D.J., 1997, Skarn deposits of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 355-395.

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Primary Reference: Nicholson, 1990; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Venus

Site type: Prospect

ARDF no.: CH065

Latitude: 67.6303 **Quadrangle:** CH C-5

Longitude: 149.3223

Location description and accuracy:

The Venus prospect is exposed on the west bank of Spruce Creek about 3.1 miles north of its mouth on the Bettles River. It is in the northwest part of section 3 and the northeast part of section 4, T. 32 N., R. 8 W. The location is accurate. Kurtak and others (2002) include a detailed map of the prospect and a map showing the regional geology of the area and the location of this and the other deposits of the Chandalar Copper Belt.

Commodities:

Main: Ag, Au, Cu

Other: Mo

Ore minerals: Bornite?, chalcopyrite, magnetite, molybdenite, pyrite

Gangue minerals: Amphibole, calcite, chlorite, diopside, epidote, garnet, quartz

Geologic description:

The Venus prospect was discovered by Bear Creek Mining Company in 1967 along what would would become known as the Chandalar Copper Belt (Kurtak and others, 2002). Bear Creek and several other companies (Midwest Oil Company, WGM Inc., Arctic Resources Inc., and Ventures Resource Corp.) explored the property into the 1990s. The work consisted mainly of mapping, geochemical and geophysical surveys, and sampling; 5 holes were drilled in 1973 and 1974 by WGM Inc. that totaled 2,466 feet.

The Venus prospect is a porphyry copper deposit associated with copper-gold-silver skarn (Kurtak and others, 2002). The Venus prospect and others along the Chandalar Copper Belt were described by Newberry and others (1986) as continental-margin, porphyry-related copper skarns; many exhibit both prograde and retrograde mineral assemblages. Ventures Resource Corporation (1998) and Dillon and others (1996) described the geology of the Venus prospect as an elongated, altered and foliated, Devonian granodiorite pluton bounded on the east by overthrust Silurian or Devonian, Skajit Limestone and on the west by Skajit Limestone and gray phyllite, felsic calc-schist, and chloritic schist.

The porphyry mineralization at Venus prospect consists of disseminations and fracture fillings of pyrite, chalcopyrite, and minor molybdenite in schistose Devonian meta-granodiorite porphyry (Kurtak and others, 2002). The meta-granodiorite porphyry is extensively propylitized and pyritized, with local zones of sericitic to potassic alteration. The intrusion-hosted mineralization contains about 0.1 to 0.2 percent copper Cu, and generally less than 0.01 ounce of gold per ton (Ventures Resource Corporation, 1999). A hand specimen described by Newberry and others (1986) as porphyry contains quartz, sericite, pyrite, chalcopyrite, chlorite, and molybdenite; the specimen contained 0.38 percent copper, 1 part per million (ppm) silver, less than 0.1 ppm gold, 0.002 percent zinc, and 0.001 percent lead. Three drill holes averaged 0.15 to 0.2 percent copper, but one averaged only 0.08 percent copper (WGM Inc., 1973; Nicholson, 1990).

The skarns form irregular masses in Skajit Limestone and calc-schist adjacent to, and as xenoliths in the meta-granodiorite. The skarns are principally garnet-magnetite-diopside bodies that show retrograde vein and replacement, epidote, amphibole, chlorite, calcite, and quartz. The mineralization consists of irregular masses of pyrite and chalcopyrite. The grade of the skarn deposits is variable but generally is about 1.5 percent to 6 percent copper, less than 0.01 ounce of gold per ton, and up to 1 ounce of silver per ton

(Newberry and others, 1986; Nicholson, 1990; Ventures Resource Corporation, 1999; Kurtak and others, 2002).

Based on limited data, Nicholson (1990) estimated that the deposit has a resource of 300,000 tons with an average grade of 0.3 percent copper. Ventures Resource (1990) estimated a resource of 495 million pounds of copper.

Alteration:

Extensive propylitic alteration of the meta-granodiorite, with local areas of sericitic to potassic alteration. Hornfels and skarn developed in adjacent calcareous rocks.

Age of mineralization:

Devonian(?) based on Early Devonian Pb/Pb zircon ages from the nearby Baby Creek batholith and Horace Mountain plutons (Dillon and others, 1996).

Generic deposit model:

Deposit model:

Porphyry copper and copper-skarn-related deposits (Cox and Singer, 1986; models 17 and 18a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

17 and 18a

Production Status: None

Site Status: Active

Workings/exploration:

The Venus prospect was discovered by Bear Creek Mining Company in 1967 along what would become known as the Chandalar Copper Belt (Kurtak and others, 2002). Bear Creek and several other companies (Midwest Oil Company, WGM Inc., Arctic Resources Inc., and Ventures Resource Corp.) explored the property into the 1990s. The work consisted mainly of mapping, geochemical and geophysical surveys, and sampling; 5 holes were drilled in 1973 and 1974 that totaled 2,466 feet.

Production notes:

None.

Reserves:

Based on limited data, Nicholson (1990) estimated that the porphyry deposit has a resource of 300,000 tons with an average grade of 0.3 percent copper. Ventures Resource Corp. (1999) estimated a resource of 495 million pounds of copper.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310060

References:

Adams, D.D., and Dillon, J.T., 1985, Geochemical investigations in the Chandalar C-5 and C-6 quadrangles, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigation RI 88-15, 37 p., 3 sheets, scale 1:63,360.

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sheets, scale 1:63,360.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

DeYoung, J.H., Jr., 1978, Mineral resources map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-878-B, 2 sheets, scale 1:250,000.

Dillon, J.T., Reifenstuhl, R.R., and, Harris, G.W., 1996, Geologic map of the Chandalar C-5 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 104, 2 sheets, scale 1:63,360.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Newberry, R.J., Allegro, G.L., Cutler, S.E., Hagen-Levelle, D.D., Adams, D.D., Nicholson, L.C., Weglarz, T.B., Bakke, A.A., Clautice, K.H., Coulter, G.A., Ford, M.J., Myers, G.L., and Szumigala, D.J., 1997, Skarn deposits of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 355-395.

Newberry, R.J., Dillon, J.T., and Adams, D.D., 1986, Regionally metamorphosed calc-silicate-hosted deposits of the Brooks Range, northern Alaska: Economic Geology, v. 81, p. 1728-1752.

Nichol, D.L., 1983, Evaluation of the mineral potential of Doyon Ltd.'s Blocks 5 and 22: Unpublished report for Doyon Ltd. (on file at Doyon Ltd., Fairbanks, Alaska).

Nicholson, L.M., 1990, Porphyry copper, copper skarn, and volcanogenic massive sulfide occurrences in the Chandalar copper district, Alaska: Fairbanks, University of Alaska, M.Sc. thesis, 164 p.

Ventures Resource Corp., 1999, 1999 Annual report: Ventures Resource Corporation, 36 p.

WGM Inc., 1973, Progress report 1973, Chandalar district: Unpublished report for Midwest Oil Corporation, 46 p.

WGM inc., 1974, Chandalar district progress report 1974: Unpublished report for AMOCO Minerals, 37 p.

WGM Inc., 1978, 1977 Annual progress report, Doyon Ltd. project, v. II, Luna area: Unpublished report 78-04 for Doyon Ltd., 15 p. (on file at Doyon Ltd., Fairbanks, Alaska).

WGM Inc., 1979, 1978 Doyon Ltd. annual progress report, Block 5 Luna volcanogenic massive sulfide and associated base-metal deposits and anomalies of the Chandalar Copper Belt: Unpublished report 79-21 for Doyon Ltd., 35 p. (on file at Doyon Ltd., Fairbanks, Alaska)

WGM Inc., 1980, 1979 annual profess report, Block 5-Wiseman Chandalar Cop[er Belt: Unpublished report 80-06 for Doyon Ltd., 28 p. (on file at Doyon Ltd., Fairbanks, Alaska).

Young, L.E., St. George, P., and Bouley, B., 1997, Porphyry copper deposits in relation to the magmatic history and palinspastic restoration of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral deposits of Alaska: Economic Geology Monograph 9, p. 306-333.

Primary Reference: Ventures Resource Corporation, 1998; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (at head of Limestone Creek)

Site type: Occurrence

ARDF no.: CH066

Latitude: 67.6043 **Quadrangle:** CH C-5

Longitude: 149.3897

Location description and accuracy:

This occurrence is at the head of Limestone Creek, a tributary of the Bettles River. It is about 0.8 mile southeast of peak 4570, about 0.6 mile northwest of the center of section 17, T. 32 N., R. 8 W. The location is accurate to a quarter of a mile.

Commodities:

Main: Ag, As, Au, Cu, Ni, Pd, Sb

Other:

Ore minerals: Chalcopyrite

Gangue minerals:

Geologic description:

Nickel, palladium, and silver were reported in an X-ray analysis of rock from a thrust sheet in Devonian or Silurian, Skajit Limestone (Brosgé and Reiser, 1964). The occurrence is in a section of Skajit Limestone that has overridden Devonian(?) quartz muscovite schist along a major northeast-trending thrust fault. A later examination of the occurrence by Foley and others (1989) found no evidence of anomalous nickel, palladium, and silver in their sample, nor did Kurtak and others (2002).

However, in their search for mineralization in the area, Kurtak and others (2002) found marble in outcrop nearby with 1 to 2 percent sulfides; a sample contained 1.3 parts per million (ppm) silver and 142 ppm arsenic. A float sample of marble with chalcopyrite was found about 1.5 miles upstream from the mouth of Limestone Creek; a sample contained 77 parts per billion gold, 3.3 ppm silver, 1.41 percent copper, and 109 ppm antimony.

Alteration:

Not specified.

Age of mineralization:

Silurian or younger based on the age of the marble host rock.

Generic deposit model:

Deposit model:

Chalcopyrite in marble with low silver, gold, arsenic, and antimony values.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only sampling by government agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310139

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

DeYoung, J.H., Jr., 1978, Mineral resources map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-878-B, 2 sheets, scale 1:250,000.

Dillon, J.T., Reifenstuhl, R.R., and, Harris, G.W., 1996, Geologic map of the Chandalar C-5 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 104, 2 sheets, scale 1:63,360.

Foley, J.Y., Burns, L.E., Schneider, C.L., and Forbes, R.B., 1989, Preliminary report of platinum group element occurrences in Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 89-20, 32 p., 1 map sheet, scale 1:2,500,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Heiner, L.E., and Wolff, E.N., eds., 1968, Mineral resources of northern Alaska, Final report, submitted to the NORTH Commission: University of Alaska, Mineral Industry Research Laboratory Report No. 16, 306 p.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Mule Creek

Site type: Mine

ARDF no.: CH067

Latitude: 67.6005 **Quadrangle:** CH C-5

Longitude: 149.3532

Location description and accuracy:

Mule Creek is a small south-flowing tributary to the Bettles River. Its mouth is approximately 4 1/2 miles northeast of the north end of Bob Johnson Lake (formerly Big Lake). There was some mining in the late 1930s at an unknown location, and prior to 1910 there was mining 1 1/2 to 2 1/2 miles upstream from the mouth of the creek. The coordinates reflect this early mining in the west half of section 16, T. 32 N., R. 8 W.

Commodities:

Main: Ag, Au, Cu

Other:

Ore minerals: Copper, gold, silver

Gangue minerals:

Geologic description:

Mule Creek was mined intermittently from 1901 to 1909 and produced at least 15 ounces of gold as well as copper and silver nuggets up to 7 pounds (Maddren, 1913). This early mining took place on a bench about 2 1/2 miles upstream from the mouth in 8 feet of gravel, and about 1 1/2 mile upstream in 2 feet of gravel. In the 1930s, two or three shafts were sunk in the alluvial fan near the mouth of the creek, and another about 1,000 feet upstream (Reed, 1938). Several of these shafts were 75 to 80 feet deep but flooded before reaching bedrock. Reed (1938) reported that the gravel was coarse and waterworn, with many large boulders, and that depth to bedrock was 3 to 8 feet (in the mining before 1910?). In 1937 and 1938, 35 ounces of gold was produced by hand mining. Dillon (1987) reported active claims in 1985. Kurtak and others (2002) examined Mule Creek as part of their study of the mineral resources of the Koyukuk mining district. They panned samples along the creek; a few pans showed visible gold but most did not. They located several of the shafts sunk in the 1930s but found no evidence of any recent mining.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Probably inactive

Workings/exploration:

Mule Creek was mined intermittently from 1901 to 1909 (Maddren, 1913). In the 1930s, two or three shafts were sunk in the alluvial fan near the mouth of the creek and another about 1,000 feet upstream (Reed, 1938). Several of these shafts were 75 to 80 feet deep but flooded before reaching bedrock. In 1937 and 1938, 35 ounces of gold was produced by hand mining. Dillon (1987) reported active claims in 1985. Kurtak and others (2002) examined Mule Creek as part of their study of the mineral resources of the Koyukuk mining district.

Production notes:

From incomplete records, Kurtak and others (2002) documented production of 50 ounces of gold from Mule Creek: 15 ounces in 1906, 10 ounces in 1937, and 25 ounces in 1938.

Reserves:

None.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

Reed (1938) pointed out that Maddren (1913) incorrectly identified Big Spruce Creek (the next tributary to the east of the Bettles River) as Mule Creek and that Mule Creek was unnamed.

MAS No. 0020310043

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., 1987, Upper Koyukuk district land and mining claim status current to 1985: Alaska Division of Geological and Geophysical Surveys, Public Data File 87-11, 25 pages, 1 map, scale 1:125,000.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Big Spruce Creek; Spruce Creek

Site type: Occurrence

ARDF no.: CH068

Latitude: 67.5905

Quadrangle: CH C-5

Longitude: 149.3008

Location description and accuracy:

Big Spruce Creek (Spruce Creek on older maps) is a major south-flowing tributary, more than 12 miles long, to the Bettles River. There is an old report that two prospect shafts were sunk near the mouth of Spruce Creek and there was prospecting upstream. The site is plotted near the mouth of Spruce Creek about 0.5 mile north of the center of section 22, T. 32 N., R. 8 W. The location of the prospecting above the mouth of Big Spruce Creek is vague.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Maddren (1910, 1913) reported limited prospecting in the 1900s on Big Spruce Creek. Reed (1938) reported that little or no gold was found in the 1930s in two shafts about 45 feet deep sunk along the west side of Big Spruce Creek near its mouth. Reed (1938) pointed out that Maddren (1913) incorrectly identified Spruce Creek as Mule Creek, which is the first south-flowing tributary to the Bettles River west of Spruce Creek, and that Mule Creek was unnamed.

Kurtak and others (2002) sampled along Spruce Creek and its tributaries as part of their study of the mineral resources of the Koyukuk mining district. None of their panned samples showed visible gold although analyses of their panned concentrates found minor amounts of gold. They found no signs of old or recent mining. Dillon (1987) reported an inactive claim about a mile upstream from the mouth of the creek.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Inactive

Workings/exploration:

Maddren (1910, 1913) reported limited prospecting in the 1900s on Big Spruce Creek. Reed (1938) reported that little or no gold was found in the 1930s in two shafts about 45 feet deep sunk along the west side of Big Spruce Creek near its mouth. Kurtak and others (2002) sampled along Spruce Creek and its tributaries as part of their study of the mineral resources of the Koyukuk mining district. They found no signs of old or recent mining. Dillon (1987) reported an inactive claim about a mile upstream from the mouth of the creek.

Production notes:

Possibly a small amount of gold was recovered during prospecting.

Reserves:

None.

Additional comments:

Reed (1938) pointed out that Maddren (1913) incorrectly identified Spruce Creek as Mule Creek (which is the first north tributary to the Bettles River west of Spruce Creek) and that Mule Creek was unnamed.

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310029

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Shady Creek, Gus Creek

Site type: Occurrence

ARDF no.: CH069

Latitude: 67.5871 **Quadrangle:** CH C-5

Longitude: 149.2696

Location description and accuracy:

Shady Creek (Gus Creek on older maps) flows into the Bettles River from the south and is labeled on modern topographic maps. The creek flows through the middle of section 23, 26, and 35, T. 32 N., R. 8 W. There is a report of prospecting in the 1900s at an unknown location along the creek and the site is arbitrarily plotted near its mouth.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Reed (1938) reported only fair prospects on what was then known as Gus Creek. He described the creek as flowing through a limestone canyon on its lower end, but widening as the bedrock changed to schist about 1/4 mile above the mouth. Kurtak and others (2002) examined Shady Creek as part of their study of the mineral resources of the Koyukuk mining district. One panned sample contained a grain of visible gold and small amounts of gold were found in analyses of their panned concentrates. They found no indications of past or recent mining along the creek or any record of claims along Shady Creek.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Inactive

Workings/exploration:

Reed (1938) reported only fair prospects on what was then known as Gus Creek. Kurtak and others (2002) examined Shady Creek as part of their study of the mineral resources of the Koyukuk mining district. They found no indications of past or recent mining along the creek or any record of claims along Shady Creek.

Production notes:

None.

Reserves:

None.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310147

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Eightmile Creek

Site type: Mine

ARDF no.: CH070

Latitude: 67.5655 **Quadrangle:** CH C-5

Longitude: 149.3742

Location description and accuracy:

The lower half of Eightmile Creek has been mined and the site is plotted at about the middle of this area. Eightmile Creek is a tributary to the Bettles River; the creek is about 5 miles north of the center of Bob Johnson Lake (formerly known as Big Lake). The mined area flows northwest through the southeast quarter of section 29, T. 32 N., R. 8 W.

Commodities:

Main: Au

Other: Hg

Ore minerals: Cinnabar, gold

Gangue minerals:

Geologic description:

Eightmile Creek has been mined for at least a mile above its mouth (Kurtak and others, 2002). Prospecting began in 1900 but there was no substantial mining until 1938, and the creek produced 44 ounces of gold from 1939 to 1941. The creek was again mined from 1948 to 1953; it produced 24 ounces of gold in 1948. Two claims were staked in 1967 (Heiner and Wolff, 1968), and Dillon (1987) reported active claims in 1985. Placer cinnabar was reported (Joesting, 1943). Kurtak and others (2002) suggested that little gold remained in view of the extensive mining in the past.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Undetermined

Site Status: Undetermined

Workings/exploration:

Eightmile Creek has been mined for at least a mile above its mouth (Kurtak and others, 2002). Prospecting began in 1900 but there was no substantial mining until the creek was mined from 1938 to 1941. The creek was again mined from 1948 to 1953. Two claims were staked in 1967 (Heiner and Wolff, 1968) and Dillon (1987) reported active claims in 1985.

Production notes:

Eightmile Creek has been mined for at least a mile above its mouth (Kurtak and others, 2002). Prospecting began in 1900 but there was no substantial mining until 1938, and the creek produced 44 ounces of gold from 1939 to 1941. The creek was again mined from 1948 to 1953; it produced 24 ounces of gold in 1948.

Reserves:

Kurtak and others (2002) suggested that little gold remained in view of the extensive mining in the past.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310028

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., 1987, Upper Koyukuk district land and mining claim status current to 1985: Alaska Division of Geological and Geophysical Surveys, Public Data File 87-11, 25 pages, 1 map, scale 1:125,000.

Dillon, J.T., Reifenstuhl, R.R., and, Harris, G.W., 1996, Geologic map of the Chandalar C-5 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 104, 2 sheets, scale 1:63,360.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Heiner, L.E., and Wolff, E.N., eds., 1968, Mineral resources of northern Alaska, Final report, submitted to the NORTH Commission: University of Alaska, Mineral Industry Research Laboratory Report No. 16, 306 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Joesting, H.R., 1943, Strategic mineral occurrences in interior Alaska, supplement to pamphlet no. 1: Alaska Territorial Department of Mines Pamphlet 2, 26 p.

Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Roehm, J.C., 1949, Report of investigations and itinerary of J.C. Roehm in the Koyukuk precinct, Alaska: Alaska Territorial Department of Mines Itinerary Report 31-1, 9 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Garnet Creek

Site type: Mine

ARDF no.: CH071

Latitude: 67.5602 **Quadrangle:** CH C-5

Longitude: 149.4034

Location description and accuracy:

The lower half mile of Garnet Creek has been mined and the site is plotted at about the middle of this area. Garnet Creek is a tributary to the Bettles River; the mouth of the creek is about 2.8 miles north-northeast of the north end of Bob Johnson Lake (formerly Big Lake). The part of the creek that was mined flows through the northeast quarter of section 31, T. 32 N., R. 8 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Most of the mining on Garnet Creek extended for about a half mile upstream from its mouth (Kurtak and others, 2002). Maddren (1913) reported the ground was producing about $7 to $9 dollars a man per day (at $20.67 per ounce of gold). Forty-eight ounces of gold was produced from 1900 to 1909. Claims were staked after World War I but the next significant mining was from 1937 to 1940 when 70 ounces of gold was produced. Reed (1938) reported that the mining was along the modern channel of the creek; the gold was on bedrock and the lower few feet of the overlying gravel. The gravel is coarse and waterworn, with many large boulders. It was about 8 feet thick near the mouth of the creek and thins to 1 to 3 feet thick a half mile upstream. The ground that was mined in 1937 was said to run about 0.022 ounce of gold per square foot of bedrock. The gold was fairly fine, with a few nuggets. Reed (1938) reported a high channel, but it had not been prospected to any extent at that time. In 1950, ground sluicing gave poor returns. Claims were staked in 1959 (Heiner and Wolff, 1968) and from 1980 to 1986 (Kurtak and others, 2002).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Undetermined

Workings/exploration:

Surface mining reported in 1937. Claims were staked in 1959 and from 1980 to 1986.

Production notes:

Production from 1900 to 1909 was reported to yield $7 to $9 per man-day and totaled $1,000, or about 48 ounces (Maddren, 1913).

Reserves:

None.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310042

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

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Dillon, J.T., Reifenstuhl, R.R., and, Harris, G.W., 1996, Geologic map of the Chandalar C-5 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 104, 2 sheets, scale 1:63,360.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Heiner, L.E., and Wolff, E.N., eds., 1968, Mineral resources of northern Alaska, Final report, submitted to the NORTH Commission: University of Alaska, Mineral Industry Research Laboratory Report No. 16, 306 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Roehm, J.C., 1949, Report of investigations and itinerary of J.C. Roehm in the Koyukuk precinct, Alaska: Alaska Territorial Department of Mines Itinerary Report 31-1, 9 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Bettles River

Site type: Mine

ARDF no.: CH072

Latitude: 67.559 **Quadrangle:** CH C-5

Longitude: 149.427

Location description and accuracy:

Placer mining took place along the Bettles River from the mouth of Mule Creek to at least a half mile below the mouth of Garnet Creek. The site is plotted about a half mile below the mouth of Garnet Creek where most of the mining apparently took place. It is about 0.6 mile northwest of the center of section 31, T. 32 N., R. 8 W.

Commodities:

Main: Au

Other: Cu

Ore minerals:

Gangue minerals:

Geologic description:

Many of the tributaries of the Bettles River north of Bob Johnson Lake (formerly Big Lake) have been placer mined. The Bettles River itself has been mined, especially below the mouth of Garnet Creek (CH071). In 1919, three holes were sunk to bedrock on the Discovery claim about a half mile below the mouth of Garnet Creek. There was considerable drift mining and prospecting in this area by several individuals from 1927 to 1939 (Kurtak and others, 2002). Both the modern channel of the river and benches were mined. Reed (1938) reported that the gravel was 7 to 18 feet deep; the productive gravel was 4.5 feet thick; and the ground was said to have run about $0.50 per square foot of bedrock (at $35 per ounce of gold.) A 2 ounce copper nugget was found in the pay gravel. Kurtak and others (2002) panned the gravel near the mouth of Limestone and Mule Creeks; the gold they recovered was very fine. Dillon (1987) reported active placer claims. There is no record of the amount of gold that was produced along the Bettles River but there was some production from 1919 to 1938, almost all from the mouth of Mule Creek to at least a half mile below the mouth of Garnet Creek.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Undetermined

Workings/exploration:

The Bettles River has been mined, especially below the mouth of Garnet Creek (CH071). In 1919, three holes were sunk to bedrock on the Discovery claim about a half mile below the mouth of Garnet Creek and there was considerable drift mining and prospecting in this area by several individuals from 1927 to 1939 (Kurtak and others, 2002). Both the modern channel of the river and benches were mined. Kurtak and others (2002) panned the gravel near the mouth of Limestone and Mule Creeks as part of their study of the mineral resources of the Koyukuk mining district. Dillon (1987) reported active placer claims in 1985 on the Bettles River near the mouths of Garnet and Mule Creeks. There is no record of the amount of gold gold that was produced along the Bettles River but there was some production from 1919 to 1938, almost all from the mouth of Mule Creek to at least a half mile below the mouth of Garnet Creek.

Production notes:

There is no record of the amount of gold that was produced along the Bettles River but there was some production from 1919 to 1938, almost all from the mouth of Mule Creek to at least a half mile below the mouth of Garnet Creek.

Reserves:

None.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310131

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., 1987, Upper Koyukuk district land and mining claim status current to 1985: Alaska Division of Geological and Geophysical Surveys Public-Data File 87-11, 1 sheet, scale 1:125,000.

Dillon, J.T., Reifenstuhl, R.R., and, Harris, G.W., 1996, Geologic map of the Chandalar C-5 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 104, 2 sheets, scale 1:63,360.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk

mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Last Chance Creek; Crab Creek

Site type: Occurrence

ARDF no.: CH073

Latitude: 67.516 **Quadrangle:** CH C-5

Longitude: 149.494

Location description and accuracy:

Last Chance Creek drains into the northwest end of Bob Johnson Lake (formerly Big Lake). For this record, this site is plotted at about the middle of the creek, about 0.3 mile north of the center of section 14, T. 31 N., R. 9 W. The creek was called Crab Creek by Reed (1938), but it is labeled Last Chance Creek on the modern topographic maps.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Last Chance Creek was prospected by at least three shafts to bedrock and an open cut (Reed, 1938). A 30-foot shaft was sunk in 1922, and 15-foot and 35-foot shafts were sunk in 1932. The 15-foot shaft reportedly was near the mouth of the creek and the 35-foot shaft was farther upstream 'at the forks'. Only a few grains of gold were found in the shafts and the open cut. Eleven claims were staked in 1969. There is no record of any significant mining on Last Chance Creek (Kurtak and others, 2002).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Last Chance Creek was prospected by at least three shafts to bedrock and an open cut (Reed, 1938). A 30-foot shaft was sunk in 1922 and 15-foot and 35-foot shafts were sunk in 1932. The 15-foot shaft reportedly was near the mouth of the creek and the 35-foot shaft was farther upstream 'at the forks'. Only a few grains of gold were found in the shafts and the open cut. Eleven claims were staked in 1969. There is no record of any significant mining on Last Chance Creek (Kurtak and others, 2002).

Production notes:

Apparently none beyond a few grains that were found during prospecting.

Reserves:

None.

Additional comments:

MAS No. 0020310099

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

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Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., and Reifenstuhl, R.R., 1995, Geologic map of the Chandalar C-6 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 105, 1 sheet, scale 1:63,360.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (near Wiehl Mountain)

Site type: Occurrence

ARDF no.: CH074

Latitude: 67.6576 **Quadrangle:** CH C-6

Longitude: 149.5105

Location description and accuracy:

This occurrence is at elevation of about 3,600 feet, about 3.9 miles north-northeast of Wiehl Mountain (peak 5765). It is about 0.2 mile northeast of the center of section 26, T. 33 N., R. 9 W. The location is accurate to within a half mile.

Commodities:

Main: Ag, As, Au, Cu, Pb, Zn

Other:

Ore minerals: Arsenopyrite, chalcopyrite, galena, gold, sphalerite

Gangue minerals: Quartz

Geologic description:

This occurrence was originally described as galena in Devonian(?) greenstone and greenschist near a contact with Devonian siltstone and grit (Brosgé and Reiser, 1964). Mulligan (1974) and Kurtak and others (2002) found a 3-foot-wide quartz vein exposed for 100 feet along strike. No sulfides were seen in place in the quartz vein but there is abundant quartz float in talus below the vein with 2 to 3 percent disseminated pyrite, arsenopyrite, chalcopyrite, galena, and sphalerite. Three samples averaged 72 parts per billion gold, 2.1 parts per million (ppm) silver, 258 ppm copper, 1,260 ppm lead, 303 ppm zinc, and 3,454 ppm arsenic.

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Polymetallic quartz vein (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only limited sampling by government agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS No. 0020310132

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

Cobb, E.H., 1972, Metallic mineral resources map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-457, 1 sheet, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

DeYoung, J.H., Jr., 1978, Mineral resources map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-878-B, 2 sheets, scale 1:250,000.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (on Sukakpak Mountain)

Site type: Prospect

ARDF no.: CH076

Latitude: 67.5957 **Quadrangle:** CH C-6

Longitude: 149.7334

Location description and accuracy:

The main vein at this prospect extends for almost 600 feet; the center is at an elevation of about 3,500 feet, about 0.6 mile south-southeast of the summit of Sukakpak Mountain. It is about 0.6 mile east-southeast of the center of section 15, T. 32 N., R. 10 W. The location is accurate. Kurtak and others (2002, figure C-6)) include a detailed map of the prospect.

Commodities:

Main: Ag, Au, Sb

Other: Hg, Mo

Ore minerals: Cinnabar?, gold, molybdenite?, stibnite, tetrahedrite

Gangue minerals: Calcite, quartz

Geologic description:

Mineralization is exposed in two places at this prospect: the main 'upper vein' (at the coordinates), and a 'lower vein' about a half mile to the southwest. The veins do not appear to be continuous but they have the same general trend (Kurtak and others, 2002). Lode claims were staked in 1977 but they were invalid because the prospect is in the Trans-Alaska Pipeline corridor which is closed to mineral entry. There is a small prospect pit on the upper vein and some trenching on the lower vein.

This prospect is near the contact of marble of the Devonian Skajit Limestone and Cambrian muscovite-albite-quartz schist (Huber 1988; Dillon and Reifenstuhl, 1990; Kurtak and others, 2002). The mineralization is mainly in the marble but the trend of the veins parallels and is very close to the contact.

The upper vein is exposed for 120 feet, varies from 1 to 6 feet wide, and averages about two feet thick (Huber 1988; Kurtak and others, 2002). It strikes N55E, dips steeply to vertical, and can be traced for 570 feet in float and discontinuous exposures. The upper vein is entirely in marble about 50 feet from the contact with the schist. There are two generations of quartz; an early, nearly barren generation with traces of tetrahedrite, and a later generation with stibnite and gold. The stibnite often makes up 50 percent of the vein. There is minor arsenopyrite and the stibnite weathers to stibiconite and kermesite. (The red kermesite has been misidentified as cinnabar.) The stibnite contains native gold which is difficult to detect. The gold occurs as small cubes and as wire and flakes in fractures in the veins, with stibnite, quartz, and graphite. There is no evidence of alteration adjacent to the vein. The vein is banded with evidence of repeated movement during and after mineralization. The vein show open-space filling with crystalline stibnite and cockscomb quartz crystals. Huber (1988) collected 11 samples along the vein; they averaged 15.52 parts per million (ppm) gold and 20.8 percent antimony. Kurtak and others (2002) collected 9 continuous chip samples and 3 float samples from the upper vein. The samples average 39.59 ppm gold and 22.74 percent antimony, but the values were erratic along strike. Dillon (1982) reported mercury and molybdenum in samples from the vein. However, in the samples collected by Kurtak and others (2002), the highest mercury value was 2.9 ppm and the highest molybdenum value was 8 ppm.

The lower quartz vein at an elevation of about 2,500 feet is mineralized for about 50 feet and quartz-vein material can be traced in float and rubble for about 350 feet (Huber 1988; Kurtak and others, 2002. The mineralization is similar to the upper vein. Stibnite occurs sporadically in quartz-carbonate gangue. The vein

strikes N70E to N70W with a variable dip. The vein is in marble near the schist contact. Kurtak and others (2002) collected a spaced-chip sample; it contained 25.23 ppm gold and 21.22 percent antimony.
Dillon (1982) suggests that the mineralization is Albian (middle Cretaceous). Huber (1988) concluded that the mineralization is no older than the end of the Neocomian (Early Cretaceous), Brooks Range Orogeny.
Kurtak and others (2002) estimated an 'inferred resource' of 31,000 tons with 'weighted average grades' of 1.22 ounces of gold per ton and 18.44 percent antimony.

Alteration:

There is little gossan or other weathering associated with the veins and almost no wallrock alteration. The stibnite weathers to yellow stibiconite (Sb3O6(OH)) and red kermesite (Sb2S2O).

Age of mineralization:

Dillon (1982) suggests that the mineralization is Albian (Middle Cretaceous). Huber (1988) concludes that the mineralization is no older than the end of the Neocomian (Early Cretaceous) Brooks Range Orogeny.

Generic deposit model:

Deposit model:

Gold-stibnite-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

A small prospect pit and some trenching by industry. Mapped and sampled by government agencies. The occurrence was first reported in print in the early 1980s, although there are older workings on outcrops of the veins and evidence of drift mining nearby on Discovery Creek (CH077). Lode claims were staked in 1977 but they were invalid because the prospect is in the Trans-Alaska Pipeline corridor, which is closed to mineral entry.

Production notes:

None.

Reserves:

Kurtak and others (2002) estimated an 'inferred resource' of 31,000 tons with 'weighted average grades' of 1.22 ounces of gold per ton and 18.44 percent antimony.

Additional comments:

This prospect is in the Alaska pipeline inner corridor which is not open to mineral entry. It probably is the source of placer Au in Discovery Creek (CH077).

MAS No. 0020310071

References:

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

Dillon, J.T., and Reifenstuhl, R.R., 1990, Geologic map of the Wiseman B-1 quadrangle, southcentral Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 101, 1

sheet, scale 1:63,360.

Dillon, J.T., Lamal, K.K., and Huber, J.A., 1989, Gold deposits in the upper Koyukuk and Chandalar mining districts, in Mull, C.G., and Adams, K.E., eds., Dalton Highway, Yukon River to Prudhoe Bay, Alaska--Bedrock geology of the eastern Koyukuk Basin, central Brooks Range, and east-central Arctic Slope: Alaska Division of Geological and Geophysical Surveys Guidebook 7, v. 2, p. 195-201.

Dillon, J.T., Reifenstuhl, R.R., and, Harris, G.W., 1996, Geologic map of the Chandalar C-5 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 104, 2 sheets, scale 1:63,360.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Huber, J.A., 1988, The geology and mineralization of the Sukakpak Mountain area, Brooks Range, Alaska: Fairbanks, University of Alaska, M.Sc. thesis, 81 p.

Mosier, E.L., Cathrall, J.B., Antweiler, J.C., Tripp, R.B., Lueck, L., and Eakins, G.R., 1987, Gold occurrences and characteristics in the Chandalar-Koyukuk area, in Albanese, M.A., and Campbell, B.W., eds., Proceedings of 9th Annual Alaska Conference on Placer Mining: Alaska Division of Geological and Geophysical Surveys Miscellaneous Paper 9, p. 45-53.

Nokleberg, W.J., Bundtzen, T.K., Berg, H.C., Brew, D.A., Grybeck, D.J., Robinson, M.S., Smith, T.E., and Yeend, W., 1987, Significant metalliferous lode deposits and placer districts of Alaska: U.S. Geological Survey Bulletin 1786, 104 p., 2 plates, scale 1:5,000,000.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Discovery Creek

Site type: Prospect

ARDF no.: CH077

Latitude: 67.5825 **Quadrangle:** CH C-6

Longitude: 149.7705

Location description and accuracy:

Discovery Creek, which is not named on the 1:63,360-scale topographic map, drains the south flank of Sukakpak Mountain. It is about 1 1/2 miles long and much of it is below a gold-stibnite-quartz vein (CH076). The site is somewhat arbitrarily plotted about 1.2 miles upstream from the mouth of the creek below the vein. The site is about 0.5 mile west-southwest of the center of section 22, T. 32 N., R. 10 W.

Commodities:

Main: Au

Other: Sb?

Ore minerals: Gold, stibnite

Gangue minerals:

Geologic description:

Discovery Creek is downslope from the gold-stibnite-quartz veins on Sukakpak Mountain (CH076). Little is known about this prospect but clasts of stibnite-quartz-vein material have been found in the creek gravels and there is some evidence of past placer mining or prospecting (Dillon, 1982; Kurtak and others, 2002). Suction dredging was reported in 1982.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Undetermined

Site Status: Inactive

Workings/exploration:

Suction dredging in 1982 and some evidence of drift mining in the early 1900s (Dillon, 1982; Huber,

1988; Kurtak and others, 2002).

Production notes:

Doubtful.

Reserves:

None.

Additional comments:

See also the nearby unnamed prospect on Sukapak Mountain (CH076) which is the probable source of any gold in this creek. This prospect is in the Alaska pipeline corridor which is not open to mineral entry.

MAS No. 0020310072

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

Dillon, J.T., Reifenstuhl, R.R., and, Harris, G.W., 1996, Geologic map of the Chandalar C-5 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 104, 2 sheets, scale 1:63,360.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Huber, J.A., 1988, The geology and mineralization of the Sukakpak Mountain area, Brooks Range, Alaska: Fairbanks, University of Alaska, M.Sc. thesis, 81 p.

Mosier, E.L., Cathrall, J.B., Antweiler, J.C., Tripp, R.B., Lueck, L., and Eakins, G.R., 1987, Gold occurrences and characteristics in the Chandalar-Koyukuk area, in Albanese, M.A., and Campbell, B.W., eds., Proceedings of 9th Annual Alaska Conference on Placer Mining: Alaska Division of Geological and Geophysical Surveys Miscellaneous Paper 9, p. 45-53.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Emery Creek; Emory Creek

Site type: Mine

ARDF no.: CH078

Latitude: 67.5499 **Quadrangle:** CH C-6

Longitude: 149.621

Location description and accuracy:

Emery Creek, a north-flowing tributary of the Bettles River, is about 2 miles northwest of Glacier Lake The creek is labeled Emery Creek on modern topographic maps but is called Emory Creek in the old reports. The site is on Emery Creek about a mile southwest of the Bettles River where there was mining in 1937. The site is near the southeast corner of section 31, T. 32 N., R. 9 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

According to Maddren (1913), Emory Creek produced about $10,000 in gold (484 ounces) from 1900 to 1909. The gold occurred on bedrock amidst boulders which had to be moved to recover the gold. Reed (1938) saw no evidence of the mining that Maddren reported, but did note prospecting and mining near the junction of Emory Creek and an east-flowing tributary about a mile south of the Bettles River. There was placer mining on the creek from 1993 to 1998 that produced 40 ounces of gold (Kurtak and others, 2002).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Probably inactive

Workings/exploration:

Placer mining from 1900 to 1909, in 1936, and from 1993 to 1998.

Production notes:

Emery Creek produced about $10,000 in gold (about 484 ounces) from 1900 to 1909; perhaps a small amount in the mid-1930s; and 40 ounces from 1993 to 1998.

Reserves:

None.

Additional comments:

MAS No. 0020310050

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Magnet Creek

Site type: Mine

ARDF no.: CH079

Latitude: 67.514 **Quadrangle:** CH C-6

Longitude: 149.7274

Location description and accuracy:

Magnet Creek is a north-flowing tributary to Gold Creek that was mined near its mouth. It is about 5 miles north of the north (6180) peak of Poss Mountain and flows through the west half of section 14, T. 31 N., R. 10 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Gold was discovered on Magnet Creek in 1900. Reed (1938) reported that the modern channel of Magnet Creek was mined from an open cut near its mouth. A high bench near the mouth of Magnet Creek on Gold Creek (CG080) was also mined for about 500 or 600 feet. Claims were staked and there was activity on the creek during several periods between 1973 and 1999. Kurtak and others (2002) sampled and panned at several locations along Magnet Creek. Several of their samples and panned concentrates contained visible gold but most of the gold they found seemed to come from open crevices in the bedrock below the overlying gravel rather than from the gravel itself.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Undetermined

Site Status: Inactive

Workings/exploration:

The modern channel of Magnet Creek near its mouth and a bench there were mined sometime prior to 1938. There was activity on the creek during several periods in the 1970s and 1990s but there is no record of production. Sampled by Bureau of Land Management in their study of the mineral resources of the Koyukuk mining district (Kurtak and others, 2002).

Production notes:

An uncertain amount of gold was produced before 1938 from near the mouth of the creek, and there was mining in the 1970s and 1990s.

Reserves:

None.

Additional comments:

MAS No. 0020310052

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Gold Creek; Little Gold Creek

Site type: Mine

ARDF no.: CH080

Latitude: 67.5156 **Quadrangle:** CH C-6

Longitude: 149.7329

Location description and accuracy:

Gold Creek is a west-flowing tributary to the Middle Fork Koyukuk River, about 6 miles south of Sukakpak Mountain. Gold Creek has been placer mined almost continuously for more than 6 miles, beginning about 2 miles upstream from its mouth, to its head. For this record, the site is located below the mouth of Magnet Creek in about the middle of the productive area where there was active mining as recently as 2001. This location is about 0.4 mile east-northeast of the center of section 15, T. 31 N., R. 10 W.

Commodities:

Main: Au

Other: Sb

Ore minerals: Gold, stibnite

Gangue minerals:

Geologic description:

Gold Creek was one of the first creeks to be mined in the Koyukuk area and it has been placer mined almost continuously for more than 6 miles, beginning about 2 miles above its mouth, to its head. No gold has been found in the lower two miles. The drainage there has been rearranged by glacial advances and the ancestral lower channel of Gold Creek probably was to the north of the modern channel, toward the lower part of Linda Creek (CH081). That ancestral channel probably was the source of the placer gold that has been mined below the sharp bend in Linda Creek just to the north.

Placer gold was discovered on Gold Creek in 1900 and Schrader (1900) reported that the ground was 'all staked'. He noted that one claim produced $12,000 in gold (about 580 ounces) in ten days. From 1900 to 1905, Gold Creek produced 10,687 ounces of gold. Production fell off rapidly after 1905 but In 1914 five mines were operating in the winter and four in the summer (Brooks, 1915). Mining continued steadily, although production was somewhat erratic, until the mid-1940, and another 3,662 ounces of gold was produced. From 1997 to 2001, there was mining below Magnet Creek and at the head of Gold Creek (near a tributary called 'Little Gold Creek' (in some old reports). The records are incomplete but Gold Creek has produced more than 14 thousand ounces of gold, perhaps considerably more.

Placer gold has been mined in Gold Creek from the modern stream channel in gravel 2 to 7 feet deep; from a deeply buried channel; and from a high channel on benches about 8 feet above the modern channel (Reed, 1938; Kurtak and others, 2002). The gravel in the modern channel is coarse and waterworn, with many boulders. The high channels seem to be confined to the north side of the lower creek and the east side of the upper several miles of the creek. The high channel about 1.5 miles upstream from the mouth of Magnet Creek is about 8 feet above the modern channel; bedrock is 3 to 50 feet deep; and the ground averaged 0.01 ounce of gold per square foot of bedrock. Below Magnet Creek, benches on the north side of Gold Creek contained 0.04 to 0.07 ounce of gold per cubic yard, with 5 feet of overburden. The deep channels vary from side to side of the Gold Creek valley. About a mile below the mouth of Magnet Creek, the deep channel is 50 to 100 feet deep; the pay zone is 12 to 15 feet wide; and the ground runs about 0.04 ounce of gold per square foot of bedrock. The richest placers were between constrictions in the valley

formed by resistant schist and diorite. The richest claim was at the mouth of Magnet Creek, just downstream from a diorite dike. Most of the gold forms smooth, shot-like pieces and small nuggets, but some pieces from high on the creek are angular and may not have been transported far. Angular fragments of stibnite in quartz have been found in the gravels.

Kurtak and others (2002) collected numerous samples and panned along Gold Creek as part of the mineral resource study of the Koyukuk mining district. Some of the samples or panned concentrates contained visible or analytical gold, and some of the panned concentrates had elevated arsenic, antimony, tungsten. They concluded that 'Except for a few sites, Gold Creek appears to be mostly worked out.'

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; medium

Site Status: Active?

Workings/exploration:

Gold Creek was one of the first creeks to be mined in the Koyukuk area and it has been placer mined almost continuously for more than 6 miles, from about 2 miles above its mouth to its head. Placer gold was discovered on Gold Creek in 1900 and Schrader (1900) reported that the ground was 'all staked'. From 1900 to 1905, Gold Creek produced 10,687 ounces of gold. Production fell off rapidly after 1905 but In 1914 five mines were operating in the winter and four in the summer (Brooks, 1915). Mining continued steadily, although production was somewhat erratic, until the mid-1940, and another 3,662 ounces of gold was produced. From 1997 to 2001, there was mining below Magnet Creek and at the head of Gold Creek (near a tributary called 'Little Gold Creek' in some of the old literature).

Production notes:

Gold Creek was one of the first creeks to be mined in the Koyukuk area and it has been placer mined almost continuously for more than 6 miles, beginning about 2 miles above its mouth, to its head. From 1900 to 1905, Gold Creek produced 10,687 ounces of gold. Production fell off rapidly after 1905 but from 1906 to 1948, Gold Creek produced another 3,662 ounces of gold. From 1997 to 2001, there was mining below Magnet Creek and at the head of Gold Creek but the amount of production is not available. The records are incomplete, but Gold Creek has produced more than 14 thousand ounces of gold, perhaps considerably more in view of the mining after 1948.

Reserves:

Unknown.

Additional comments:

MAS No. 0020310051

References:

Brooks, A.H., 1908, The mining industry in 1907: U.S. Geological Survey Bulletin 345-A, p. 30-53.

Brooks, A.H., 1915, Mineral resources of Alaska; report on progress of investigations in 1914: U.S. Geological Survey Bulletin 622, 380 p.

Brooks, A.H., 1916, The Alaskan mining industry in 1915: U.S. Geological Survey Bulletin 642-A, p. 16-71.

Brooks, A.H., 1916, Antimony deposits of Alaska: U.S. Geological Survey Bulletin 649, 67 p.

Brooks, A.H., 1918, Mineral resources of Alaska, 1916: U.S. Geological Survey Bulletin 662, 469 p.

Cobb, E.H., 1973, Placer deposits of Alaska: U.S. Geological Survey Bulletin 1374, 213 p.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

Dillon, J.T., and Reifenstuhl, R.R., 1995, Geologic map of the Chandalar C-6 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 105, 1 sheet, scale 1:63,360.

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Joesting, H.R., 1942, Strategic mineral occurrences in interior Alaska: Alaska Territorial Department of Mines Pamphlet 1, 46 p.

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Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

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Schrader, F.C., 1900, Preliminary report on a reconnaissance along the Chandalar and Koyukuk Rivers,

Alaska, in 1899: U.S. Geological Survey Twenty-first Annual Report, Part 2, p. 441-486.

Schrader, F.C., 1904, A reconnaissance in northern Alaska across the Rocky Mountains, along Koyukuk, John, Anaktuvuk, and Colville rivers and the Arctic coast to Cape Lisburne, in 1901, with notes by W.J. Peters: U.S. Geological Survey Professional Paper 20, 139 p.

Smith, P.S., 1933, Mineral industry of Alaska in 1931: U.S. Geological Survey Bulletin 844-A, p. 1-81.

Smith, P.S., 1936, Mineral industry of Alaska in 1934: U.S. Geological Survey Bulletin 868-A, p. 1-91.

Smith, P.S., 1939, Mineral industry of Alaska in 1937: U.S. Geological Survey Bulletin 910-A, p. 1-113.

Smith, P.S., 1939, Mineral industry of Alaska in 1938: U.S. Geological Survey Bulletin 917-A, p. 1-113.

Wimmler, N.L., 1925, Placer mining in Alaska in 1925: Alaska Territorial Department of Mines Miscellaneous Report 195-8, 118 p.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Linda Creek

Site type: Mine

ARDF no.: CH081

Latitude: 67.5177 **Quadrangle:** CH C-6

Longitude: 149.8187

Location description and accuracy:

Linda Creek is a west-flowing tributary to the Middle Fork Koyukuk River. The mine is approximately 6 1/4 miles south-southwest of Sukakpak Mountain and 1/2 mile east of the Trans-Alaska Pipeline. The center of the mine is about 0.5 mile north-northeast of the center of section 17, T. 31 N., R. 10 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Linda Creek was a consistent gold producer from 1901 to at least 2002 (Kurtak and others, 2002). Gold was discovered in 1901 and by 1903, 871 ounces of gold had been produced, mainly from the discovery claim near the sharp bend in the creek about 0.8 mile upstream from its mouth. Placer mining continued intermittently by simple hydraulic and hand methods until 1938. Mining took place in 1962 and 1975 using heavy equipment. Drift mining by drilling and blasting and diesel haulage began in 1978 and continued until at least 2002. The total production from 1902 to 1999 was 2,069 ounces of gold.

The early placer mining was along the modern stream channel for about 0.25 mile downstream from the sharp bend in Linda Creek at the airfield. There is little information about the early mining except that nearly all the gold was mined from the Discovery claim about 1/2 mile above the mouth. But only the upper half of this claim was productive. Reed (1938) described a 'shoveling in' surface-mining operation. Eight feet of gravel overlay bedrock; the gold was in the lower 3 feet of gravel and the upper two feet of bedrock. About a quarter of a mile downstream from the bend, the bedrock changes to phyllite and slopes down steeply to the west; no gold has been found downstream. Maddren (1913) and most miners since have thought that the source of the gold at the bend was not in the upper portion of Linda Creek but that the gold came from an ancestral channel of Gold Creek (CH080) that drained toward the mouth of modern Linda Creek.

East of the bend, early drift mining located a high channel that was probably the ancestral course of Gold Creek (Kurtak and others, 2002). From 1982 to at least 2002, the deep gravel east of the bend in Linda Creek was mined with drills and explosives to free the frozen gravel and diesel haulage to bring the gravel to the surface. The auriferous gravel is about 100 feet wide; the gold is in the lower 2.5 to 3.0 feet of the gravel and the upper 1.5 feet of the phyllite bedrock. The gold apparently is not confined to a single channel but is distributed across a series of braided channels. Most of the gold occurs as flattened to rounded nuggets. The largest nugget was 0.99 ounce and the pay zones have as much as 1.0 ounce of gold per cubic yard. Figure C-7 of Kurtak and others (2002) is a map of the drift mine.

Kurtak and others (2002) suggested the possibility of a large gold resource in the deep buried channel of Linda Creek, east of the bend. They estimated an 'inferred resource' of 2.4 million cubic yards of gravel of uncertain grade.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Linda Creek was a consistent gold producer from 1901 to at least 2002 (Kurtak and others, 2002). Gold was discovered in 1901 and by 1903, 871 ounces of gold had been produced, mainly from the discovery claim near the sharp bend in the creek about 0.8 mile upstream from its mouth. Placer mining continued intermittently by simple hydraulic and hand methods until 1938. Mining took place in 1962 and 1975 using heavy equipment. Drift mining by drilling and blasting and diesel haulage began in 1978 and continued until at least 2000.

Production notes:

The total production from 1902 to 1999 was 2,069 ounces of gold.

Reserves:

Kurtak and others (2002) suggested the possibility of a large gold resource in the deep buried channel of Linda Creek, east of the bend. They estimated an 'inferred resource' of 2.4 million cubic yards of gravel of uncertain grade.

Additional comments:

MAS No. 0020310003

References:

Brooks, A.H., 1915, Mineral resources of Alaska; report on progress of investigations in 1914: U.S. Geological Survey Bulletin 622, 380 p.

Brooks, A.H., 1916, The Alaskan mining industry in 1915: U.S. Geological Survey Bulletin 642-A, p. 16-71.

Carnes, D.R., 1976, Active Alaskan placer operations, 1975: U.S. Bureau of Mines Open-File Report 98-76, 90 p., 40 plates, scale 1:250,000.

Cobb, E.H., 1972, Metallic mineral resources map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-457, 1 sheet, scale 1:250,000.

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materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

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Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (south of the Hammond River)

Site type: Occurrence

ARDF no.: CH082

Latitude: 67.6246 **Quadrangle:** CH C-6

Longitude: 149.9863

Location description and accuracy:

This occurrence is at an elevation of about 4,300 feet, on a ridge south of the Hammond River, approximately 6.5 miles west-northwest of Sukakpak Mountain and 5.5 miles north of Jennie Creek Lake. It is about 0.3 mile southwest of the center of section 3, T. 32 N., R. 11 W. The location is accurate within one mile.

Commodities:

Main: As, Cu, Sb, Zn

Other:

Ore minerals: Azurite, chalcopyrite, galena, malachite

Gangue minerals: Quartz

Geologic description:

This occurrence was originally described as copper sulfides and malachite-azurite staining in Middle to Upper Devonian(?) conglomerate interbedded in black slate, phyllite, and chloritic siltstone of the Beaucoup Formation (Dillon and Reifenstuhl, 1995). Kurtak and other (2002) describe a quartz vein 1 to 4 inches thick, with trace chalcopyrite and galena, that crosscuts quartz-muscovite schist. Two samples contained up to 356 parts per million (ppm) antimony, 140 ppm arsenic, and 580 ppm zinc, but they were not analyzed for copper and lead.

Alteration:

Not noted.

Age of mineralization:

Late Devonian or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Quartz vein with chalcopyrite and galena.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only limited sampling by government agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

This occurrence is in the Gates of the Arctic National Park which is closed to prospecting and mining.

MAS No. 0020310094

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

DeYoung, J.H., Jr., 1978, Mineral resources map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-878-B, 2 sheets, scale 1:250,000.

Dillon, J.T., and Reifenstuhl, R.R., 1995, Geologic map of the Chandalar C-6 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 105, 1 sheet, scale 1:63,360.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Cindy

Site type: Prospect

ARDF no.: CH098

Latitude: 67.7697 **Quadrangle:** CH D-4

Longitude: 148.9938

Location description and accuracy:

The Cindy prospect is about 7.3 miles at an azimuth of 24 degrees from the central (5425) peak of Horace Mountain and about 1.2 miles north-northeast of peak 5150. It is near the center of section 18, T. 34 N., R. 6 W. Kurtak and others (2002) include a map showing the regional geology of the area and the location of this and the other deposits of the Chandalar Copper Belt.

Commodities:

Main: Ag, As, Au, Cu, Pb, Zn

Other:

Ore minerals: Arsenopyrite?, chalcopyrite, galena, hematite, pyrite, sphalerite

Gangue minerals: Calcite, quartz

Geologic description:

The Cindy prospect was staked by Placid Oil Company in 1972 and explored by them until 1977 (Kurtak and others, 2002). It was also one of the prospects listed in a report by Ventures Resources Corp. (1999) about their exploration of the Chandalar Copper Belt.

The Cindy prospect is at the northeast end of the Chandalar Copper Belt which is characterized by copper skarn deposits (Newberry and others, 1986). The rocks in the vicinity of the prospect are mainly lower Paleozoic greenschist, calcareous schist, and marble in thrust contact with Devonian Hunt Fork Shale and Silurian and Devonian Skajit Limestone (Brosgé and Reiser, 1964). Massive pyrite, galena, and chalcopyrite occur in veins and pods in silicified marble (Kurtak and others, 2002) Two samples from outcrop averaged 955.5 parts per billion (ppb) gold, 48.5 parts per million (ppm) silver, 225 ppm copper, 809.5 ppm lead, and 14,514 ppm arsenic. A float sample of massive hematite with 5 percent galena contained 144 ppb gold, 15 ppm silver, 1,591 ppm copper, 4.24 percent lead, 21.01 percent zinc, and 1,038 ppm arsenic. The mineralization appears to be limited to an area of about 500 square feet.

Alteration:

Silicification of marble.

Age of mineralization:

Probably a distal deposit of the Chandalar Copper Belt and thus Devonian(?) based on Early Devonian Pb/Pb zircon ages from the Baby Creek batholith and Horace Mountain plutons which are thought to be genetically tied to the mineralization of the belt (Dillon and others, 1996).

Generic deposit model:

Deposit model:

Silicified marble with lead, silver, and copper.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

The Cindy prospect was staked by Placid Oil Company in 1972 and explored by them until 1977 (Kurtak and others, 2002). Sampled by Bureau of Land Management.

Production notes:

None.

Reserves:

None.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310144

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey, Miscellaneous Geologic Investigations Map I-375, 2 sheets, scale 1:250,000.

Dillon, J.T., Reifenstuhl, R.R., and, Harris, G.W., 1996, Geologic map of the Chandalar C-5 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 104, 2 sheets, scale 1:63,360.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Newberry, R.J., Allegro, G.L., Cutler, S.E., Hagen-Levelle, D.D., Adams, D.D., Nicholson, L.C., Weglarz, T.B., Bakke, A.A., Clautice, K.H., Coulter, G.A., Ford, M.J., Myers, G.L., and Szumigala, D.J., 1997, Skarn deposits of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 355-395.

Newberry, R.J., Dillon, J.T., and Adams, D.D., 1986, Regionally metamorphosed calc-silicate-hosted deposits of the Brooks Range, northern Alaska: Economic Geology, v. 81, p. 1728-1752.

Nicholson, L.M., 1990, Porphyry copper, copper skarn, and volcanogenic massive sulfide occurrences in the Chandalar copper district, Alaska: Fairbanks, University of Alaska, M.Sc. thesis, 164 p.

Ventures Resource Corp., 1999, 1999 Annual Report: Ventures Resource Corporation, 36 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Pilgrim

Site type: Prospect

ARDF no.: CH099

Latitude: 67.7544 **Quadrangle:** CH D-5

Longitude: 149.0175

Location description and accuracy:

The Pilgrim prospect is about 5.8 miles at an azimuth of 20 degrees from the central (5425) peak of Horace Mountain and about 0.4 mile south-southwest of peak 5150. It about 0.5 mile south-southwest of the center of section 24, T. 34 N, R, 7 W. Kurtak and others (2002) include a map showing the regional geology of the area and the location of this and the other deposits of the Chandalar Copper Belt.

Commodities:

Main: Ag, Au?, Cu

Other: Zn

Ore minerals: Chalcopyrite, pyrite, sphalerite

Gangue minerals: Actinolite, epidote, garnet

Geologic description:

The Pilgrim prospect was staked by Placid Oil Company in 1972 and explored by them until 1977 (Kurtak and others, 2002). It was also one of the prospects listed in a report by Ventures Resources Corp. (1999) about their exploration of the Chandalar Copper Belt.

The Pilgrim prospect is at the northeast end of the Chandalar Copper Belt. The rocks in the vicinity are mainly lower Paleozoic greenschist, calcareous schist, and marble, in thrust contact with Devonian Hunt Fork Shale and Silurian and Devonian, Skajit Limestone (Brosgé and Reiser, 1964). A sample with garnet, epidote, actinolite, pyrite, sphalerite, and chalcopyrite contained 12.4 percent copper, 0.24 percent zinc, and 71 parts per million silver (Newberry and others, 1986). WGM Inc. (1980) identified coarse-grained pyrite and chalcopyrite in quartz-sericite schist and chlorite schist; grab samples contained up to 3.8 percent copper. Kurtak and others (2002) found similar mineralization in sericite-quartz schist and as well small amounts of disseminated chalcopyrite, and pyrite in calc-silicate rocks. Newberry and others (1986) classified the Pilgrim prospect as a copper(-zinc-silver) skarn, and Newberry and others (1997) classified it as a calcic copper skarn.

Alteration:

Local development of masses of skarn in calcareous rocks.

Age of mineralization:

Devonian(?) based on Early Devonian Pb/Pb zircon ages from the nearby Baby Creek batholith and Horace Mountain plutons (Dillon and others, 1996).

Generic deposit model:

Deposit model:

Cu skarn deposit (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
18b

Production Status: None

Site Status: Undetermined

Workings/exploration:
The Pilgrim prospect was staked by Placid Oil Company in 1972 and explored by them until 1977 (Kurtak and others, 2002). It was also one of the prospects listed in a report by Ventures Resources Corp. (1999) about their exploration of the Chandalar Copper Belt.

Production notes:
None.

Reserves:
None.

Additional comments:
This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310143

References:
Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey, Miscellaneous Geologic Investigations Map I-375, 2 sheets, scale 1:250,000.

Dillon, J.T., Reifenstuhl, R.R., and, Harris, G.W., 1996, Geologic map of the Chandalar C-5 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 104, 2 sheets, scale 1:63,360.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Newberry, R.J., Allegro, G.L., Cutler, S.E., Hagen-Levelle, D.D., Adams, D.D., Nicholson, L.C., Weglarz, T.B., Bakke, A.A., Clautice, K.H., Coulter, G.A., Ford, M.J., Myers, G.L., and Szumigala, D.J., 1997, Skarn deposits of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 355-395.

Newberry, R.J., Dillon, J.T., and Adams, D.D., 1986, Regionally metamorphosed calc-silicate-hosted deposits of the Brooks Range, northern Alaska: Economic Geology, v. 81, p. 1728-1752.

Nicholson, L.M., 1990, Porphyry copper, copper skarn, and volcanogenic massive sulfide occurrences in the Chandalar copper district, Alaska: Fairbanks, University of Alaska, M.Sc. thesis, 164 p.

Ventures Resource Corp., 1999, 1999 Annual Report: Ventures Resource Corporation, 36 p.

WGM Inc., 1980, 1979 annual profess report, Block 5-Wiseman Chandalar Cop[er Belt: Unpublished report 80-06 for Doyon Ltd., 28 p. (on file at Doyon Ltd., Fairbanks, Alaska).

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Mike

Site type: Prospect

ARDF no.: CH100

Latitude: 67.7707 **Quadrangle:** CH D-5

Longitude: 149.0532

Location description and accuracy:

The Mike prospect is on the hillside just east of the last bend at the head of Robert Creek and about 1.3 miles northwest of peak 5150. It is about 0.3 east of the center of section 14, T. 34 N., R. 7 W. Kurtak and others (2002) include a map showing the regional geology of the area and the location of this and the other deposits of the Chandalar Copper Belt.

Commodities:

Main: Ag, Au, Cu, Zn

Other:

Ore minerals:

Gangue minerals: Epidote

Geologic description:

The Mike prospect was staked by Placid Oil Company in 1972 and explored by them until 1977 (Kurtak and others, 2002). The prospect was one of the deposits listed in a report by Ventures Resources Corp. (1999) about their exploration of the Chandalar Copper Belt.

The Mike prospect is at the northeast end of the Chandalar Copper Belt. The rocks in the vicinity are Devonian calcareous schist and marble, in thrust contact with Devonian Hunt Fork Shale, Skajit Limestone, and greenschist (Brosgé and Reiser, 1964). The prospect consists of an outcrop of quartz-epidote skarn about 20 feet by 50 feet in area (Kurtak and others, 2002) A select sample contained 29 parts per billion gold, 0.8 parts per million (ppm) silver, and 167 ppm copper. Kurtak and others (2002) searched the area between the Mike prospect and the Pilgrim prospect (CH099), about 1.5 miles to the south-southeast, but found little outcrop and no skarn. Newberry and others (1986) classify the Mike prospect as a copper (-zinc-silver) skarn, and Newberry and others (1997) classify it as a calcic copper skarn.

Alteration:

Age of mineralization:

Devonian(?) based on Early Devonian Pb/Pb zircon ages from the nearby Baby Creek batholith and Horace Mountain plutons (Dillon and others, 1996).

Generic deposit model:

Deposit model:

Cu skarn deposits (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b

Production Status: None

Site Status: Inactive

Workings/exploration:

The Mike prospect was staked by Placid Oil Company in 1972 and explored by them until 1977 (Kurtak and others, 2002). The prospect was one of the deposits listed in a report by Ventures Resources Corp. (1999) about their exploration of the Chandalar Copper Belt.

Production notes:

None.

Reserves:

None.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310101

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey, Miscellaneous Geologic Investigations Map I-375, 2 sheets, scale 1:250,000.

Dillon, J.T., Reifenstuhl, R.R., and, Harris, G.W., 1996, Geologic map of the Chandalar C-5 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 104, 2 sheets, scale 1:63,360.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Newberry, R.J., Allegro, G.L., Cutler, S.E., Hagen-Levelle, D.D., Adams, D.D., Nicholson, L.C., Weglarz, T.B., Bakke, A.A., Clautice, K.H., Coulter, G.A., Ford, M.J., Myers, G.L., and Szumigala, D.J., 1997, Skarn deposits of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 355-395.

Newberry, R.J., Dillon, J.T., and Adams, D.D., 1986, Regionally metamorphosed calc-silicate-hosted deposits of the Brooks Range, northern Alaska: Economic Geology, v. 81, p. 1728-1752.

Nicholson, L.M., 1990, Porphyry copper, copper skarn, and volcanogenic massive sulfide occurrences in the Chandalar copper district, Alaska: Fairbanks, University of Alaska, M.Sc. thesis, 164 p.

Ventures Resource Corp., 1999, 1999 Annual Report: Ventures Resource Corporation, 36 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Luna

Site type: Prospect

ARDF no.: CH101

Latitude: 67.76 **Quadrangle:** CH D-5

Longitude: 149.1633

Location description and accuracy:

The Luna prospect is about 6.5 miles at an azimuth of 6 degrees from the west peak of Horace Mountain. It covers much of the northeast quarter of section 20, T. 34 N., R. 7 W. Kurtak and others (2002) include detailed maps of the geology of the prospect, the regional geology of the area, and the location of this and other deposits of the Chandalar Copper Belt.

Commodities:

Main: Cu

Other: Ag, Au, Co, Zn

Ore minerals: Arsenopyrite, bornite, chalcopyrite, magnetite, pyrite, pyrrhotite, sphalerite

Gangue minerals: Actinolite, chlorite, epidote, garnet, pyroxene, quartz, sericite

Geologic description:

The Luna prospect was discovered by Bear Creek Mining Company in 1968 and they explored it until 1973 by detailed mapping, geochemical and geophysical surveys, trenching, and sampling. Exploration continued at intervals until at least 1997 by Midwest Oil Company; by WGM Inc. who core drilled 5 holes totaling 1,500 feet in 1978-1979; and by Arctic Resources Inc. and Ventures Resource Corp. in 1997. The prospect has been mapped and sampled in detail several times and is covered by several generations of geochemical and geophysical surveys.

The rocks in the vicinity of the Luna prospect are interbedded Cambrian or Ordovician schist, marble, and skarn, overlain by Silurian and Devonian, Skajit Limestone. Quartz-sericite schist closely associated with the ore bodies is thought to be the sheared margin of a metamorphosed igneous body (Kurtak and others, 2002). The structure of the area is complex with thrust faulting and at least two generations of folding. The schists are isoclinally folded with shallow-plunging northeast-trending axes and they form a broad synform, which follows Roberts Creek.

Most of the mineralization is in quartz-sericite schist and calcareous quartz(+/-sericite)-chlorite schist. It consists of bodies of massive pyrrhotite, pyrite, chalcopyrite, magnetite, and sphalerite, in stringers and disseminations (Kurtak and others, 2002). Several notable intercepts were cut in the five, 1978-1979 drill holes: 1) 6.1 feet that contained 6.3 percent copper, 0.5 percent zinc, and 1.0 ounce of silver per ton; 2) 2.2 feet that contained 1.9 percent copper, and 1.0 percent zinc; and 3) 3.6 feet that contained 2.0 percent copper and 7.0 percent zinc. Samples collected by Nicholson (1990) contained up to 1,129 parts per billion (ppb) gold, 10.2 percent copper, and 8,447 ppm zinc. Kurtak and others (2002) collected samples of the same tenor and Ventures Resource Alaska reported samples over widths of 20 to 30 feet with 3 percent or more copper (Swainbank and others, 1997).

There are several interpretations of the mineralization at the Luna prospect. Newberry and others (1986, 1997) group it with the many skarn deposits of the Chandalar Copper Belt that is northwest of and genetically related to the Devonian(?) granitic plutons at Horace Mountain. Many of those skarns exhibit both garnet-pyroxene prograde and epidote-actinolite retrograde mineral assemblages. They conclude that the mineralogy, mineralization, and alteration indicate that most of them are continental-margin, porphyry-related copper skarns. In particular, they classify the Luna deposit as a copper-zinc-silver skarn or a calcic

copper skarn.

Nicholson (1990) suggests that at least part of the mineralization is volcanogenic based on the presence of massive, stringer, and disseminated sulfides, even if there are 'distal' copper-zinc skarns at Luna as well. Ventures Resource Corporation (1999) conclude that the mineralization at Luna is stratabound and consists principally of chalcopyrite and lesser amounts of bornite and sphalerite in altered calc-silicate schist associated with small bodies of meta-diorite and granodiorite. Ventures describes the deposit as including: a) stratabound volcanogenic sulfides; b) strata-controlled massive pyrite-chalcopyrite-magnetite skarns; c) strata- and shear-controlled massive chalcopyrite-bornite-sphalerite replacements; and d) a 2-foot-thick massive pyrrhotite-arsenopyrite replacement(?) in marble.

Using two different models, Nicholson (1990) estimated that the Luna deposit contains a resource of 1.8 million tons or 70,000 tons, in both cases with an average grade of 0.9 percent copper, 0.03 percent zinc, and 0.25 ounce of silver per ton.

Alteration:

Chloritic alteration of schists and silicic alteration of metamorphosed dikes and sills.

Age of mineralization:

Devonian(?) based on Early Devonian Pb/Pb zircon ages from the nearby Baby Creek batholith and Horace Mountain plutons (Dillon and others, 1996).

Generic deposit model:

Deposit model:

Cu skarn deposit or Kuroko massive sulfide? (Cox and Singer, 1986; models 18b? and 28a?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b? or 28a?

Production Status: None

Site Status: Active

Workings/exploration:

The Luna prospect was discovered by Bear Creek Mining Company in 1968 and they explored it until 1973 by detailed mapping, geochemical and geophysical surveys, trenching, and sampling. Exploration continued at intervals until at least 1997 by Midwest Oil Company; by WGM Inc. who core drilled 5 holes totaling 1,500 feet in 1978-1979; and by Arctic Resources Inc. and Ventures Resource Corp. in 1997. The prospect has been mapped and sampled in detail several times and is covered by several generations of geochemical and geophysical surveys.

Production notes:

None.

Reserves:

Using two different models, Nicholson (1990) estimated that the Luna deposit contains a resource of 1.8 million tons or 70,000 tons, in both cases with an average grade of 0.9 percent copper, 0.03 percent zinc, and 0.25 ounce of silver per ton.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310109

References:

Arctic Resources Inc., 1981, Doyon Ltd. exploration program, Block 4, 5, 8, and 22: Unpublished report 81-27 for Doyon Ltd., p. 1-36 (

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

Dashevsky, S.S., 1986, Mines, prospects, and geochemical anomalies on Doyon Ltd. regional overselection lands, Alaska Blocks 1 - 8, v; I of II: Unpublished report 86-01A for Doyon Ltd., 42 p. (on file at Doyon Ltd., Fairbanks, Alaska).

Dillon, J.T., Reifenstuhl, R.R., and, Harris, G.W., 1996, Geologic map of the Chandalar C-5 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 104, 2 sheets, scale 1:63,360.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Newberry, R.J., Allegro, G.L., Cutler, S.E., Hagen-Levelle, D.D., Adams, D.D., Nicholson, L.C., Weglarz, T.B., Bakke, A.A., Clautice, K.H., Coulter, G.A., Ford, M.J., Myers, G.L., and Szumigala, D.J., 1997, Skarn deposits of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 355-395.

Newberry, R.J., Dillon, J.T., and Adams, D.D., 1986, Regionally metamorphosed calc-silicate-hosted deposits of the Brooks Range, northern Alaska: Economic Geology, v. 81, p. 1728-1752.

Nicol, D.L., 1983, Evaluation of the mineral potential of Doyon Ltd.'s Block 5 and 22 (unpublished report 83-04 for Doyon Ltd., (on file at Doyon Ltd., Fairbanks, Alaska).

Nicholson, L.M., 1990, Porphyry copper, copper skarn, and volcanogenic massive sulfide occurrences in the Chandalar copper district, Alaska: Fairbanks, University of Alaska, M.Sc. thesis, 164 p.

Swainbank, R.C., Clautice, K.C., and Nauman, J.L., 1998, Alaska's mineral industry, 1997: Alaska Division of Geological and Geophysical Surveys Special Report 52, 65 p.

WGM Inc., 1978, 1977 Annual progress report, Doyon Ltd. project, v. II, Luna area: Unpublished report 78-04 for Doyon Ltd., 15 p. (on file at Doyon Ltd., Fairbanks, Alaska).

WGM Inc., 1979, 1978 Doyon Ltd. annual progress report, Block 5 Luna volcanogenic massive sulfide and associated base-metal deposits and anomalies of the Chandalar Copper Belt: Unpublished report 79-21 for Doyon Ltd., 35 p. (on file at Doyon Ltd., Fairbanks, Alaska).

WGM Inc., 1980, 1979 annual profess report, Block 5-Wiseman Chandalar Cop[er Belt: Unpublished report 80-06 for Doyon Ltd., 28 p. (on file at Doyon Ltd., Fairbanks, Alaska).

Ventures Resource Corporation, 1999, 1999 Annual report: Ventures Resource Corporation, 36 p.

Primary Reference: Ventures Resource Corporation, 1998; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Big Jim Creek

Site type: Occurrence

ARDF no.: CH106

Latitude: 67.8587 **Quadrangle:** CH D-6

Longitude: 149.9522

Location description and accuracy:

This site is at an elevation of about 3,500 feet, approximately 0.6 mile north-northwest of the mouth of Big Jim Creek on Jim Creek. It is about 0.5 mile west of the center of section 13, T. 35 N., R. 11 W. The location is accurate to within a half mile.

Commodities:

Main: Cu, Pb

Other:

Ore minerals: Azurite, chalcopyrite, galena, malachite

Gangue minerals: Quartz

Geologic description:

This occurrence was originally described as galena and copper sulfides with malachite-azurite staining in Upper Devonian phyllite with some siltstone and sandstone (Brosgé and Reiser, 1964). Kurtak and others (2002) identified a 50-foot-wide zone of quartz veins that are exposed along strike for about 100 feet. There are two sets of veins; one parallel to the foliation of the phyllite host rock, and the other one crosscuts it. Both are deformed by post-mineralization folding. A sample of a 3-foot-wide quartz vein with chalcopyrite and a trace of galena contained 0.36 percent copper.

Alteration:

None noted.

Age of mineralization:

Late Devonian or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Quartz vein with chalcopyrite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only limited sampling by government agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

This occurrence is in the Gates of the Arctic National Park which is closed to prospecting and mining.

MAS No. 0020310073

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., and Cruz, E.L., 1983, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in the Chandalar quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-278, 91 p.

DeYoung, J.H., Jr., 1978, Mineral resources map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-878-B, 2 sheets, scale 1:250,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

U.S. Bureau of Mines, 1978, Mineral appraisal of the proposed Gates of the Arctic Wilderness National Park, Alaska--A preliminary comment: U.S. Bureau of Mines Open-File Report 109-78, 29 p., 4 sheets.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Willow Creek

Site type: Mine?

ARDF no.: CH109

Latitude: 67.6632 **Quadrangle:** CH C-4

Longitude: 148.9764

Location description and accuracy:

Willow Creek is a 5-mile-long, headwater tributary to Robert Creek, approximately 7 miles north-northeast of the north end of Twin Lakes. There is an early reference to placer prospecting on Willow Creek but no information on its location along the creek. Arbitrarily, this site is located about 2 miles upstream from the mouth of the creek, near the northeast corner of section 30, T. 33 N., R. 6 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Reed (1938) reported that very good placer gold prospects were found in Willow Creek in the early 1900s. A small amount of gold was probably produced during the prospecting. Kurtak and others (2002) note that 28 placer claims were staked and kept current on Willow Creek from 1982 to 1986. They saw no evidence, however, of past or ongoing mining along the creek. Some of their panned concentrates from the creek contained small amounts of gold.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Undetermined

Site Status: Inactive

Workings/exploration:

Reed (1938) reported that very good placer gold prospects were found in Willow Creek in the early 1900s. Kurtak and others (2002) note that 28 placer claims were staked and kept current on Willow Creek from 1982 to 1986. They saw no evidence, however, of past or ongoing mining along the creek.

Production notes:

A small amount of gold was probably recovered during prospecting.

Reserves:

None.

Additional comments:

MAS No. 0020310074

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Reed, I.M., 1938 (1939), Report on lode mining and development in the year 1938 in the Fairbanks district: Alaska Territorial Department of Mines Miscellaneous Report 194-6, 28 p.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Pioneer; Grubstake East

Site type: Prospects

ARDF no.: CH110

Latitude: 67.5562 **Quadrangle:** CH C-3

Longitude: 148.1442

Location description and accuracy:

The several Pioneer prospects are centered about 0.1 mile southwest of Crystal Peak at an elevation of about 4,000 feet, about 0.2 mile northeast of the center of section 35, T. 32 N., R. 3 W. The location is accurate.

Commodities:

Main: As, Au

Other:

Ore minerals: Arsenopyrite, gold

Gangue minerals:

Geologic description:

Placer gold was discovered in the Chandalar area on Little Squaw Creek (CH039) in 1902 (Barker, and Bundtzen, 2004; Barker, 2007; Barker and others, 2009). By 1909, four quartz veins including the Mikado vein had been discovered and many more were located prior to WWI. Most of the important properties in the district were consolidated by William Sulzer from 1909 to 1941; the Mikado Mine was one of the prominent deposits of the Chandalar area and was included. Those properties were taken over in 1946 to form the Little Squaw Mining Company in 1959, which in turn became the Little Squaw Gold Mining Company in 1968. From 1967 to 1999, Little Squaw Gold Mining Company leased some of their Chandalar lode and placer ground for mining and/or exploration to a succession of companies, notably the Chandalar Gold Mining and Milling Company (1967-1971), Noranda Mining (1974-1976), the Chandalar Development Corporation (1980-1983), and Gold Dust Mines (1989-1999). There was some earlier small lode production from the district but the first documented gold produced from the lodes was 870 ounces produced from 1967 to 1971 from the Mikado and Summit mines by the Chandalar Gold Mining and Milling Company. Subsequently, Chandalar Development produced 8,169 ounces of lode gold from the Mikado and Summit Mines but recovery was poor. In 2003, Little Squaw Gold Mining Company and its direct descendent Goldrich Mining Company began an aggressive exploration program for lode and placer deposits over a large block of land that covers almost all of the known deposits in the Chandalar area and as of early 2010, that effort continued (Goldrich Mining Company, 2010).

The geology of the Chandalar area is dominated by a system of west-northwest-trending regional faults including a prominent thrust fault in the southern part of the district and a series of major high-angle faults through the center of the area (Bundtzen and Laird, 2009a, 2009b). These faults separate the rocks into two principal units, a west-northwest-trending Upper Plate unit about 3 miles wide in the center of the area and a Lower Plate unit to the north and south. The contact of the two units is a thrust fault on the south side of the Upper Plate rocks and a high-angle fault on the north side. Most of the Upper Plate rocks consist of Devonian upper-greenschist-facies metamorphic rocks, mainly carbonaceous schist; quartz-chlorite-muscovite schist, schist and phyllite derived from turbidites that comprise the Mikado Phyllite, metamorphosed calcareous sandstone, and quartz-muscovite schist. The Lower Plate rocks consist of Devonian, upper-greenschist-facies metamorphic rocks, mainly metamorphosed volcanic agglomerate, chlorite-rich tuffaceous schist, quartz-mica schist derived from mudstone, mica-quartz schist, and quartzite.

Both the Upper and Lower Plate rocks are cut by irregular masses, dikes and sills of greenstone, metagabbro, and metadiorite of unknown age. Most of the mineral deposits in the Chandalar area are in the Upper Plate rocks and the deposits often are along the regional, steep-to-vertical, west-northwest-trending faults. There is an additional conjugate set of north-northeast-trending faults that offset the Upper Plate rocks and at least some of the mineralization may be localized at the intersections of the regional west-northwest-trending faults and the conjugate faults.

Several veins are exposed in trenches and pits on the ridge just southwest of Crystal Peak (Barker and Bundtzen, 2004; Barker, 2006, 2007; Barker and others, 2009). The veins are aligned along or a component of the Pioneer Fault zone which can be traced for almost 6 miles and is probably the most continuous structural feature in the Chandalar district; it trends about N65-75W. At least two veins are exposed in the Pioneer workings; they consist of discontinuous lenses of shattered quartz, sericite, and clay from a few inches to three feet thick, generally in the footwall of the Pioneer fault. The host rocks are quartz-muscovite schist of the Upper Plate unit. Float and outcrop samples contained up to 7.54 ounces of gold per ton (Strandberg, 1990). However, systematic channel samples across the veins assayed 0.02 to 2.523 ounces of gold per ton (Swanson and Ashworth, 1981).

The Pioneer fault continues northwest across Little Squaw Creek to the Grubstake East and Prospector East (CH111) prospects. The Grubstake East prospect is about 0.8 mile northwest of the Pioneer prospects in the valley of Little Squaw Creek. There is no outcrop at the Grubstake East prospect nor up the hillside to the Pioneer prospects. There is a small caved adit at the Grubstake East prospect and several prospect trenches. A single float sample of scorodite-stained quartz contained 5.18 parts per million gold.

The gold veins in the Chandalar district are considered mesothermal (Barker and others, 2004) by comparison similar deposits elsewhere and in consideration of fluid inclusion and oxygen and lead isotope studies of the Chandalar mineralization (Ashworth, 1983; Rose and others, 1988; Gacetta and Church, 1989).

Alteration:

Not specifically noted.

Age of mineralization:

Possibly Middle Cretaceous based on the assertion of Dillon (1982) that the gold-quartz veins of the central Brooks Range are that age. However, there is no definitive data for the age of the veins of the Chandalar area.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

The work includes trenches, several prospect pits, and considerable surface sampling and examination over many years in several episodes of work by industry. In early 2010, this is one of the sites that was being studied by Goldrich Mining Company during their intensive exploration of the Chandalar area.

Production notes:

None.

Reserves:

None.

Additional comments:

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Strandberg E.O. Jr., 1990, Description of Properties, Chandalar Mining District, Alaska: Unpublished company report, 143 p. 14 plates.

Primary Reference: Barker and others, 2009

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Prospector East

Site type: Prospect

ARDF no.: CH111

Latitude: 67.565 **Quadrangle:** CH

Longitude: 148.1882

Location description and accuracy:

The Prospector East prospect is at an elevation of about 3500 feet along the ridge about 1.2 miles north-northeast of Little Squaw Peak. It if about 0.3 mile south of the center of section 27, T. 32 N., R. 3 W. The location is accurate.

Commodities:

Main: Ag, Au, Bi, Cd, Pb

Other:

Ore minerals: Galena, gold

Gangue minerals: Quartz

Geologic description:

Placer gold was discovered in the Chandalar area on Little Squaw Creek (CH039) in 1902 (Barker, and Bundtzen, 2005; Barker, 2007; Barker and others, 2009). By 1909, four quartz veins had been discovered and many more were located prior to WWI. Most of the important properties in the district were consolidated by William Sulzer from 1909 to 1941. Those properties were taken over in 1946 into what became the Little Squaw Mining Company in 1959 and the Little Squaw Gold Mining Company in 1968. In 2008, the Little Squaw Gold Mining Company became the Goldrich Mining Company, the operator as of early 2010 (Goldrich Mining Company, 2010). From 1967 to 1999, Little Squaw Gold Mining Company leased some of their Chandalar lode and placer ground for mining and/or exploration to a succession of companies, notably the Chandalar Gold Mining and Milling Company (1967-1971), Noranda Mining (1974-1976), the Chandalar Development Corporation (1980-1983), and Gold Dust Mines (1989-1999). There was some earlier small lode production from the district but the first documented gold produced from the lodes was 870 ounces produced from 1967 to 1980 from the Mikado Mine by the Chandalar Gold Mining and Milling Company. In 2003, Little Squaw Gold Mining Company and its direct descendent Goldrich Mining Company began an aggressive exploration program for lode and placer deposits over a large block of land that covers almost all of the know deposits in the Chandalar area and as of early 2010, that effort continued (Goldrich Mining Company, 2010).

The geology of the Chandalar area is dominated by a system of west-northwest-trending regional faults including a major thrust fault in the southern part of the district and a series of major high-angle faults through the center of the area (Bundtzen and Laird, 2009a, 2009b). These faults separate the rocks into two major units, a west-northwest-trending Upper Plate unit about 3 miles wide in the center of the area and a Lower Plate unit to the north and south. The contact of the two units is a major thrust fault on the south side of the Upper Plate rocks and a high-angle fault on the north side. Most of the Upper Plate rocks consist of Devonian upper-Greenschist-facies metamorphic rocks, mainly carbonaceous schist; quartz-chlorite-muscovite schist, schist and phyllite derived from turbidites that comprise the Mikado Phyllite, metamorphosed calcareous sandstone, and quartz-muscovite schist. The Lower Plate rocks consist of Devonian, upper-Greenschist facies metamorphic rocks, mainly metamorphosed volcanic agglomerates, chlorite-rich tuffaceous schist, quartz-mica schist derived from mudstone, mica-quartz schist, and quartzite. Both the Upper and Lower Plate rocks are cut by irregular masses, dikes and sills of greenstone,

metagabbro, and metadiorite of unknown age. Most of the mineral deposits in the Chandalar area are in the Upper Plate rocks and the deposits often occur along the regional, steep-to-vertical, west-northwest-trending faults. There is an additional set of north-northeast-trending conjugate faults that offset the Upper Plate rocks and at least some of the mineralization may be localized at the intersections of the regional west-northwest-trending faults and the conjugate faults.

The vein at the Prospect East prospect is not exposed but can be traced northwest for about 400 feet in shallow trenches and a short caved adit. In the Chandalar district, it is uniquely a silver prospect (Barker and Bundtzen, 2004, Barker, 2006; Barker, 2007; Barker and others, 2009). Two samples contained 171 and 740 parts per million (ppm) silver, 2.94 and 2.50 ppm gold, and up to 11.65 percent lead, 1,120 ppm bismuth, and 104 ppm cadmium. Barker (2009) considers the mineralization to be the northwest extension along the Pioneer fault of the mineralization at the Pioneer and Grubstake East prospects (CH110). The gold veins in the Chandalar district are considered mesothermal (Barker and Bundtzen, 2004) by comparison with similar deposits elsewhere and consideration of fluid inclusion and oxygen and lead isotope studies of the Chandalar mineralization (Ashworth, 1983; Rose and others, 1988; Gacetta and Church, 1989).

Alteration:

Not noted specifically.

Age of mineralization:

Possibly Middle Cretaceous based on the assertion of Dillon (1982) that the gold-quartz veins of the central Brooks Range are that age. However, there is no definitive data for the age of the veins of the Chandalar area.

Generic deposit model:

Deposit model:

Silver-lead-gold-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

A few old trenches and a short, caved adit. As of early 2010, this is one of the sites being studied by Goldrich Mining Company in their intensive exploration of the Chandalar area.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Ashworth, K.K., 1983, Genesis of gold deposits at the Little Squaw mines, Chandalar mining district, Alaska: Bellingham, Western Washington University, M.Sc. thesis, 98 p.

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Primary Reference: Barker, 2009

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Crystal

Site type: Mine

ARDF no.: CH112

Latitude: 67.5449 **Quadrangle:** CH C-3

Longitude: 148.164

Location description and accuracy:

The Crystal Mine is in a low saddle on the ridge about 0.9 mile southwest of Crystal Peak. It is about 0.6 mile northwest of the center of section 2, T. 31 N., R. 3 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold, pyrite

Gangue minerals: Quartz

Geologic description:

Placer gold was discovered in the Chandalar area on Little Squaw Creek (CH039) in 1902 (Barker, and Bundtzen, 2004; Barker, 2007; Barker and others, 2009). By 1909, four quartz veins including the Crystal vein had been discovered and many more were located prior to WWI. Most of the important properties in the district were consolidated by William Sulzer from 1909 to 1941; the Mikado Mine was one of the prominent deposits of the Chandalar area and was included. Those properties were taken over in 1946 to form the Little Squaw Mining Company in 1959, which in turn became the Little Squaw Gold Mining Company in 1968. From 1967 to 1999, Little Squaw Gold Mining Company leased some of their Chandalar lode and placer ground for mining and/or exploration to a succession of companies, notably the Chandalar Gold Mining and Milling Company (1967-1971), Noranda Mining (1974-1976), the Chandalar Development Corporation (1980-1983), and Gold Dust Mines (1989-1999). There was some earlier small lode production from the district but the first documented gold produced from the lodes was 870 ounces produced from 1967 to 1971 from the Mikado and Summit mines by the Chandalar Gold Mining and Milling Company. Subsequently, Chandalar Development produced 8,169 ounces of lode gold from the Mikado and Summit Mines but recovery was poor. In 2003, Little Squaw Gold Mining Company and its direct descendent Goldrich Mining Company began an aggressive exploration program for lode and placer deposits over a large block of land that covers almost all of the known deposits in the Chandalar area and in early 2010, that effort continued (Goldrich Mining Company, 2010).

The geology of the Chandalar area is dominated by a system of west-northwest-trending regional faults including a prominent thrust fault in the southern part of the district and a series of major high-angle faults through the center of the area (Bundtzen and Laird, 2009a, 2009b). These faults separate the rocks into two principal units, a west-northwest-trending Upper Plate unit about 3 miles wide in the center of the area and a Lower Plate unit to the north and south. The contact of the two units is a thrust fault on the south side of the Upper Plate rocks and a high-angle fault on the north side. Most of the Upper Plate rocks consist of Devonian upper-greenschist-facies metamorphic rocks, mainly carbonaceous schist; quartz-chlorite-muscovite schist, schist and phyllite derived from turbidites that comprise the Mikado Phyllite, metamorphosed calcareous sandstone, and quartz-muscovite schist. The Lower Plate rocks consist of Devonian, upper-greenschist-facies metamorphic rocks, mainly metamorphosed volcanic agglomerate, chlorite-rich tuffaceous schist, quartz-mica schist derived from mudstone, mica-quartz schist, and quartzite. Both the Upper and Lower Plate rocks are cut by irregular masses, dikes and sills of greenstone,

metagabbro, and metadiorite of unknown age. Most of the mineral deposits in the Chandalar area are in the Upper Plate rocks and the deposits often are along the regional, steep-to-vertical, west-northwest-trending faults. There is an additional conjugate set of north-northeast-trending faults that offset the Upper Plate rocks and at least some of the mineralization may be localized at the intersections of the regional west-northwest-trending faults and the conjugate faults. The Crystal Mine is in schist of the Upper Plate and occurs along the Little Squaw faults that continues across Little Squaw Creek to the Little Squaw Mine (CH040) (Barker and others, 2009).

The Crystal Mine was discovered by 1909 and developed by a prospect shaft and short crosscut (Barker and Bundtzen, 2005; Barker 2006; Barker and others, 2009). As then described, the Crystal vein was 6.5 to 9 feet thick and grab samples assayed 10.0 to 43.2 ounces of gold per ton. The vein is has several distinct bands, one of which has a ribbon structure; the vein consist of quartz with pyrite (arsenopyrite?). A 1908 report indicates that 4.5 tons of ore was processed at the Little Squaw mill. By 2005, the old shaft and workings were sloughed or covered by talus. Little Squaw Gold Mining Company drilled two holes but failed to intersect the vein because of unexpected faults.

Alteration:

Not specifically noted. However, many of the veins in the area such as Crystal are aligned along major faults that are marked by much clay and gouge.

Age of mineralization:

Possibly Middle Cretaceous based on the assertion of Dillon (1982) that the gold-quartz veins of the central Brooks Range are that age. However, there is no definitive data for the age of the veins of the Chandalar area.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Developed by a shaft and a short crosscut by 1909. Two holes drilled in 2006. In early 2010, this was one of the sites being studied by Goldrich Mining Company in their intensive exploration of the Chandalar area (Goldrich Mining Company, 2010).

Production notes:

A 1908 report indicates that 4.5 tons of ore was processed at the Little Squaw mill.

Reserves:

None.

Additional comments:

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Stanford, J.V., 1931, Report on Little Squaw, Bonanza, and Mikado groups of claims, Chandalar, Alaska: Alaska Territorial Department of Mines Miscellaneous Report 31-5, 10 p.

Primary Reference: Barker, 2009

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): St Marys

Site type: Prospect

ARDF no.: CH113

Latitude: 67.5242 **Quadrangle:** CH

Longitude: 148.2138

Location description and accuracy:

St Marys Creek is an informal name for the mile-long creek that flows southeast into upper Big Creek; the mouth of St Marys Creek is about 1.2 miles east of McLellan Mountain. This lode prospect is at bedrock at about the middle of the creek, about 0.3 mile east-southeast of the center of section 9, T. 32 N., R. 3 W., was mined. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals: Quartz

Geologic description:

Placer gold was discovered in the Chandalar area on Little Squaw Creek (CH039) in 1902 (Barker, and Bundtzen, 2004; Barker, 2007; Barker and others, 2009). By 1909, four quartz veins including the Mikado vein had been discovered and many more were located prior to WWI. Most of the important properties in the district were consolidated by William Sulzer from 1909 to 1941; the Mikado Mine was one of the prominent deposits of the Chandalar area and was included. Those properties were taken over in 1946 to form the Little Squaw Mining Company in 1959, which in turn became the Little Squaw Gold Mining Company in 1968. From 1967 to 1999, Little Squaw Gold Mining Company leased some of their Chandalar lode and placer ground for mining and/or exploration to a succession of companies, notably the Chandalar Gold Mining and Milling Company (1967-1971), Noranda Mining (1974-1976), the Chandalar Development Corporation (1980-1983), and Gold Dust Mines (1989-1999). There was some earlier small lode production from the district but the first documented gold produced from the lodes was 870 ounces produced from 1967 to 1971 from the Mikado and Summit mines by the Chandalar Gold Mining and Milling Company. Subsequently, Chandalar Development produced 8,169 ounces of lode gold from the Mikado and Summit Mines but recovery was poor. In 2003, Little Squaw Gold Mining Company and its direct descendent Goldrich Mining Company began an aggressive exploration program for lode and placer deposits over a large block of land that covers almost all of the known deposits in the Chandalar area and in early 2010, that effort continued (Goldrich Mining Company, 2010).

The geology of the Chandalar area is dominated by a system of west-northwest-trending regional faults including a prominent thrust fault in the southern part of the district and a series of major high-angle faults through the center of the area (Bundtzen and Laird, 2009a, 2009b). These faults separate the rocks into two principal units, a west-northwest-trending Upper Plate unit about 3 miles wide in the center of the area and a Lower Plate unit to the north and south. The contact of the two units is a thrust fault on the south side of the Upper Plate rocks and a high-angle fault on the north side. Most of the Upper Plate rocks consist of Devonian upper-greenschist-facies metamorphic rocks, mainly carbonaceous schist; quartz-chlorite-muscovite schist, schist and phyllite derived from turbidites that comprise the Mikado Phyllite, metamorphosed calcareous sandstone, and quartz-muscovite schist. The Lower Plate rocks consist of Devonian, upper-greenschist-facies metamorphic rocks, mainly metamorphosed volcanic agglomerate,

chlorite-rich tuffaceous schist, quartz-mica schist derived from mudstone, mica-quartz schist, and quartzite. Both the Upper and Lower Plate rocks are cut by irregular masses, dikes and sills of greenstone, metagabbro, and metadiorite of unknown age. Most of the mineral deposits in the Chandalar area are in the Upper Plate rocks and the deposits often are along the regional, steep-to-vertical, west-northwest-trending faults. There is an additional conjugate set of north-northeast-trending faults that offset the Upper Plate rocks and at least some of the mineralization may be localized at the intersections of the regional west-northwest-trending faults and the conjugate faults. The St Marys prospect is in the upper plate rocks along the Mikado fault, one of the prominent west-northwest trending fault zones in the region.

Oxidized quartz veins in fault gouge were found on bedrock during placer mining on St Marys Creek in 1993 (Barker and Bundtzen, 2004) There are at least two veins (Barker, 2007). One is in the creek bottom; it is up to 10 feet thick and parallels a body of quartz-iron oxide breccia, 6 feet or more thick. The other only can be traced in float. None of the samples carried significant gold. However, an unpublished company report in the Goldrich Mining Company records cites a sample that contained 0.24 ounce of gold per ton across an 11-foot-wide quartz vein in the bed of St Marys Creek.

Barker and others (2009) propose that this prospect is at the southeast end of a belt of mineralization 4,000 or more feet long that extends to here from the Mikado Mine (CH045) along the Mikado fault. Numerous trenches between the Mikado Mine and this prospect have uncovered quartz veins with gold values. They suggest that the greatest economic potential of this belt is the extensive lower grade and probably relatively continuous mineralization that surrounds the rich gold-quartz lenses along the belt such as were mined at the Mikado Mine.

Alteration:

Age of mineralization:

Possibly Middle Cretaceous based on the assertion of Dillon (1982) that the gold-quartz veins of the central Brooks Range are that age. However, there is no definitive data for the age of the veins of the Chandalar area.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

Trenched and sampled in 2006.

Production notes:

None.

Reserves:

None.

Additional comments:

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Ashworth, (Lamal) Kate, 1984, Fluid inclusion study of the Eneveloe Vein, Chandalar Mining District: Private Report, Chandalar Development Associates, 8 pages (in files of the Goldrich Mining Company.

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Chipp, E.R., 1970, Geology and geochemistry of the Chandalar area, Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 42, 39 p., 1 sheet, scale 1:3,000.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

Goldrich Mining Company, 2010, Chandalar, Alaska; Project overview: http://www.goldrichmining.com/pages/prop_chan_over.htm (as of February 16, 2010).

Mertie, J.B., Jr., 1925, Geology and gold placers of the Chandalar district, in Brooks, A.H., and others, Mineral resources of Alaska, report on progress of investigations in 1923: U.S. Geological Survey Bulletin 773, p. 215-263.

Primary Reference: Barker, 2007; Barker and others, 2009

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Rachet Ridge

Site type: Prospect

ARDF no.: CH114

Latitude: 67.5395 **Quadrangle:** CH

Longitude: 148.1825

Location description and accuracy:

The Rachet Ridge prospect is at the east side of the pass between the head of Little Squaw Creek and Big Creek. It is about 0.8 mile southeast of Little Squaw Peak, about 0.3 mile southeast of the center of section 3, T. 31 N., R. 3 W. The location is accurate.

Commodities:

Main: Au

Other: As, Pb

Ore minerals: Arsenopyrite, galena, gold, pyrrhotite

Gangue minerals: Quartz

Geologic description:

Placer gold was discovered in the Chandalar area on Little Squaw Creek (CH039) in 1902 (Barker, and Bundtzen, 2004; Barker, 2007; Barker and others, 2009). By 1909, four quartz veins and many more were located prior to WWI. Most of the important properties in the district were consolidated by William Sulzer from 1909 to 1941; the Mikado Mine was one of the prominent deposits of the Chandalar area and was included. Those properties were taken over in 1946 to form the Little Squaw Mining Company in 1959, which in turn became the Little Squaw Gold Mining Company in 1968. From 1967 to 1999, Little Squaw Gold Mining Company leased some of their Chandalar lode and placer ground for mining and/or exploration to a succession of companies, notably the Chandalar Gold Mining and Milling Company (1967-1971), Noranda Mining (1974-1976), the Chandalar Development Corporation (1980-1983), and Gold Dust Mines (1989-1999). There was some earlier small lode production from the district but the first documented gold produced from the lodes was 870 ounces produced from 1967 to 1971 from the Mikado and Summit mines by the Chandalar Gold Mining and Milling Company. Subsequently, Chandalar Development produced 8,169 ounces of lode gold from the Mikado and Summit Mines but recovery was poor. In 2003, Little Squaw Gold Mining Company and its direct descendent Goldrich Mining Company began an aggressive exploration program for lode and placer deposits over a large block of land that covers almost all of the known deposits in the Chandalar area and in early 2010, that effort continued (Goldrich Mining Company, 2010).

The geology of the Chandalar area is dominated by a system of west-northwest-trending regional faults including a prominent thrust fault in the southern part of the district and a series of major high-angle faults through the center of the area (Bundtzen and Laird, 2009a, 2009b). These faults separate the rocks into two principal units, a west-northwest-trending Upper Plate unit about 3 miles wide in the center of the area and a Lower Plate unit to the north and south. The contact of the two units is a thrust fault on the south side of the Upper Plate rocks and a high-angle fault on the north side. Most of the Upper Plate rocks consist of Devonian upper-greenschist-facies metamorphic rocks, mainly carbonaceous schist; quartz-chlorite-muscovite schist, schist and phyllite derived from turbidites that comprise the Mikado Phyllite, metamorphosed calcareous sandstone, and quartz-muscovite schist. The Lower Plate rocks consist of Devonian, upper-greenschist-facies metamorphic rocks, mainly metamorphosed volcanic agglomerate, chlorite-rich tuffaceous schist, quartz-mica schist derived from mudstone, mica-quartz schist, and quartzite.

Both the Upper and Lower Plate rocks are cut by irregular masses, dikes and sills of greenstone, metagabbro, and metadiorite of unknown age. Most of the mineral deposits in the Chandalar area are in the Upper Plate rocks and the deposits often are along the regional, steep-to-vertical, west-northwest-trending faults. There is an additional conjugate set of north-northeast-trending faults that offset the Upper Plate rocks and at least some of the mineralization may be localized at the intersections of the regional west-northwest-trending faults and the conjugate faults. The rocks in the Rachet Ridge prospect area are part of the Upper Plate.

There was no record of work at the Rachet prospect until it was explored by Little Squaw Gold Mining Company in 2006. They found a short adit and several hand-dug pits that probably date to the early days of the district. In 2006, they excavated a trench on the prospect and drilled three reverse-circulation holes.

The rocks at the prospect are similar to those at the nearby Summit Mine (CH041), black carbonaceous schist overlain by light-gray, muscovite-chlorite-quartz schist. The Summit fault, one of the west-northwest-striking regional faults, is along the south side of the prospect. The veins at the prospect splay from the Summit fault and strike about N70E. There are at least 5 veins; where exposed they are about 2 feet thick. A quartz-vein sample with arsenopyrite and galena contained 2.88 parts per million (ppm) gold. One drill hole showed considerable pyrrhotite, arsenopyrite, and pyrite for 20 feet. Another had a 5-foot intercept with 0.28 ppm gold and a 10-foot interval with 0.32 ppm gold.

Alteration:

Not specifically mentioned.

Age of mineralization:

Possibly Middle Cretaceous based on the assertion of Dillon (1982) that the gold-quartz veins of the central Brooks Range are that age. However, there is no definitive data for the age of the veins of the Chandalar area.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

An old adit and several pits probably date to the early 1900s. No record of any work until Little Squaw Gold Mining Company examined and sampled the prospect, did a magnetic survey, dug a trench, and drilled three, reverse-circulation holes in 2006.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Barker, J.C., 2006, Chandalar Mining District, a report of findings and recommendations, 2005: Unpublished report for Little Squaw Gold Mining Company, 93 p. (on the Internet at http://www.goldrichmining.com/Files/corporate/2005AnnualReport011906.pdf, as of February 14, 2010).

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Barker, J.C., and Bundtzen, T.K., 2004, Gold deposits of the Chandalar Mining District, Northern Alaska: An information review and recommendations: Unpublished report for the Little Squaw Gold Mining Company, 165 p. (in the files of the Goldrich Mining Company).

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Buzzell, R.G., 2007, History of the Caro-Coldfoot trail (RST 262) and the Coldfoot-Chandalar trail (RST 9): Alaska Office of History and Archaeology, Report 17, 138 p.

Chipp, E.R., 1970, Geology and geochemistry of the Chandalar area, Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 42, 39 p., 1 sheet, scale 1:3,000.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

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Mertie, J.B., Jr., 1925, Geology and gold placers of the Chandalar district, in Brooks, A.H., and others, Mineral resources of Alaska, report on progress of investigations in 1923: U.S. Geological Survey Bulletin

Primary Reference: Barker, 2007; Barker and others, 2009

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Kiska; Chiga; Star

Site type: Prospects

ARDF no.: CH115

Latitude: 67.5347 **Quadrangle:** CH C-3

Longitude: 148.216

Location description and accuracy:

The Kiska prospect is along the ridge top about 0.9 mile south-southwest of Little Squaw Peak. It is near the southeast corner of section 4, T. 31 N., R. 3 W. The Chiga prospect is about 1,500 feet north of the Kiska prospect. The coordinates are for the Kiska prospect and the locations are accurate.

Commodities:

Main: Au

Other: As, Sb

Ore minerals: Gold, stibnite

Gangue minerals: Quartz

Geologic description:

Placer gold was discovered in the Chandalar area on Little Squaw Creek (CH039) in 1902 (Barker, and Bundtzen, 2004; Barker, 2007; Barker and others, 2009). By 1909, four quartz veins and many more were located prior to WWI. Most of the important properties in the district were consolidated by William Sulzer from 1909 to 1941; the Mikado Mine was one of the prominent deposits of the Chandalar area and was included. Those properties were taken over in 1946 to form the Little Squaw Mining Company in 1959, which in turn became the Little Squaw Gold Mining Company in 1968. From 1967 to 1999, Little Squaw Gold Mining Company leased some of their Chandalar lode and placer ground for mining and/or exploration to a succession of companies, notably the Chandalar Gold Mining and Milling Company (1967-1971), Noranda Mining (1974-1976), the Chandalar Development Corporation (1980-1983), and Gold Dust Mines (1989-1999). There was some earlier small lode production from the district but the first documented gold produced from the lodes was 870 ounces produced from 1967 to 1971 from the Mikado and Summit mines by the Chandalar Gold Mining and Milling Company. Subsequently, Chandalar Development produced 8,169 ounces of lode gold from the Mikado and Summit Mines but recovery was poor. In 2003, Little Squaw Gold Mining Company and its direct descendent Goldrich Mining Company began an aggressive exploration program for lode and placer deposits over a large block of land that covers almost all of the known deposits in the Chandalar area and in early 2010, that effort continued (Goldrich Mining Company, 2010).

The geology of the Chandalar area is dominated by a system of west-northwest-trending regional faults including a prominent thrust fault in the southern part of the district and a series of major high-angle faults through the center of the area (Bundtzen and Laird, 2009a, 2009b). These faults separate the rocks into two principal units, a west-northwest-trending Upper Plate unit about 3 miles wide in the center of the area and a Lower Plate unit to the north and south. The contact of the two units is a thrust fault on the south side of the Upper Plate rocks and a high-angle fault on the north side. Most of the Upper Plate rocks consist of Devonian upper-greenschist-facies metamorphic rocks, mainly carbonaceous schist; quartz-chlorite-muscovite schist, schist and phyllite derived from turbidites that comprise the Mikado Phyllite, metamorphosed calcareous sandstone, and quartz-muscovite schist. The Lower Plate rocks consist of Devonian, upper-greenschist-facies metamorphic rocks, mainly metamorphosed volcanic agglomerate, chlorite-rich tuffaceous schist, quartz-mica schist derived from mudstone, mica-quartz schist, and quartzite.

Both the Upper and Lower Plate rocks are cut by irregular masses, dikes and sills of greenstone, metagabbro, and metadiorite of unknown age. Most of the mineral deposits in the Chandalar area are in the Upper Plate rocks and the deposits often are along the regional, steep-to-vertical, west-northwest-trending faults. There is an additional conjugate set of north-northeast-trending faults that offset the Upper Plate rocks and at least some of the mineralization may be localized at the intersections of the regional west-northwest-trending faults and the conjugate faults. The Kiska and Chiga prospect are in Upper Plate rocks near the contact of black, carbonaceous phyllite and schist of the Mikado Phyllite with muscovite-chlorite-quartz schist.

The Kiska and Star veins are typical of those in the district; they are gold quartz veins with a few percent sulfides, mainly arsenopyrite and some galena. Barker (2007) show that both the Kiska and Star veins trend west- northwest, i.e., parallel to the regional faults in the district that often control the mineralization.

No rocks crop out at the Kiska prospect and the old trenches that probably date to before WWII have sloughed (Barker, 2007). Two veins were identified by float of quartz vein and breccia material spread over an area about 1,600 feet long and up to 600 feet wide. The veins strike west-northwest. Fine gold can be panned from the frost boils in the vicinity of the veins and soil sampling shows strong gold and arsenic anomalies over the veins. The fine fraction of soil collected over the veins contained 0.4 to more than 2 parts per million (ppm) gold. Seven holes were drilled on the prospect in 2006. The drilling indicated that the mineralization is discontinuous and only a few short intercepts were cut that contained no more than 2 parts per million gold. After the drilling, a trench was dug over one of the drill holes. Discontinuous pods and lenses of weathered quartz were exposed. One sample contained 422 ppm gold. Another assayed 0.378 ppm gold but when reanalyzed by a metallic-screen assay, it assayed 71.7 ppm gold. The Kiska veins were traced for about 2,500 feet as a magnetic low.

Just north of the Kiska prospect, lenses of black dolomite are found along a fault zone. The dolomite appears to be hydrothermal and samples contain anomalous arsenic.

The nearby Chiga prospect is covered by thick alluvium, talus, and solifluction lobes. Some quartz float is on the surface and soil samples had up to 242 ppm antimony. One trench was cut on the Chiga prospect. One interval in an intensely altered shear zone averaged 1.1 ppm gold across 24 feet. Pods of massive stibnite occur along a fault zone. The Chiga gold and antimony soil anomalies can be traced for 3,200 feet. The high antimony values suggest a style of mineralization that is different from the other vein deposits in the Chandalar district. Most of the veins in the Chandalar district are considered mesothermal (Barker and Bundtzen, 2004) by comparison with similar deposits elsewhere and in consideration of the fluid inclusion and oxygen and lead isotope studies of the Chandalar mineralization (Ashworth, 1983, 1984; Rose and others, 1988; Gacetta and Church, 1989). However, the Chiga may be epithermal.

Alteration:

Not noted specifically. The mineralization is associated with fault zones that have much gouge and clay.

Age of mineralization:

Possibly Middle Cretaceous based on the assertion of Dillon (1982) that the gold-quartz veins of the central Brooks Range are that age. However, there is no definitive data for the age of the veins of the Chandalar area.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a; stibnite vein (Cox and Singer, 1986, model 27d).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a, 27d

Production Status: None

Site Status: Active

Workings/exploration:

Several old hand-dug prospect pits and trenches that probably date to before WWII. Soil and geophysical surveys, 7 drill holes, and several trenches in 2006.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Ashworth, Kate, 1983, Genesis of gold deposits at the Little Squaw Mines, Chandalar Mining District, Alaska: Unpublished Masters of Science Thesis, Western Washington University, Bellingham, 98 pages.

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Rose, S.C., Pickthorn, W.J., and Goldfarb, R.J., 1988, Gold mineralization by metamorphic fluids in the Chandalar Mining District, southern Brooks range-fluid inclusion and oxygen isotopic evidence, in, Galloway, J.P., and Hamilton, T.D., eds., Geologic studies in Alaska by the U.S. Geological Survey during 1987: U.S. Geological Survey Circular 1016, p. 81-84.

Primary Reference: Barker, 2007; Barker and others, 2009

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Rock Glacier

Site type: Prospect

ARDF no.: CH116

Latitude: 67.5428 **Quadrangle:** CH C-3

Longitude: 148.1872

Location description and accuracy:

The Rock Glacier prospect consists is based on abundant float of cobbles and boulders of auriferous quartz-vein material in an area about 800 feet long and 150 feet wide on the lower west side of a prominent rock glacier in the cirque at the head of Little Squaw Creek. The coordinates are at about the center of the prospect. It is about 0.2 mile north of the center of section 3, T. 32 N., R. 3 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

Placer gold was discovered in the Chandalar area on Little Squaw Creek (CH039) in 1902 (Barker and Bundtzen, 2004; Barker, 2007; Barker and others, 2009). By 1909, four quartz veins had been discovered and many more were located prior to WWI. Most of the important properties in the district were consolidated by William Sulzer from 1909 to 1941; the Mikado Mine was one of the prominent deposits of the Chandalar area and was included. Those properties were taken over in 1946 to form the Little Squaw Mining Company in 1959, which in turn became the Little Squaw Gold Mining Company in 1968. From 1967 to 1999, Little Squaw Gold Mining Company leased some of their Chandalar lode and placer ground for mining and/or exploration to a succession of companies, notably the Chandalar Gold Mining and Milling Company (1967-1971), Noranda Mining (1974-1976), the Chandalar Development Corporation (1980-1983), and Gold Dust Mines (1989-1999). In 2003, Little Squaw Gold Mining Company and its direct descendent Goldrich Mining Company began an aggressive exploration program for lode and placer deposits over a large block of land that covers almost all of the known deposits in the Chandalar area and in early 2012 that effort continued (Goldrich Mining Company, 2012).

The geology of the Chandalar area is dominated by a system of west-northwest-trending regional faults including a prominent thrust fault in the southern part of the district and a series of major high-angle faults through the center of the area (Bundtzen and Laird, 2007 [map]; 2007 [83 p.]). These faults separate the rocks into two principal units, a west-northwest-trending Upper Plate unit about 3 miles wide in the center of the area and a Lower Plate unit to the north and south. The contact of the two units is a thrust fault on the south side of the Upper Plate rocks and a high-angle fault on the north side. Most of the Upper Plate rocks consist of Devonian upper-greenschist-facies metamorphic rocks, mainly carbonaceous schist, quartz-chlorite-muscovite schist, schist and phyllite derived from turbidites that comprise the Mikado Phyllite, metamorphosed calcareous sandstone, and quartz-muscovite schist. The Lower Plate rocks consist of Devonian, upper-greenschist-facies metamorphic rocks, mainly metamorphosed volcanic agglomerate, chlorite-rich tuffaceous schist, quartz-mica schist derived from mudstone, mica-quartz schist, and quartzite. Both the Upper and Lower Plate rocks are cut by irregular masses, dikes and sills of greenstone, metagabbro, and metadiorite of unknown age. Most of the mineral deposits in the Chandalar area are in the Upper Plate rocks and the deposits often are along the regional, steep-to-vertical, west-northwest-trending

faults. There is an additional conjugate set of north-northeast-trending faults that offset the Upper Plate rocks and at least some of the mineralization may be localized at the intersections of the regional west-northwest-trending faults and the conjugate faults. This prospect in the cirque at the head of Little Squaw Creek is covered by alluvium, landslide material, glacial deposits, and thick soil with much solifluction. However, the rocks on both sides of the cirque are part of the Upper Plate unit and the rocks under the surficial material in the cirque probably are mostly Mikado Phyllite.

Before 2002 there was no record of mineralization on the prominent rock glacier in the cirque at the head of Little Squaw Creek. During the work by Little Squaw Mining Company (Barker and Bundtzen, 2004; Barker, 2006; Barker, 2007; Barker and others, 2009) an area about 800 feet long and 150 feet wide on the western side of the lower part of the rock glacier was found to be littered with cobbles and boulders of quartz-vein material and of altered argillized and brecciated schist similar to that found at many of the veins in the Chandalar area. A random chip sample of the white quartz contained 4.06 parts per million gold. The quartz float is so abundant that it points to an undiscovered zone of mineralization in the cirque.

Reconstruction of the source of the float indicates that it probably is associated with one of the west-northwest-trending shear zones along which most of the gold deposits in the Chandalar district are located. In this case, it is probably a fault that extends from the Eneveloe Mine (CH046) to the northwest and the Rachet Ridge prospect (CH114) to the southeast. Ground magnetic surveys and geochemical surveys over the likely site of the source of the float suggest that it consists of at least 4 and perhaps 6 veins. In 2011, Goldrich Mining Corp. drilled 5 holes on the Rock Glacier prospect that totaled 850 meters. Of the 15 intercept 0.3 to 11.3 meters long that contained more than 0.5 gram of gold per tonne, the best were 2.1 meters with 6.02 grams of gold per tonne and 1.5 meters with 4.17 grams of gold per tonne.

Alteration:

Abundant quartz-vein float associated with rubble of argillized schist.

Age of mineralization:

Possibly mid-Cretaceous based on the assertion of Dillon (1982) that the gold-quartz veins of the central Brooks Range are that age. However, there is no definitive data for the age of the veins of the Chandalar area.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986, model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

The work on the Rock Glacier prospect from 2004 to 2009 included sampling and geophysical and geochemical surveys. In 2011, Goldrich Mining Corp. drilled 5 holes on the Rock Glacier prospect that totaled 850 meters.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Barker, J.C., 2006, Chandalar Mining District, a report of findings and recommendations, 2005: Unpublished report for Little Squaw Gold Mining Company, 93 p. (on the Internet at http://www.goldrichmining.com/Files/corporate/2005AnnualReport011906.pdf, as of February 14, 2010).

Barker, J.C., 2007, Chandalar Mining District, Annual Report of findings for 2006; Unpublished report for Little Squaw Gold Mining Company, 124 p. (On the Internet at http://www.goldrichmining.com/Files/chandalar/chandalar_barker_rpt_2007.pdf, as of February 14, 2010).

Barker, J.C., and Bundtzen, T.K., 2004, Gold deposits of the Chandalar Mining District, Northern Alaska: An information review and recommendations: Unpublished report for the Little Squaw Gold Mining Company, 165 p. (in the files of the Goldrich Mining Company).

Barker, J.C., Murray, R.B., Keener, J.O., and Martin, P.L., 2009, Evaluation of the Chandalar mining property: Unpublished report prepared for Goldrich Mining Company, 165 p. (on the Internet at http://www.goldrichmining.com/Files/chandalar/Chandalar_tech_rept_4_15_09.pdf, as of February 14, 2010).

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Bundtzen, T.K., and Laird, G.M., 2007, Geology of the Chandalar Mining District, east-central Brooks Range, Northern Alaska: Unpublished technical report for Little Squaw Gold Mining Company, 83 p. (on the Internet at http://www.goldrichmining.com/Files/chandalar/Chandalar_Geo_01_23_07.pdf , as of February 14, 2010).

Buzzell, R.G., 2007, History of the Caro-Coldfoot trail (RST 262) and the Coldfoot-Chandalar trail (RST 9): Alaska Office of History and Archaeology, Report 17, 138 p.

Chipp, E.R., 1970, Geology and geochemistry of the Chandalar area, Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 42, 39 p., 1 sheet, scale 1:3,000.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

Goldrich Mining Company, 2011, Goldrich completes Chandalar, Alaska Phase I exploration drilling: http://www.goldrichmining.com/news/45-goldrich-completes-chandalar-alaska-phase-i-exploration-drilling.html (News release, November 30, 2011).

Primary Reference: Barker, 2007; Barker and others, 2009

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): McLellan Creek

Site type: Mines

ARDF no.: CH117

Latitude: 67.5532 **Quadrangle:** CH C-3

Longitude: 148.0216

Location description and accuracy:

The most prominent area of placer tailings near McLellan Creek is about 0.4 mile north-northeast of the junction of the Little McLellan and McLellan Creeks. The area is about 0.5 mile east-southeast of the center of section 32, T. 32 N., R. 2 W. The coordinates are at this location. Another area nearby is along Little McLellan Creek about 0.9 mile west of the junction of Little McLellan and McLellan Creeks. The locations are accurate.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Other than word-of-mouth, there is little known about placer mining on Little McLellan Creek (Barker and Bundtzen, 2004). However, on their geologic map, Bundtzen and Laird (2009a, 2009b) show two areas of placer tailings near the junction of Little McLellan and McLellan Creeks. The area is covered by glacial till and outwash of two stages of the Itkillik Glaciation and by Quaternary colluvial talus deposits.

The most obvious area that is probably a placer mine is an area about 0.4 mile north-northeast of the junction of the two creeks (Bundtzen, and Laird, 2009a). Satellite imagery available on the Internet (e.g. at www.mapper.acme.com) shows an area about 500 feet long with little vegetation and signs of relatively recent mining(?) activity. The area is about 100 feet higher than McLellan Creek and if it is a placer mine, it may be a bench deposit. It is in an area of glacial till and outwash of the Itkillik II Glaciation.

Bundtzen and Laird (2009a, 2009b) show another area of placer tailings about 0.4 mile long along McLellan Creek, about 0.9 mile west of the junction of Little McLellan and McLellan Creeks. On the Internet satellite imagery, the area is heavily vegetated and placer mining is not obvious. They suggest that this placer may be derived from glacial outwash immediately below a terminal ice position of of the Itkillik II Glaciation.

In early 2010, these placer tailings were on the land being explored by Goldrich Mining Company (2010) in their study of the lodes and placers of the Chandalar district.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Active

Workings/exploration:

Areas of tailings indicate placer mining in the past.

Production notes:

Some gold was possibly produced but there is no published record of it.

Reserves:

Probably none.

Additional comments:

References:

Barker, J.C., and Bundtzen, T.K., 2004, Gold deposits of the Chandalar Mining District, Northern Alaska: An information review and recommendations: Unpublished report for the Little Squaw Gold Mining Company, 165 p. (in the files of the Goldrich Mining Company).

Bundtzen, T.K., and Laird, G.M., 2007a, Geologic map of the Chandalar Mining District, Brooks Range, Northern Alaska, 2007: Unpublished map prepared for Little Squaw Gold Mining Company, 1 sheet, scale 1:20,000. (on the Internet at http://www.goldrichmining.com/Files/chandalar/regional_chandalar_geo_map_final_07.pdf, as of February 14, 2010).

Bundtzen, T.K., and Laird, G.M., 2007b, Geology of the Chandalar Mining District, east-central Brooks Range, Northern Alaska: Unpublished technical report for Little Squaw Gold Mining Company, 83 p. (on the Internet at http://www.goldrichmining.com/Files/chandalar/Chandalar_Geo_01_23_07.pdf, as of February 14, 2010).

Buzzell, R.G., 2007, History of the Caro-Coldfoot trail (RST 262) and the Coldfoot-Chandalar trail (RST 9): Alaska Office of History and Archaeology, Report 17, 138 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Goldrich Mining Company, 2010, Chandalar, Alaska; Project overview:

Primary Reference: Bundtzen and Laird, 2009a and 2009b

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Pallasgreen

Site type: Prospect

ARDF no.: CH118

Latitude: 67.562 **Quadrangle:** CH C-3

Longitude: 148.1158

Location description and accuracy:

The Pallasgreen prospect is at an elevation of about 3,000 feet, 0.8 mile northeast of Crystal Peak and about 0.5 mile north-northwest of the center of section 36, T. 32 N., R. 3 W., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: As, Au, Pb

Other:

Ore minerals: Arsenopyrite, galena, gold, limonite

Gangue minerals: Quartz

Geologic description:

The geology of the Chandalar area is dominated by a system of west-northwest-trending regional faults including a prominent thrust fault in the southern part of the district and a series of major high-angle faults through the center of the area (Bundtzen and Laird, 2009a, 2009b). These faults separate the rocks into two principal units, a west-northwest-trending Upper Plate unit about 3 miles wide in the center of the area and a Lower Plate unit to the north and south. The contact of the two units is a thrust fault on the south side of the Upper Plate rocks and a high-angle fault on the north side. Most of the Upper Plate rocks consist of Devonian upper-greenschist-facies metamorphic rocks, mainly carbonaceous schist; quartz-chlorite-muscovite schist, schist and phyllite derived from turbidites that comprise the Mikado Phyllite, metamorphosed calcareous sandstone, and quartz-muscovite schist. The Lower Plate rocks consist of Devonian, upper-greenschist-facies metamorphic rocks, mainly metamorphosed volcanic agglomerate, chlorite-rich tuffaceous schist, quartz-mica schist derived from mudstone, mica-quartz schist, and quartzite. Both the Upper and Lower Plate rocks are cut by irregular masses, dikes and sills of greenstone, metagabbro, and metadiorite of unknown age. Most of the mineral deposits in the Chandalar area are in the Upper Plate rocks and the deposits often are along the regional, steep-to-vertical, west-northwest-trending faults. There is an additional conjugate set of north-northeast-trending faults that offset the Upper Plate rocks and at least some of the mineralization may be localized at the intersections of the regional west-northwest-trending faults and the conjugate faults.

Although the Pallasgreen prospect was discovered in the early 1900s, there was little more than a few bits of old company information about it prior to the work of Little Squaw Mining Company in 2005 (Barker, 2006 and 2007). A prominent, iron-stained quartz hogback about 25 feet wide that strikes 100-105 degrees with a steep south dip is exposed at the prospect. The footwall of the vein is feldspathic schist; the hanging wall is black graphitic schist. As mapped by Bundtzen and Laird (2009a, 2009b) the host rocks are part of the finely laminated, fine grained, quartz-mica schist unit of the Upper Plate.

Brecciated quartz-limonite zones and several joint sets cut the vein. Wispy bands of chlorite and arsenopyrite are common along the footwall and hanging wall contacts. Samples showed little gold. However, float quartz rock and a prospect pit about 300 feet west of the hogback suggest one or more parallel bands or zones of quartz-limonite breccia or quartz veins. The float quartz contain clots and grains of arsenopyrite and galena up to 3 cm. Soil samples in the vicinity contained up to 1.91 parts per million

(ppm) gold; rock-chip samples contained up to 12.12 ppm gold. Chips of quartz in the tundra that surround the outcrop suggest that the vein and quartz breccia may be extensive. The gold veins in the Chandalar district are considered mesothermal (Barker and Bundtzen, 2004; Barker, 2006, 2007; Barker and others, 2009) by comparison with similar deposits elsewhere and consideration of fluid inclusion and oxygen and lead isotope studies of the Chandalar mineralization (Ashworth, 1984; Rose and others, 1988; Gacetta and Church, 1989).

Alteration:

Quartz vein is heavily oxidized to limonite.

Age of mineralization:

Possibly Middle Cretaceous based on the assertion of Dillon (1982) that the gold-quartz veins of the central Brooks Range are that age. However, there is no definitive data for the age of the veins of the Chandalar area.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

Only limited surface sampling by industry.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Ashworth, (Lamal) Kate, 1984, Fluid inclusion study of the Eneveloe Vein, Chandalar Mining District: Private Report, Chandalar Development Associates, 8 pages (in files of the Goldrich Mining Company.

Barker, J.C., 2006, Chandalar Mining District, a report of findings and recommendations, 2005: Unpublished report for Little Squaw Gold Mining Company, 93 p. (on the Internet at http://www.goldrichmining.com/Files/corporate/2005AnnualReport011906.pdf, as of February 14, 2010).

Barker, J.C., 2007, Chandalar Mining District, Annual Report of findings for 2006; Unpublished report for Little Squaw Gold Mining Company, 124 p. (On the Internet at http://www.goldrichmining.com/Files/chandalar/chandalar_barker_rpt_2007.pdf, as of February 14, 2010).

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Gacetta, J.D., and Church, S.E., 1989, Lead isotope data base for sulfide occurrences in Alaska, December, 1989: U.S. Geological Survey Open File report 89-688, 59 pages.

Rose, S.C., Pickthorn, W.J., and Goldfarb, R.J., 1988, Gold mineralization by metamorphic fluids in the Chandalar Mining District, southern Brooks range-fluid inclusion and oxygen isotopic evidence, in, Galloway, J.P., and Hamilton, T.D., eds., Geologic studies in Alaska by the U.S. Geological Survey during 1987: U.S. Geological Survey Circular 1016, p. 81-84.

Primary Reference: Barker, 2006

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Unnamed (near Horace Mountain)

Site type: Prospect

ARDF no.: CH119

Latitude: 67.6535 **Quadrangle:** CH C-5

Longitude: 149.1799

Location description and accuracy:

The center of this prospect is about 1.3 miles north-northeast of the mouth of Sheep Creek on Robert Creek. It is near the center of section 29, T. 33 N., R 7 W. However, similar mineralization is widespread on the north and south side of Horace Mountain. Kurtak and others (2002) include a map showing the regional geology of the area and the location of this and the other deposits of the Chandalar Copper Belt.

Commodities:

Main: Ag, As, Au, Cu, Mo, Pb, Zn

Other:

Ore minerals: Arsenopyrite, pyrite

Gangue minerals:

Geologic description:

A color and geochemical anomaly that suggested mineralization in this area was first identified in 1983 (Nichol, 1983). In the early 1990s, Central Alaska Gold Company (1992) mapped and sampled the prospect, and Kurtak and others (2002) visited it and collected samples widely on the slopes of Horace Mountain.

A east-northeast-trending, Devonian meta-granodiorite intrusion about 7 miles long and a mile wide makes up most of the central part of Horace Mountain (Dillon and others, 1996; Kurtak and others, 2002). It is flanked by Ordovician quartz-sericite schist, calcareous chlorite schist, felsic schist, and thin-bedded marble. The quartz-sericite schist is thought to be highly-altered metamorphosed intrusive rock.

Red-and-yellow-stained, quartz-sericite schist with zones of 2 to 3 percent pyrite is conspicuous near the meta-granodiorite on both sides of Horace Mountain (Kurtak and others, 2002). This schist probably outcrops continuously along the south side of Horace Mountain. On the west flank of Horace Mountain below peak 5540, samples of quartz-sericite schist with 4 percent pyrite and minor arsenopyrite, and a float sample of siliceous mica schist, averaged 127.5 parts per billion (ppb) gold, 15.7 parts per million (ppm) silver, 1,119 ppm copper, 510 ppm lead, 291 ppm zinc, and 1.16 percent arsenic. On the east flank of Horace Mountain below peak 5192, a 75- to 100-foot-thick outcrop of sericite-quartz schist contains zones of pyrite up to a foot thick. Select samples with 2 to 5 percent pyrite contained up to 62 ppb gold, 1.4 ppm silver, 116 ppm molybdenum, and 134 ppm arsenic.

The mineralization on the flanks of Horace Mountain is probably related to the meta-granodiorite in the center of the mountain and has much the same genesis as the other skarn deposits in the Chandalar Copper Belt (Newberry and others, 1986).

Alteration:

Not noted.

Age of mineralization:

Devonian(?) based on Early Devonian Pb/Pb zircon ages from the nearby Baby Creek batholith and Horace Mountain plutons (Dillon and others, 1996).

Generic deposit model:

Deposit model:

Mineralized quartz-sericite schist adjacent to a meta-granodiorite pluton.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only mapping and sampling by government agencies and industry from 1983 to 2002.

Production notes:

None.

Reserves:

None.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

MAS No. 0020310141

References:

Central Alaska Gold Company, 1990, 1989 annual report to Doyon Ltd. Alaska field operations, v. 1: Unpublished report 90-06A for Doyon Ltd., (on file at Doyon Ltd., Fairbanks, Alaska).

Dillon, J.T., Reifenstuhl, R.R., and, Harris, G.W., 1996, Geologic map of the Chandalar C-5 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 104, 2 sheets, scale 1:63,360.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Newberry, R.J., Allegro, G.L., Cutler, S.E., Hagen-Levelle, D.D., Adams, D.D., Nicholson, L.C., Weglarz, T.B., Bakke, A.A., Clautice, K.H., Coulter, G.A., Ford, M.J., Myers, G.L., and Szumigala, D.J., 1997, Skarn deposits of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 355-395.

Newberry, R.J., Dillon, J.T., and Adams, D.D., 1986, Regionally metamorphosed calc-silicate-hosted deposits of the Brooks Range, northern Alaska: Economic Geology, v. 81, p. 1728-1752.

Nicol, D.L., 1983, Evaluation of the mineral potential of Doyon Ltd.'s Block 5 and 22 (unpublished report 83-04 for Doyon Ltd., (on file at Doyon Ltd., Fairbanks, Alaska).

Nicholson, L.M., 1990, Porphyry copper, copper skarn, and volcanogenic massive sulfide occurrences in the Chandalar copper district, Alaska: Fairbanks, University of Alaska, M.Sc. thesis, 164 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (along Willow Creek)

Site type: Occurrence

ARDF no.: CH120

Latitude: 67.666 **Quadrangle:** CH C-4

Longitude: 148.9968

Location description and accuracy:

This occurrence is about 1.5 miles above the mouth of Willow Creek. The creek is a 5-mile-long, headwater tributary to Robert Creek. The occurrence is about 0.4 mile southwest of the center of section 19, T. 33 N., R. 6 W.

Commodities:

Main: As, Cu, Zn

Other:

Ore minerals: Arsenopyrite, chalcopyrite, malachite, pyrite

Gangue minerals:

Geologic description:

Kurtak and others (2002) examined the canyon of Willow Creek, about 1.5 miles above its mouth. The rocks in the area are Devonian chlorite-muscovite schist in thrust contact with quartz-muscovite-chlorite schist. Two iron-stained exposures of sericite schist up to 25 feet wide contain pyrite bands that average 0.8 foot thick and parallel the schistosity. The bands also contain arsenopyrite and trace chalcopyrite and malachite. A 7-foot chip sample across pyrite bands up to 0.5 foot thick contained 1,679 parts per million (ppm) copper and 367 ppm zinc. None of the samples contained precious metals.

Alteration:

Iron staining of pyritiferous schist.

Age of mineralization:

Devonian or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Schist with bands of pyrite and minor copper and zinc.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Only limited sampling by the U.S. Bureau of Land Management.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Limestone Creek

Site type: Prospect

ARDF no.: CH121

Latitude: 67.5722 **Quadrangle:** CH C-5

Longitude: 149.3837

Location description and accuracy:

Limestone Creek is a south-flowing tributary to the Bettles River. The mouth of the creek is about 6 miles north of the center of Bob Johnson Lake (formerly known as Big Lake) near the center of section 29, T. 32 N., R. 8 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

There is no record of mining on Limestone Creek (Kurtak and others, 2002). However, Reed (1938) reported that an 18-foot shaft was sunk near the mouth of the creek with indifferent results. Kurtak and others (2002) found remnants of a boom dam and cabin near the mouth of the creek that may indicate some unreported mining. They panned the creek at several locations for about 2 and a half miles above its mouth; none of their pans showed visible gold.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Evidence of prospecting for placer gold near the mouth of the creek prior to 1938.

Production notes:

Possibly a small amount of gold was produced in the course of prospecting but there is no recorded production and little sign of mining.

Reserves:

None.

Additional comments:

This prospect is on Doyon Ltd. selected lands; for more information, contact Doyon Ltd., Fairbanks, Alaska.

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., Reifenstuhl, R.R., and, Harris, G.W., 1996, Geologic map of the Chandalar C-5 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 104, 2 sheets, scale 1:63,360.

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Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Canyon Creek

Site type: Mine

ARDF no.: CH122

Latitude: 67.5187 **Quadrangle:** CH C-6

Longitude: 149.6056

Location description and accuracy:

There is little information about placer mining along Canyon Creek but Kurtak and others (2002) reported mining in 2000 'near the narrows'. That feature is probably about 1.3 miles upstream from the mouth of Canyon Creek where the creek cuts through a low ridge. This location is about 0.5 mile north of the center of section 17, 32 N. R. 7 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

In his detailed list of the placer deposits of the Koyukuk area, Reed (1938) found no evidence of mining or prospecting on Canyon Creek. Kurtak and others (2002) reported claim staking in 1978 and 1982-1983, and mining in 1986 and 2000.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Undetermined

Workings/exploration:

Apparently the first claims were staked in 1978; more were staked in 1982-1983; and there was placer mining in 1986 and 2000.

Production notes:

Some production in 1986 and 2000.

Reserves:

Probably none.

Additional comments:

MAS No. 0020310115

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., and Reifenstuhl, R.R., 1995, Geologic map of the Chandalar C-6 quadrangle, southeastern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 105, 1 sheet, scale 1:63,360.

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Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Wizard

Site type: Prospect

ARDF no.: CH123

Latitude: 67.3798 **Quadrangle:** CH B-5

Longitude: 149.1554

Location description and accuracy:

This prospect is at the head of Dennys Gulch at an elevation of about 2,950 feet, near the center of section 32, T. 30 N., R. 7 W.

Commodities:

Main: Ag, Au, Ba, Cu, Pb, Zn

Other:

Ore minerals: Gold, iron

Gangue minerals:

Geologic description:

This record describes the lode deposit at the head of the Dennys Gulch. Both this lode prospect and a placer mine (CH019) in Dennys Gulch are associated with Denny O'Keefe, who had claims and explored the area from 1948 to 1957; much of the work on the lode and placer probably coincided (Kurtak and others, 2002). A magnetometer survey was run over Dennys Gulch and Sawlog Creek in 1951 (Williams, 1952); there was uranium exploration by the U.S. Geological Survey in 1956 (Freeman, 1963); 6 lode claims were staked in 1955 (Heiner and Wolff, 1968); and WGM Inc. explored in the area from 1975 to 1976, and in 1983 (Dashevsky, 1986).

The rocks in Dennys Gulch are mainly Devonian quartz-mica schist and schistose quartzite intercalated with beds of greenschist and greenstone; the mineralization is associated with a thrust fault separating graphitic schist and quartz-muscovite schist. As described by Kurtak and others (2002), the rocks in upper Dennys Gulch are intensely stained dark red and are cut by numerous thin quartz veins. None of their samples of the quartz veins contained significant metal values, but there were reports that gold 'colors' could be panned 'at will' in the altered, quartz-veined rocks. Native iron is common in small, bright fragments, green copper staining is present, and the bitter taste of the water in the stream is attributed to arsenic. A panned-concentrate sample collected in the upper part of Dennys Gulch contained 235 parts per million (ppm) gold, 21.2 ppm silver, 133 ppm lead, 222 ppm zinc, and 116 ppm barite. Some of the rocks read as much as 0.035 milliroentgens per hour; these values are anomalous but probably do not indicate a body of economic uranium ore (Freeman, 1963).

Alteration:

Schist in upper Dennys Gulch is intensely stained dark red.

Age of mineralization:

Generic deposit model:

Deposit model:

Unclear.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Both this lode prospect and a placer mine (CH019) in Dennys Gulch are associated with Denny O'Keefe, who had claims and explored the area from 1948 to 1957; much of the work on the lode and placer probably coincided (Kurtak and others, 2002). A magnetometer survey was run over Dennys Gulch and Sawlog Creek in 1951 (Williams, 1952); there was uranium exploration by the U.S. Geological Survey in 1956 (Freeman, 1963); 6 lode claims were staked in 1955 (Heiner and Wolff, 1968); and WGM Inc. explored in the area from 1975 to 1976, and in 1983 (Dashevsky, 1986).

Production notes:

None.

Reserves:

None.

Additional comments:

See also Dennys Gulch (CH019) and Sawlog Creek (CH020).

MAS No. 0020310035

References:

Brosgé, W.P., and Reiser, H.N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-375, 1 sheet, scale 1:250,000.

Cobb, E.H., 1973, Placer deposits of Alaska: U.S. Geological Survey Bulletin 1374, 213 p.

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Cobb, E.H., 1977, Placer deposit map of central Alaska: U.S. Geological Survey Open-File Report 77-168-B, 64 p., 1 map, scale 1:1,000,000.

DeYoung, J.H., Jr., 1978, Mineral resources map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-878-B, 2 sheets, scale 1:250,000.

Dashevsky, S.S., 1986, Mines, prospect, and geochemical anomalies on Doyon Ltd. regional overselection lands Alaska, Block 1 - 8, v. 1 or II: Unpublished report for Doyon Ltd., 42 p. (on file at Doyon Ltd., Fairbanks, Alaska).

Eakins, G.R., 1969, Uranium in Alaska: Alaska Division of Mines and Geology Geologic Report 38, 49 p., 2 sheets (scale 1:3,800,000).

Freeman, V.L., 1963, Examination of uranium prospects, 1956, in Contributions to economic geology of Alaska: U.S. Geological Survey Bulletin 1155, p. 29-33.

Heiner, L.E., and Wolff, E.N., eds., 1968, Mineral resources of northern Alaska, Final report, submitted to

the NORTH Commission: University of Alaska, Mineral Industry Research Laboratory Report No. 16, 306 p.

Holdsworth, P.R., 1952, Report of the Commissioner of Mines for the Biennium ended December 31, 1952: Alaska Territorial Department of Mines Annual Report 1952, 66 p.

Holdsworth, P.R., 1955, Report of the Commissioner of Mines for the biennium ended December 31, 1954: Alaska Territorial Department of Mines Annual Report 1954, 110 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska, 2 vols.: Bureau of Land Management, Alaska Technical Report 50, 845 p.

Williams, J.A., 1952, A magnetometer survey of Denny's Gulch and Sawlog Creek in the Koyukuk-Chandalar region, Alaska: Alaska Territorial Department of Mines Prospect Evaluation 31-2, 28 p., 1 sheet (of traverse lines, scale 1:2,400, 17 line sheets).

Primary Reference: Freeman, 1963

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Aurora

Site type: Prospect

ARDF no.: CH124

Latitude: 67.5505 **Quadrangle:** CH B-4

Longitude: 148.1798

Location description and accuracy:

The Aurora prospect is about 0.9 mile east-northeast of Little Squaw Peak and about 0.5 mile south-southeast of the center of section 34, T. 32 N., R. 3 W. The location is accurate.

Commodities:

Main: Au

Other: Ag, Cu, Pb, Sb, Zn

Ore minerals: Arsenopyrite, galena, gold, pyrite, scorodite, sphalerite

Gangue minerals: Quartz

Geologic description:

The Aurora prospect is one of the numerous gold-vein occurrences in the Chandalar district that prior to 2011 didn't seem to merit a specific identify. It was drilled in 2011 by Goodrich Mining Corp. (2011) with notable results. Little specific information is available for the Aurora prospect but its geology and mineralization is almost certainly the same as the many of the prospects in the district.

Placer gold was discovered in the Chandalar area on Little Squaw Creek (CH039) in 1902 (Barker and Bundtzen, 2004; Barker, 2007; Barker and others, 2009). By 1909, four quartz veins had been discovered and many more were located prior to WWI. Most of the important properties in the district were consolidated by William Sulzer from 1909 to 1941; the Mikado Mine was one of the prominent deposits of the Chandalar area and was included. Those properties were taken over in 1946 to form the Little Squaw Mining Company in 1959, which in turn became the Little Squaw Gold Mining Company in 1968. From 1967 to 1999, Little Squaw Gold Mining Company leased some of their Chandalar lode and placer ground for mining and/or exploration to a succession of companies, notably the Chandalar Gold Mining and Milling Company (1967-1971), Noranda Mining (1974-1976), the Chandalar Development Corporation (1980-1983), and Gold Dust Mines (1989-1999). In 2003, Little Squaw Gold Mining Company and its direct descendent Goldrich Mining Company began an aggressive exploration program for lode and placer deposits over a large block of land that covers almost all of the known deposits in the Chandalar area and that effort continued through 2012 (Goldrich Mining Company, 2012).

The geology of the Chandalar area is dominated by a system of west-northwest-trending regional faults including a prominent thrust fault in the southern part of the district and a series of major high-angle faults through the center of the area (Bundtzen and Laird, 2007 [map]; 2007 [83 p.]). These faults separate the rocks into two principal units, a west-northwest-trending Upper Plate unit about 3 miles wide in the center of the area and a Lower Plate unit to the north and south. The contact of the two units is a thrust fault on the south side of the Upper Plate rocks and a high-angle fault on the north side. Most of the Upper Plate rocks consist of Devonian upper-greenschist-facies metamorphic rocks, mainly carbonaceous schist, quartz-chlorite-muscovite schist, schist and phyllite derived from turbidites that comprise the Mikado Phyllite, metamorphosed calcareous sandstone, and quartz-muscovite schist. The Lower Plate rocks consist of Devonian, upper-greenschist-facies metamorphic rocks, mainly metamorphosed volcanic agglomerate, chlorite-rich tuffaceous schist, quartz-mica schist derived from mudstone, mica-quartz schist, and quartzite. Both the Upper and Lower Plate rocks are cut by irregular masses, dikes and sills of greenstone,

metagabbro, and metadiorite of unknown age. Most of the mineral deposits in the Chandalar area are in the Upper Plate rocks and the deposits often are along the regional, steep-to-vertical, west-northwest-trending faults. There is an additional conjugate set of north-northeast-trending faults that offset the Upper Plate rocks and at least some of the mineralization may be localized at the intersections of the regional west-northwest-trending faults and the conjugate faults. This prospect in the cirque at the head of Little Squaw Creek is covered by alluvium, landslide material, glacial deposits, and thick soil with much solifluction. However, the rocks on both sides of the cirque are part of the Upper Plate unit and the rocks under the surficial material in the cirque probably are mostly Mikado Phyllite.

In 2011, Goldrich drilled 4 holes at the Aurora prospect that totaled 784 meters (Goldrich Mining Co., 2011). Of the 17 intervals 0.6 to 3.0 meters wide that contained more than 0.55 grams of gold per tonne, the best were 0.9 meters with 5.32 grams of gold per tonne, 0.6 meters with 4.14 grams of gold per tonne, 1.5 metes with 4.39 grams of gold per tonne, 1.5 meters with 6.57 grams of gold per tonne, and 0.9 meters with 4.44 grams of gold per tonne.

Alteration:

Not specifically noted. However, many of the veins in the area are aligned along major faults that are marked by much clay and gouge.

Age of mineralization:

Possibly mid-Cretaceous based on the assertion of Dillon (1982) that the gold-quartz veins of the central Brooks Range are that age. However, there is no definitive data for the age of the veins of the Chandalar area.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

Four holes drilled in 2011.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Ashworth, Kate, 1983, Genesis of gold deposits at the Little Squaw Mines, Chandalar Mining District, Alaska: Unpublished Masters of Science Thesis, Western Washington University, Bellingham, 98 pages.

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Barker, J.C., and Bundtzen, T.K., 2004, Gold deposits of the Chandalar Mining District, Northern Alaska: An information review and recommendations: Unpublished report for the Little Squaw Gold Mining Company, 165 p. (In files of the Goldrich Mining Company).

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Boadway, E.A., 1932, Report on Sulzer properties, Chandalar, Alaska: Alaska Territorial Department of Mines Miscellaneous Report 31-6, 23 p., 4 sheets.

Boadway, E.A., 1933, Report on Mikado and Little Squaw veins, Chandalar, Alaska: Alaska Territorial Department of Mines Miscellaneous Report 31-7, 37 p.

Bundtzen, T.K., and Laird, G.M., 2007, Geologic map of the Chandalar Mining District, Brooks Range, Northern Alaska, 2007: Unpublished map prepared for Little Squaw Gold Mining Company, 1 sheet, scale 1:20,000. (on the Internet at http://www.goldrichmining.com/Files/chandalar/regional_chandalar_geo_map_final_07.pdf, as of February 14, 2010).

Bundtzen, T.K., and Laird, G.M., 2007, Geology of the Chandalar Mining District, east-central Brooks Range, Northern Alaska: Unpublished technical report for Little Squaw Gold Mining Company, 83 p. (on the Internet at http://www.goldrichmining.com/Files/chandalar/Chandalar_Geo_01_23_07.pdf , as of February 14, 2010).

Chipp, E.R., 1970, Geology and geochemistry of the Chandalar area, Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 42, 39 p., 1 sheet, scale 1:3,000.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

Gacetta, J.D., and Church, S.E., 1989, Lead isotope data base for sulfide occurrences in Alaska, December, 1989: U.S. Geological Survey Open File report 89-688, 59 pages.

Goldrich Mining Company, 2011, Goldrich completes Chandalar, Alaska Phase I exploration drilling: http://www.goldrichmining.com/news/45-goldrich-completes-chandalar-alaska-phase-i-exploration-drilling.html (News release, November 30, 2011).

Goldrich Mining Company, 2012, Chandalar gold district: http://www.goldrichmining.com/properties/chandalar-gold-district.html (of of March 25, 2012).

Mertie, J.B., Jr., 1925, Geology and gold placers of the Chandalar district, in Brooks, A.H., and others, Mineral resources of Alaska, report on progress of investigations in 1923: U.S. Geological Survey Bulletin 773, p. 215-263.

Reed, I.M., 1930, Report on the Little Squaw area of the Chandalar mining district: Alaska Territorial Department of Mines Miscellaneous Report 31-4, 18 p.

Rose, S.C., Pickthorn, W.J., and Goldfarb, R.J., 1988, Gold mineralization by metamorphic fluids in the Chandalar Mining District, southern Brooks range-fluid inclusion and oxygen isotopic evidence, in, Galloway, J.P., and Hamilton, T.D., eds., Geologic studies in Alaska by the U.S. Geological Survey during 1987: U.S. Geological Survey Circular 1016, p. 81-84

Stanford, J.V., 1931, Report on Little Squaw, Bonanza, and Mikado groups of claims, Chandalar, Alaska: Alaska Territorial Department of Mines Miscellaneous Report 31-5, 10 p.

Primary Reference: Goldrich, 2011

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): 88 Group

Site type: Prospect

ARDF no.: CI001

Latitude: 65.4375 **Quadrangle:** CI B-2

Longitude: 144.7532

Location description and accuracy:

The 88 Group prospect is about 5 miles southwest of Circle Hot Springs, near the divide between the head of Half Dollar Creek and Ketchem Creek. In 2008, the 88 Group is part of an approximately 5,000-acre property that was being explored by Millrock Resources Inc. as a single endeavor. The outline of the claim block and the site of recent exploration is uncertain but the coordinates near the northwest corner of section 18, T. 7 N., R. 14 E., are within the block, if not near the center of it .

Commodities:

Main: Au

Other: As, Cu, Sn

Ore minerals: Arsenopyrite, cassiterite, chalcopyrite

Gangue minerals: Quartz

Geologic description:

The 88 Group prospect is in a dark, mafic peripheral phase of a Cretaceous, coarse-grained porphyritic granitic pluton. Both lode and placer gold is found at these claims (Vetter, 1995). Wiltse and others (1995) mapped the bedrock in the area and described the pluton as a chloritized porphyritic (hornblende-)biotite monzogranite to syenogranite. They also mapped a mafic dike in the area as black to dark gray, aphanitic to slightly porphyritic rock with major plagioclase, augite, hornblende and magnetite.

Gold mineralization occurs in heavily Fe-oxide stained, quartz-rich greisen zones up to six feet across, within fractures, and in stockwork veins. A significant aspect of the prospect is the large amount of grus that covers the area to a depth of 10 to 20 feet and pans considerable gold. Other heavy minerals found in the panned concentrates include abundant sphalerite, and small amounts of arsenopyrite, chalcopyrite, cassiterite(?), and monazite(?).

Gold occurs in samples of mineralized exposures along about 2,000 feet of ditch along the Portage Creek road. The mineralization is within heavily Fe-oxide stained, quartz-filled greisen zones that average about 3 inches wide. Phyllic and argillic alteration is present along vein margins and is also controlled by fractures. Strong zinc anomalies, up to 0.5 percent, and moderate arsenic values were noted. Tin was not detected in the rock samples but two panned-concentrate samples contained anomalous tin values. The dominant trend in mineralization is N50W with near vertical dips (Bakke, 1991).

As described by Millrock Resources Inc. (2008), the 88-Group mineralization consists of gold-bearing quartz veins and stockworks that occur in three structurally controlled zones 3 to 25 meters wide. Placer Dome USA and AMAX Exploration previously sampled the property and drilled three holes. The drilling intersected numerous zones with anomalous gold values up to 745 parts per billion gold. One of the zones in altered granite that was sampled at the surface contained 8.92 grams of gold per tonne across a width of 25 meters. Several other prospects are on the property. The mineralization at the Silver Chalice prospect consists of quartz-sulfide veinlets in altered sedimentary rocks; grab samples contained up to 32.0 grams of gold per tonne. The Portage prospect is similar. The Silver Chalice and Portage prospects may be recent names for two sites previously included in ARDF, a nearby unnamed occurrence (DI065) and the Top Dollar occurrence (DI058). These occurrences are probably all within the property that was being explored

by Millrock in 2008.

Alteration:

Mineralization occurs within heavily Fe-stained, quartz-filled greisen zones that average about 3 inches wide. Phyllic and argillic alteration is present along vein margins and also along fractures (Bakke, 1991).

Age of mineralization:

Probably related to the Cretaceous granitic intrusion that hosts at least some of the mineralization.

Generic deposit model:

Deposit model:

Auriferous greisen zones and gold-quartz veins in granitic rocks.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Surface sampling beginning in the 1991 or before; three holes drilled. Being explored by Millrock Resources in 2008.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bakke, Arne, 1991, Fairbanks gold, in Vetter, 1995, Joker and 88 group, property summary: Fairbanks, Alaska, Vetter and Associates, 24 p.

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Wiltse, M.A., Reger, R.D., Newberry, R.J, Pessel, G.H., Pinney, D.S., Robinson, M.S., and Solie, D.N., 1995, Bedrock geologic map of the Circle mining district, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 95-2B, 1 sheet, scale 1:63,360.

Primary Reference: Millrock Resources Inc., 2008 (Ketchem).

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer, A.S. Clements (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Little Champion Creek

Site type: Prospect

ARDF no.: CI051

Latitude: 65.438 **Quadrangle:** CI B-6

Longitude: 146.588

Location description and accuracy:

The location is the approximate center of a large claim group along the NW margin of the Mt. Prindle pluton. This record is a general description of the Mt. Prindle pluton uranium occurrences. Separate entries for individual sites are as follows: ARDF no. CI076, CI067, and CI069.

Commodities:

Main: U

Other: REE

Ore minerals: Allanite, bastnaesite, monazite, thorianite, thorite, uraninite, xenotime

Gangue minerals: Topaz, tourmaline

Geologic description:

This area contains significant uranium-rare earth mineralization.
There are numerous uranium prospects, uraniferous springs and stream-sediments in the area (Barker and Clautice, 1977). Mt. Prindle pluton is a tourmaline- and topaz-bearing porphyritic biotite granite that crops out over a 50-square-km area. Country rock is quartzite and micaceous quartzite with subordinate quartz-mica schist, phyllitic schist and calcareous schist, thermally metamorphosed to upper hornblende facies near the pluton contact. The pluton is cut by three major NE-trending faults, and several quartz porphyry, aplite and pegmatite dikes.

Fissure veins containing allanite, bastnaesite, monazite, thorianite, thorite, uraninite, and xenotime occur in Cretaceous porphyritic biotite syenite and alkali granite. The deposit contains significant La, Cd, Nd, Pr, Yd, and fluorite. Hematitic alteration of wall rock and leaching of magnetite occurs in host rocks. Samples contain up to 0.1 percent U-308 and 15 percent rare-earth elements (Burton, 1981).

Some exploration and limited drilling was carried out on Little Champion Creek, but no further development has taken place. Claims were active from 1977 through at least 1981 (Menzie and others, 1983, p. 56).

Alteration:

There is hematitic alteration of wall rock and leaching of magnetite in host rocks (Burton, 1981).

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Some exploration and limited drilling was carried out on Little Champion Creek, but no further development has taken place. Claims were active from 1977 through at least 1981 (Menzie and others, 1983, p. 56).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Barker, J.C., and Clautice, K.H., 1977, Anomalous uranium concentrations in artesian springs and stream sediments in the Mount Prindle area, Alaska: U.S. Bureau of Mines Open-File Report 130-77, 19 p.

Bundtzen, T.K., Eakins, G.R., Green, C.B., and Lueck, L.L., 1986, Alaska's mineral industry, 1985: Alaska Division of Geological and Geophysical Surveys Special Report 39, 68 p.

Burton, P.J., 1981, Radioactive mineral occurrences, Mt. Prindle area, Yukon-Tanana Uplands: Fairbanks, University of Alaska, M.Sc. thesis, 72 p.

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Nokleberg, W.J., Bundtzen, T.K., Berg, H.C., Brew, D.A., Grybeck, D.J., Robinson, M.S., Smith, T.E., and Yeend, W., 1987, Significant metalliferous lode deposits and placer districts of Alaska: U.S. Geological Survey Bulletin 1786, 104 p., 2 plates, scale 1:5,000,000.

Primary Reference: Burton, 1981

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer, A.S. Clements (Avalon Development Corporation)

Last report date: 2016-03-15

Site name(s): Top Dollar

Site type: Prospect

ARDF no.: CI058

Latitude: 65.4433 **Quadrangle:** CI B-2

Longitude: 144.7586

Location description and accuracy:

The location is the approximate center of 20 mining claims about 5 miles southwest of Circle Hot Springs and about 0.6 mile southeast of the center of section 12, T. 7 N., R. 14 E. The location is generally accurate and probably well within the claim boundaries.

Commodities:

Main: Au

Other:

Ore minerals: Arsenopyrite, gold

Gangue minerals: Quartz

Geologic description:

Note: This prospect is probably within a large block of ground that is currently (2008) being explored by Millrock Resources Inc. (2008). The geology and past exploration within the block is discussed in the ARDF site for the '88 group' (CI001).

The Top Dollar claims are in the Paleozoic metamorphic rocks intruded by Cretaceous to Tertiary granitic rocks . The region is transected by regional-scale, northeast-trending shear zones and northeast-trending mafic dikes.

Gold mineralization occurs as gold-arsenopyrite-quartz veins and stockwork zones in massive, hornfelsed, micaceous quartzite and schist. The mineralization is near the intrusive contact of the Cretaceous 'Two Bit' granite pluton; possibly as mineralized pendants above the pluton. Rock, samples contain up to 14 parts per million gold, highly anomalous arsenic and antimony, and variably anomalous bismuth and base metals (D.D. Adams, written communication, 1998).

Alteration:

Silicification, quartz-sericite, chlorite, and iron-oxides.

Age of mineralization:

Possibly genetically related to the nearby Cretaceous granitic pluton.

Generic deposit model:

Deposit model:

Gold-arsenopyrite veins in hornfels and schist.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:
Only surface sampling.

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Millrock Resources Inc., 2008. Ketchem: http://www.millrockresources.com/index.php/projects/ketchem/ (as of May 25, 2008).

Primary Reference: Millrock Resources Inc., 2008 (Ketchem).

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer, A.S. Clements (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Unnamed (southwest of Circle Hot Springs)

Site type: Occurrence

ARDF no.: CI065

Latitude: 65.4394 **Quadrangle:** CI B-2

Longitude: 144.7275

Location description and accuracy:

This occurrence is the site of sample 3MZ0007b, plate 1, of U.S. Geological Survey, Open-File Report 84-479 (Foster and others, 1984). It is approximately 1 mile southwest of VABM 3125, about 5 miles southwest of Circle Hot Springs, near the northeast corner of section 18, T. 7 N., R. 14 E. The location is accurate.

Commodities:

Main: Au

Other: Ag

Ore minerals: Arsenopyrite

Gangue minerals: Quartz

Geologic description:

A sample of quartzite with arsenopyrite contained 3.2 ppm Au and 0.5 ppm Ag (Foster and others, 1984). This prospect is probably within a large block of ground that is currently (2008) being explored by Millrock Resources Inc. (2008). The geology and past exploration within the block is discussed in the ARDF record for the '88 group' (CI001).

Alteration:

Not specified.

Age of mineralization:

May be genetically related to a nearby Cretaceous granitic pluton.

Generic deposit model:

Deposit model:

Auriferous arsenopyrite-bearing quartzite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Only a surface sampling.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Foster, H.L., O'Leary, R.M, McDougal, C.M, and Menzie, W.D., 1984, Analyses of rock samples from the Circle quadrangle, Alaska: U.S. Geological Survey Open-File Report 84-479, 126 p., 1 sheet, scale 1:250,000.

Millrock Resources Inc., 2008. Ketchem: http://www.millrockresources.com/index.php/projects/ketchem/ (as of May 25, 2008).

Primary Reference: Foster and others, 1984.

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer, A.S. Clements (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Harrison Creek

Site type: Prospect

ARDF no.: CI090

Latitude: 65.3803 **Quadrangle:** CI B-2

Longitude: 144.8593

Location description and accuracy:

The placer prospect consists of 4 claims that extend along Harrison Creek from near the mouth of Bottom Dollar Creek, upstream to near the mouth of Squaw Creek; the location is in about the center of the claims. The claims extend along the northern half of sections 3 and 4, T. 6 N., R. 14 E. The location is accurate.

Commodities:

Main: Au, Sn, W

Other:

Ore minerals: Cassiterite, gold, wolframite

Gangue minerals:

Geologic description:

Jim Halloran in an unpublished report (2007) reports placer gold in Harrison Creek along 4 claims that extend from near the mouth of Squaw Creek downstream to near the mouth of Bottom Dollar Creek. His report is based on drilling by E.N. Wolf in 1995; Wolf's work consisted of 28 holes along 7 lines. Based on his samples, Wolf estimated that there is about 2.9 million cubic yards of auriferous gravels on the claims with an average grade of 0.032 ounce of gold per cubic yard. Earlier drilling by the United States Smelting, Refining, and Mining Company in 1938, which wholly or in part may not coincide with the later Wolf drilling, gave much lower values. Halloran, however, suggests that the Wolf numbers are conservative because his drilling apparently did not reach bedrock where the most gold is likely to be located. Cassiterite and wolframite also occur in the concentrates.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer gold (Singer and Cox, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Active

Workings/exploration:

Jim Halloran in an unpublished report (2007) reports placer gold in Harrison Creek along 4 claims that extend from near the mouth of Squaw Creek downstream to near the mouth of Bottom Dollar Creek. His report is based on drilling by E.N. Wolf in 1995; Wolf's work consisted of 28 holes along 7 lines. Earlier drilling by the United States Smelting, Refining, and Mining Company in 1938, which wholly or in part may not coincide with the later Wolf drilling, gave much lower values.

Production notes:

There is no record of gold production on Harrison Creek. However, there were at least 100 claims on the creek in 1897 just before the rush to the Klondike in 1898. A small amount of gold may have been produced then but there is no indications of any substantial production since and no production from the Halloran claims.

Reserves:

Based on 28 drill samples along 7 lines, E.N. Wolf estimated that there is about 2.9 million cubic yards of auriferous gravels on the four claims with an average grade of 0.032 ounce of gold per cubic yard. Earlier drilling by the United States Smelting, Refining, and Mining Company in 1938, which wholly or in part may not coincide with the later Wolf drilling, gave much lower values. Halloran, however, suggests that the Wolf numbers are conservative because his drilling apparently did not reach bedrock where the most gold is likely to be.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Primary Reference: This record

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Unnamed (beside Cobblestone Creek)

Site type: Occurrence

ARDF no.: CL006

Latitude: 68.5097 **Quadrangle:** CL C-1

Longitude: 150.3917

Location description and accuracy:

The occurrence is in bluffs and outcrops on the west side of Cobblestone Creek at an elevation of about 2300 feet. It is about 15.7 kilometers south of Arc Mountain near the northwest corner of section 12, T. 11 S., R. 7 E.

Commodities:

Main: Mn

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Shale and silty mudstone of the Lower Cretaceous Torok Formation are exposed along Cobblestone Creek in bluffs and outcrops just west of the creek. Greenish-brown mudstone and shale locally display intense manganese staining (Kurtak and others, 1995). Four samples across a zone 6.5 meters thick contained 2.4 to 11.7 percent manganese. Another sample across a zone 4.5 meters wide contained 5.5 percent manganese. A sample examined by the U.S. Bureau of Mines contained 61.9 percent iron, 15.2 percent silica, 7.4 percent aluminum, 5.8 percent calcium, 4.8 percent manganese, and 4.0 percent phosphorus (Barnwell and others, 1989). The main mineral in the sample is siderite; no specific manganese mineral was identified. Similar manganese-stained rocks occur along a northeast-trending zone about 2.3 kilometers long.

Alteration:

Age of mineralization:

Early Cretaceous host rock.

Generic deposit model:

Deposit model:

Sedimentary manganese.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only sampling by government agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS No. 0020220011.

References:

Barnwell, C.E., Simpson, S., and Church, S.E., 1989, Analytical results and sample locality maps of stream-sediment and rock samples from the Cobblestone Creek area, southeastern Chandler Lake quadrangle, Alaska: U.S. Geological Survey Open-file Report 89-540, 26 p., 2 sheets, scale 1 inch equals 1.56 miles.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Meyer, M.P., 1994, Analytical results from U.S. Bureau of Mines investigations in the Colville Mining District, Alaska: U.S. Bureau of Mines Open-File Report 34-94, 137 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): K.D. Kelley (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (at head of Siksikpuk River)

Site type: Occurrence

ARDF no.: CL014

Latitude: 68.271 **Quadrangle:** CL B-4

Longitude: 152.3296

Location description and accuracy:

The location of this occurrence is somewhat ambiguous in Kurtak and others (1995) but it is probably about 8.5 miles northwest of Inualurak Mountain in the southeast part of section 34, T. 13 S., R. 2 W. The location is probably accurate to within a half mile.

Commodities:

Main: Pb, Zn

Other: Ba

Ore minerals: Galena, marcasite, pyrite, sphalerite

Gangue minerals: Calcite, quartz, siderite

Geologic description:

This occurrence is in a 42.9-meter-thick fissile, carbonaceous black shale member of the Kayak Shale between a lower argillaceous member and an upper red limestone member. The black shale member contains red-brown, cherty ironstone nodules or concretions that vary from rounded forms about 4 centimeters in diameter to elongate forms about 8 by 38 centimeters in size. The concretions consist of quartz, calcite, siderite, pyrite (or marcasite?), minor sphalerite, and rare galena (Kurtak and others, 1995). There are also 2.5- to 5-centimeter sulfide-bearing beds in the black shale. Several samples of the concretions from a 6-meter-thick section of the black shale contained up to 13,152 parts per million (ppm) zinc, more than 2,000 ppm barium, and 52 ppm lead. Samples from a 10-centimeter-thick, cherty ironstone bed at the base of the black shale member contained up to 1,357 ppm zinc.

Although this record describes a specific site, Kurtak and others (1995) note that it is representative of similar sulfide occurrences in a member of the Early Mississippian Kayak Shale that outcrops for several hundred kilometers along the north side of the Brooks Range.

Alteration:

Age of mineralization:

Syngenetic deposit in Early Mississippian black shale.

Generic deposit model:

Deposit model:

Stratiform zinc(-lead) deposit?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Only sampling by government agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS No. 0020220017.

References:

Bowsher, A.L., and Dutro, J.T. Jr., 1957, The Paleozoic section in the Shainin Lake area, central Brooks Range, Alaska: U.S. Geological Survey Professional Paper 303-A, p. 1-39.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (near Pin Peak, Coronation Island)

Site type: Mine

ARDF no.: CR001

Latitude: 55.9126 **Quadrangle:** CR D-7

Longitude: 134.3311

Location description and accuracy:

Several adits are on the east side of Pin Peak at elevations between about 700 and 980 feet. The site is near the center of the area of workings, about 0.2 mile southwest of the center of section 2, T. 69 S., R. 71 E. The location is accurate.

Commodities:

Main: Ag, Au, Pb

Other: As, Hg, Sn, Zn

Ore minerals: Cerussite, galena, hydrozincite, limonite, smithsonite, sphalerite, tetrahedrite

Gangue minerals: Calcite

Geologic description:

This mine is in limestone of the Silurian Heceta Limestone (Moerlein and others, 1971-1973; Eberlein and others, 1983; Brew, 1996). A small Cretaceous granitic pluton is nearby. The deposit consists of irregular, scattered masses of galena with sphalerite and tetrahedrite (Wright and Wright, 1908; Roehm, 1940; Twenhofel and others, 1949; Wedow and others, 1952). Some of the ore is oxidized to limonite, hydrozincite, cerussite, and smithsonite. The maximum dimension of the ore bodies was about 20 feet. The largest was about 8 feet by 12 feet by 18 feet; one 1- to 4-foot-thick body extended for about 100 feet. The deposit was mined from three adits at elevations of about 700 feet, 860 feet, and 980 feet; the underground workings total about 800 feet. A sample from the highest adit contained 9.7 percent lead, 0.16 ounce of gold per ton, and 20.8 ounces of silver per ton.

Roppel (1991) presents a detailed history of the development and mining. Galena was discovered in 1900 and ten claims were staked. By 1901, several hundred bags of ore had been mined. A test shipment of 16 tons of ore proved to have a value of $88 per ton in lead and silver. Possibly as much as 400 tons of ore was then shipped. Mining continued intermittently until 1905 when 5 tons of ore was sent to the smelter and another 25 tons of ore was stacked on the beach. The claims were restaked several times until at least 1928 and there were several more small test shipments. Phelps Dodge mapped much of Coronation Island in the early 1970s, sampled the workings and held their claims until 1973 (Moerlein and others, 1971-1973; Still and others, 2002) and drilled several holes. There is no record of any significant discovery in their drilling.

The Bureau of Land Management located many of the old working and collected numerous samples in the adits and from the dumps in the late 1990s (Still and others, 2002). The highest grade sample they collected from below the number 2 adit was of oxidized gossan with knots of galena. It contained 13.95 parts per million (ppm) gold, 682 ppm silver, more than 1 percent lead, 3.58 percent zinc, more than 1 percent arsenic, 39.3 ppm mercury, and 307 ppm tin. They concluded that the ore was mainly in irregular pods and that most of the mineralization found in the underground work had been mined out.

Alteration:

Some of the ore was oxidized to limonite, hydrozincite, cerussite, and smithsonite.

Age of mineralization:

The deposit is younger than the Silurian host rock.

Generic deposit model:

Deposit model:

Galena masses in limestone.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

Roppel (1991) presents a detailed history of the development and mining. Galena was discovered in 1900 and ten claims were staked. By 1901, several hundred bags of ore had been mined. A test shipment of 16 tons of ore proved to have a value of $88 per ton in lead and silver. Possibly as much as 400 tons of ore was then shipped. Mining continued intermittently until 1905 when 5 tons of ore was sent to the smelter and another 25 tons of ore was stacked on the beach. The claims were restaked several times until at least 1928 and there were several more small test shipments. Phelps Dodge mapped much of Coronation Island in the early 1970s (Moerlein and others, 1971-1973) and drilled several holes but there is no indication of any significant discovery. The Bureau of Land Management found and mapped several of the old working and collected numerous samples in the late 1990s.

Production notes:

Most references indicate that about 100 tons of ore was shipped but there are indications that production may have been higher.

Reserves:

None.

Additional comments:

All of Coronation Island is now a Forest Service Wilderness Area and is closed to exploration and mining.

References:

Brew, D.A., 1996, Geologic map of the Craig, Dixon Entrance, and parts of the Ketchikan and Prince Rupert quadrangles, southeastern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2319, 53 p., 1 sheet, scale 1:250,000.

Chapin, Theodore, 1916, Mining developments in southeastern Alaska: U.S. Geological Survey Bulletin 642-B, p. 73-104.

Cobb, E. H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Craig quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-869, 262 p.

Eberlein, G.D., Churkin, Michael, Jr., Carter, Claire, Berg, H.C., and Ovenshine, A. T., 1983, Geology of the Craig quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-91, 52 p.

Maas, K.M., Bittenbender, P E., and Still, J.C., 1995, Mineral investigations in the Ketchikan mining district, southeastern Alaska: U.S. Bureau of Mines Open-File Report 11-95, 606 p.

Moerlein, G.A, and others, 1971-1973, Large body of unorganized geologic field maps, notes, and tables,

Coronation Island, southeastern Alaska: (Unpublished data and maps held by the Bureau of Land Management, Mineral Information Center, Juneau, Alaska.)

Roehm, 1940, Summary report of mining investigations in the Ketchikan and Wrangell districts and itinerary of J.C. Roehm, May 24-June 18, 1940: Alaska Division of Geological and Geophysical Surveys Itinerary Report IR-195-28, 19 p.

Roppel, Patricia, 1991, Fortunes from the earth: Manhattan, Kansas, Sunflower University Press, 139 p.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Twenhofel, W.S., Reed, J. C., and Gates, G.O., 1949, Some mineral investigations in southeastern Alaska: U.S. Geological Survey Bulletin 963-A, p. 1-45.

Wedow, Helmuth, Jr., and others, 1953, Preliminary summary of reconnaissance for uranium and thorium in Alaska, 1952: U.S. Geological Survey Circular 248, 15 p.

Wedow, Helmuth, Jr., White, M. G., and Moxham, R. M., 1952, Interim report on an appraisal of the uranium possibilities of Alaska: U.S. Geological Survey Open-File Report 51, 123 p.

Wright, C.W., 1915, Geology and ore deposits of Copper Mountain and Kasaan Peninsula, Alaska: U.S. Geological Survey Professional Paper 87, 110 p.

Wright, C.W., and Paige, Sidney, 1908, Copper deposits on Kasaan Peninsula, Prince of Wales Island: U.S. Geological Survey Bulletin 345, p. 98-115.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Roppel, 1991; Still and others, 2002

Reporter(s): Donald Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Gold Standard; Blue Jay; Lakeview; Lower Gold Standard; Lone Jack; Alaska; Free Gold

Site type:

Mine

ARDF no.: CR028

Latitude: 55.6514

Quadrangle: CR C-1

Longitude: 132.0041

Location description and accuracy:

The Gold Standard Mine has a long and complex history dating back to before 1900. The workings are in two distinct areas that were part of the same claim group. Managerially and operationally they were always were tied together and they share the same geology. There is an 'upper', early set of workings (in the Craig C-1 quadrangle); the upper workings are about 0.3 mile northwest of the 'lower', younger workings (in the Ketchikan C-6 quadrangle) which consist of several glory holes undercut by a long adit. The coordinates are for the lower workings which are just back from the shoreline about 1.3 miles northwest of the the north end of Forss Island in Helm Bay. The location is near the northeast corner of section 12, T. 72 S., R. 87 E. Figure 46 of Maas and others (1995) shows the location of the upper and lower workings and Figure 47 has detailed maps of the lower workings.

Commodities:

Main: Ag, Au

Other: Pb, Te

Ore minerals: Galena, gold, pyrite, tetradymite, tetrahedrite

Gangue minerals: Calcite, chlorite, quartz

Geologic description:

The original discovery in 1897 on what was to become the Gold Standard mine was at the so-called upper workings about 0.3 miles back from the sea shore, when 17 claims were staked over the property. The gold occurred near or at the surface, either as a creek placer or as a residual deposit over a quartz vein, or both (Brooks, 1902, Maas and others, 1995; Roppel, 2005). Some pans were said to contain up to $100 in gold and 120 ounces of gold was soon recovered. A small arrastre using a water nozzle to move the ground into it was built and by the end of the 1898 season the upper workings had produced $20,000 (almost certainly in gold at $20.67 per ounce). The discovery aroused considerable interest and in 1898, the Alaska Gold Standard Mining Company was incorporated. By the fall of 1899, a camp had been built, a 5-stamp mill powered by a Pelton wheel was in operation at the upper workings, a tram was built to the coast, and the workings consisted of a 260-foot tunnel from a 50-foot shaft. The mill began operating in December 1899 and by April, 1901, 2,430 tons of ore had been run through it with a net yield of $10,540. There was very little work in the upper workings from 1902 to 1906. By 1907, depending on the source $150,000 or $75,000 had been invested in the property with a return of only $35,000. There was intermittent activity from 1902 to 1914, mainly changes in the principals of the company. Several leasers examined or did some work on the upper workings, and several mining companies examined the property. In 1914, a new slate of officers was in place and interest shifted to what would become the lower workings, where three holes were diamond. drilled. In 1921, a leaseholder took out $28,000 (almost certainly in gold) from 2 tons of material in a rich pocket in the lower workings; larger bodies of lower-grade material were also identified. In 1922, a 1,600-foot tunnel was started under what would become two glory holes that were the focus of mining by several leasers from 1922 to the start of WWII. Detailed production records are not available but the ore

was processed in the old 5-stamp mill that was moved from the upper workings to a mill site near the sea shore.

Maas and others (1995, p. 192) did considerable sample and mapping of the mine, especially the lower workings (Figure 47), as part of a Bureau of Mines regional mineral assessment. They also reported that the adit at the lower workings was sampled by private interests in 1993 but the gold values were subeconomic.

The rocks in the vicinity are are andesitic and basaltic metavolcanic rocks that are gradationally interbedded with flysch like metasedimentary rocks (Berg and others, 1988, p. 18). The strata were regionally metamorphosed to greenschist-grade phyllite and semischist in Late Cretaceous time (Brew, 1996, p. 27). The premetamorphic age of the strata is uncertain. Berg and others (1988, p. 17) report that they closely resemble Jurassic to Cretaceous strata nearby on Gravina Island.

According to Brooks (1902) and Wright and Wright (1908), the mineralization at the upper workings consisted of two sets of quartz veins in metamorphosed greenstone and greenschist. One set, typified by the principal vein, is parallel to the schistosity of the host rocks. It strikes about N25W and dips 60E and varies from 6 inches to 6 feet thick. The other set consists of gash veins that extend from the main vein; they also strike about N25W but dip 60-75 SW. The veins are faulted and there is considerable gouge along the footwalls. The veins are mainly quartz with subordinate chlorite and calcite. Free gold occurs in the veins with minor pyrite, tetrahedrite, and galena; the telluride tetradymite is reported in the gash veins. The ore is free milling and was said to run about $5 to $15 per ton in gold (at $20.67 per ounce). Bittenbender and others (1993) and Maas and others (1995) sampled the upper workings. The average content of their samples, taken along 40 meters of vein that averages 0.73 meter thick, was 3,713 parts per billion (ppb) gold. A sample across 0.43 meters of the 'Folwarzny vein' contained 5,500 ppb gold.

The Lakeview prospect described by Maas and others (1995) is about 0.1 mile west of the upper workings of the Gold Standard Mine. The deposit is probably similar. The average gold content of samples taken over a length of 550 feet of a vein that averages about 20 inches wide was 3,103 ppb. The only workings are trenches and prospect pits.

The mineralization of the lower workings is similar in character and orientation to that of the upper workings. The walls of the veins are well defined by slickensides, with gouge on the footwall side and by a seam filled with calcite carrying free gold along the hanging wall. Locally, the wallrock next to the veins is bleached and impregnated with pyrite (Maas and others, 1995, p. 183). Maas and others (1995, table 25) collected numerous samples in the lower workings, they averaged 10.4 parts per million (ppm) gold, 99 ppm copper, 7.4 ppm lead, 48 ppm zinc, 2.3 ppm tellurium, and 9.6 ppm tin. Two samples of quartz contained 8.12 and 8.71 ppm gold, and the gold content in several samples of pyritic schist was 17.0 and 35.9 ppm. The sampling by Maas and others (1995, p. 184) shows a distinct northward plunge to the ore zone, which is cut off by a fault that strikes NE and dips 45SE. The continuation of the ore zone past this fault has not yet been determined.

Fluid inclusion studies of quartz vein material from several of the Helm Bay lodes suggest that the veins formed at temperatures and pressures consistent with conditions during the Late Cretaceous greenschist-grade regional metamorphism (Maas and others, 1995, p. 184).

Alteration:

Locally, the wallrock next to the veins in at least the lower workings is bleached and impregnated with pyrite (Maas and others, 1995).

Age of mineralization:

The quartz veins cut country rocks that may be as young as Cretaceous or as old as Paleozoic.

Generic deposit model:

Deposit model:

Low-sulfide gold-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

The original discovery in 1897 on what was to become the Gold Standard mine was at the so-called upper workings about 0.3 miles back from the sea shore, when 17 claims were staked over the property. The gold occurred near or at the surface, either as a creek placer or as a residual deposit over a quartz vein, or both (Brooks, 1902, Maas and others, 1995; Roppel, 2005). Some pans were said to contain up to $100 in gold and 120 ounces of gold was soon recovered. A small arrastre using a water nozzle to move the ground into it was built and by the end of the 1898 season the upper workings had produced $20,000 (almost certainly in gold at $20.67 per ounce). The discovery aroused considerable interest and in 1898, the Alaska Gold Standard Mining Company was incorporated. By the fall of 1899, a camp had been built, a 5-stamp mill powered by a Pelton wheel was in operation at the upper workings, a tram was built to the coast, and the workings consisted of a 260-foot tunnel from a 50-foot shaft. The mill began operating in December 1899 and by April, 1901, 2,430 tons of ore had been run through it. There was very little work in the upper workings from 1902 to 1906. By 1907, depending on the source $150,000 or $75,000 had been invested in the property with a return of only $35,000. There was intermittent activity from 1902 to 1914, mainly changes in the principals of the company. Several leasers examined or did some work on the upper workings, and several mining companies examined the property. In 1914, a new slate of officers was in place and interest shifted to what would become the lower workings, where three holes were diamond. drilled. In 1921, a leaseholder took out $28,000 (almost certainly in gold) from 2 tons of material in a rich pocket in the lower workings; larger bodies of lower-grade material were also identified. In 1922, a 1,600-foot tunnel was started under what would become two glory holes that were the focus of mining by several leasers from 1922 to the start of WWII. Detailed production records are not available but the ore was processed in the old 5-stamp mill that was moved from the upper workings to a mill site near the sea shore.

Maas and others (1995, p. 192) did considerable sample and mapping of the mine, especially the lower workings (Figure 47), as part of a Bureau of Mines regional mineral assessment. They also reported that the adit at the lower workings was sampled by private interests in 1993 but the gold values were subeconomic.

Production notes:

Maas and others (1995, p. 192) estimate that the combined production from the lower and upper Gold Standard mines from about 1898 to 1941 was 310 kg or more of gold, and 33 kg or more of silver. The production figures for the lower workings alone are not available. Judging from the assay values and the extent of the workings, the production from the upper and lower workings may have been about equal.

Reserves:

None.

Additional comments:

References:

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Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Wright and Wright, 1908; Bittenbender and others, 1993

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Flagstaff; Last Chance; Treasure

Site type: Mine

ARDF no.: CR043

Latitude: 55.5345 **Quadrangle:** CR C-2

Longitude: 132.6645

Location description and accuracy:

The Flagstaff Mine is a well known property on the east side of Granite Mountain. The workings are extensive and the location used here is the main adit of the mine at an elevation of about 1,400 feet. This adit is shown on the USGS 1:63,360-scale topographic map; it is about 0.5 mile southwest of the center of section 16, T. 73 S., R. 84 E.

Commodities:

Main: Ag, Au, Pb

Other: Cu, Zn

Ore minerals: Bornite, chalcocite, chalcopyrite, copper, covellite, galena, gold, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks in the vicinity of the Flagstaff Mine are part of a large granodiorite-quartz diorite stock (Sainsbury, 1961; Eberlein and others, 1983; Brew, 1996). Early workers considered the stock to be Mesozoic or Cretaceous, but recent radiometric dating indicates that it is Devonian (S.M. Karl, oral communication, 2003). The granitic rocks are cut by diabase dikes of unknown age.

Roppel (2005) provides much detail on the history of the mine. The property was originally staked in 1902 as the Treasure group; by 1905, it had been developed by a lower 400-foot adit and an upper 50-foot adit and a road had been built from Karta Bay to Salmon Lake and from Salmon Lake to the mine. The 400-foot tunnel became the main adit of the mine (Wright and Wright, 1908; Twenhofel and others, 1949; Stewart, 1938, 1944; Maas and others, 1991, 1995). By 1908, the original locator of the property relinquished it and in 1912, the claims were restaked by T.N. Steven as the Last Chance Group; he would hold the property for the next 22 years. By 1935, Stevens or leaseholders had extended the upper tunnel to 432 feet and the lower tunnel to 987 feet. In 1937, the Flagstaff Mining Company was formed to develop the property and they rebuilt the road, built several buildings at the property and a 2,000-foot tramway to the main adit, and built a 25-ton mill at the bottom of the tramway. The mill was run intermittently in 1936 and 1938 but the recovery of gold was poor. Mining and milling continued intermittently until the fall of 1941 when the property reverted to its original owners and the mine closed. Poor gold and silver recovery in the mill is cited as a major cause of the closure. There is no record of production since 1941 but several companies have examined the property; among the more intensive efforts, El Paso Mining and Milling Company examined the property in the mid-70s and Killick Gold Company, Ltd. optioned the property and did geological mapping and geochemical surveys from 1980 to 1988.

The property has two vein systems. The main workings of the mine are on a quartz vein, the lower or Flagstaff vein, that can be traced for nearly a mile through a vertical extent of at least 1,300 feet. The vein strikes about N55W and dips 60-86NE. The footwall of the vein is a diabase dike more than 8 feet thick that near the vein is almost completely altered to calcite, chlorite, and brown clay. Twenhofel and others (1949) describe the hanging wall as diorite and gabbro. Detailed maps of the main vein are on Plate 1 of Twenhofel and others (1949) and on several appendices in Stewart (1944). The vein varies from less than an inch to more than 36 inches thick; it averages about 18 inches thick but the thickness often varies abruptly. The vein

is white, vuggy quartz with free gold and locally abundant sulfide minerals that in many places are banded parallel to the vein. The sulfide minerals include galena, chalcopyrite, pyrite, bornite, and sphalerite. Native copper, covellite and chalcocite occur and may be secondary. The sulfides average 1-2 percent of the vein but may form up to 5 percent locally. The main vein has been sampled several times (see Stewart, 1944, in particular). There are high gold and silver values, but the data are not systematic enough to provide their average values in the vein. The mill operators told Stewart (1938) that the ore was running about $25 to $35 in gold and silver (with gold at $35 per ounce). Maas and others (1991) sampled the main vein. One sample across 2.5 feet of the vein contained 0.35 ounce of gold per ton, 10.77 ounces of silver per ton, and 7.04 percent lead. The weighted average of 4 other samples was 0.15 ounce of gold and 1.75 ounce of silver per ton across an average width of 1.9 feet.

The upper vein is exposed west of the main workings of the mine between about 2, 600 to 2,800 feet elevation near the top of Granite Mountain. This vein strikes about N25E and dips about 20NW, but it is cut by several cross faults and/or deflects markedly and varies in strike and dip. It varies in width from about 1 to 3 feet. The upper vein is similar to the lower vein, but it is mainly in quartz diorite. The intersection of the two veins has not been found. The upper vein has less sulfides but more free gold than the lower vein.

Maas and others (1995) give the total production of the Flagstaff Mine as 257 ounces of gold, 1,980 ounces of silver, 2,864 pounds of copper, and 5,926 pounds of lead from 873 tons of ore; however, they cite another report that gives the total production from 1938 to 1940 as 1,305 tons of ore.

Alteration:

Diabase dikes are almost totally altered to chlorite, calcite, and brown clay near the veins.

Age of mineralization:

Unknown, other than that the veins are in Devonian granitic rocks.

Generic deposit model:

Deposit model:

Polymetallic vein (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: Yes; small

Site Status: Active?

Workings/exploration:

Roppel (2005) provides much detail on the history of the mine. The property was originally staked in 1902 as the Treasure group; by 1905, it had been developed by a lower 400-foot adit and an upper 50-foot adit and a road had been built from Karta Bay to Salmon Lake and from Salmon Lake to the mine. The 400-foot tunnel became the main adit of the mine (Wright and Wright, 1908; Twenhofel and others, 1949; Stewart, 1938, 1944; Maas and others, 1991, 1995). By 1908, the original locator of the property relinquished it and in 1912, the claims were restaked by T.N. Steven as the Last Chance Group; he would hold the property for the next 22 years. By 1935, Stevens or leaseholders had extended the upper tunnel to 432 feet and the lower tunnel to 987 feet. In 1937, the Flagstaff Mining Company was formed to develop the property and they rebuilt the road, built several buildings at the property and a 2,000-foot tramway to the main adit, and built a 25-ton mill at the bottom of the tramway. The mill was run intermittently in 1938 and 1938 but the recovery of gold was poor. Mining and milling continued intermittently until the fall of 1941 when the property reverted to its original owners and the mine closed. Poor gold and silver recovery in the mill is cited as a major cause of the closure. There is no record of production since 1941 but several companies have examined the property; among the more intensive efforts, El Paso Mining and Milling Company examined the property in the mid-70s and Killick Gold Company, Ltd. optioned the property and did geological mapping and geochemical surveys from 1980 to 1988.

Production notes:

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Reserves:

Probably none.

Additional comments:

This mine is in the Karta River Wilderness Area, and any area which is not already a valid claim or is patented is closed to exploration and mining.

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Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Stewart, 1944; Twenhofel and others, 1949

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): North Pole Hill

Site type: Prospects

ARDF no.: CR047

Latitude: 55.6364 **Quadrangle:** CR C-2

Longitude: 132.60411

Location description and accuracy:

There are several prospects in the large gabbro-pyroxenite pluton that forms North Pole Hill (Sainsbury, 1961). There are numerous pits and mineral occurrences scattered on the hill and this site is somewhat arbitrarily located at about the center of the hill, near the southwest corner of section 7, T. 72 S., R. 84 E., of the Copper River Meridian. The accuracy of this location is within 500 feet.

Commodities:

Main: Ag, Au, Cu, Pd

Other:

Ore minerals: Bornite

Gangue minerals:

Geologic description:

The gabbro and pyroxenite that makes up North Pole Hill is an extension of the pluton at the Salt Chuck Mine (CR049), where it has been dated at 429 Ma (Loney and others, 1987).

In 1954 and 1955, Juan Munoz carried out geophysical and geochemical surveys on North Pole Hill and dug several prospects pits that showed bornite in the gabbro and pyroxenite (Munoz, 1955; Sainsbury, 1961). In 1969, and perhaps other years, Munoz drilled several holes on the body (D.J. Grybeck, field visit, 1969). Although not well documented, North Pole Hill has been examined and prospected repeatedly since the 1970s because of its proximity and similar geology to the Salt Chuck Mine. Santoy Resources Ltd. was active on North Pole Hill (http://www.santoy.ca/index.html; Sept. 2003). They had one showing on the north flank of the hill ('Geoff showing') with samples that contained 1.1 percent copper and 0.19 gram of palladium per ton. They also located a previously unknown small adit (at an unspecified location on the hill); grab samples from the dump contained 2.67 percent copper, 0.63 gram of palladium per ton, 2.42 grams of gold per ton, and 14.03 grams of silver per ton.

In his 1954 and 1955 work, Munoz also located several pyritiferous quartz veins, 6 to 18 inches thick, near a prominent fault. They contained about $7.00 in gold (at $35 per ounce). Those veins are probably at the prospect (shown on Plate 33 of Sainsbury, 1961) at about the center of section 7, T. 72 S., R. 84 E., of the Copper River Meridian.

From 2010 to 2014, Pure Nickel Inc. has been exploring at North Pole Hill as part of their Salt Chuck Project. Work they have performed includes IP surveying, soil sampling, and drilling. A 2012 drilling program resulted in high grade intersections of up to 127.8 grams of gold per tonne, 57.6 grams of silver per tonne, and 2.78 percent copper over 0.35 meter apparent width. Pure Nickel's 2014 drill program is to test continuity of high grade gold-copper mineralization (Pure Nickel Inc., 2014).

Alteration:

Not reported.

Age of mineralization:

The gabbro on North Pole Hill has been dated at 429 Ma (Loney and others, 1987); the bornite deposit is

probably cogenetic with the intrusion of the gabbro.

Generic deposit model:

Deposit model:

Disseminated bornite in gabbro.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Prospect pits and at least two drill holes. Although not well documented, North Pole Hill has been examined and prospected repeatedly since the 1970s because of its proximity and similar geology to the Salt Chuck Mine. Santoy Resources Ltd. was active on North Pole Hill (http://www.santoy.ca/index.html; Sept. 2003). They had one showing on the north flank of the hill ('Geoff showing') with samples that contained 1.1 percent copper and 0.19 gram of palladium per ton. They also located a previously unknown small adit (at an unspecified location on the hill); grab samples from the dump contained 2.67 percent copper, 0.63 gram of palladium per ton, 2.42 grams of gold per ton, and 14.03 grams of silver per ton.

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Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Primary Reference: Sainsbury, 1961; Loney and others, 1983

Reporter(s): D.J. Grybeck (Applied Geology); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-10

Site name(s): Salt Chuck; Stevens; Liebrant; Goodro; Joker

Site type: Mine

ARDF no.: CR049

Latitude: 55.6339 **Quadrangle:** CR C-2

Longitude: 132.5602

Location description and accuracy:

The Salt Chuck Mine is labeled at the wrong location on the USGS 1:63,360-scale topographic map. The principal workings of the mine are about 0.3 mile west of the mine symbol on the map, or about 0.5 mile north-northeast of the center of section 17, T. 72 S., R. 84 E., of the Copper River Meridian. The location of the underground workings and glory holes of the mine are shown in detail on the maps and diagrams of Gault (1945) and Gault and Wahrhaftig (1992). The location is accurate to within 1/2 mile.

Commodities:

Main: Ag, Au, Cu, Pd, Pt

Other: Sb, Te

Ore minerals: Bornite, chalcocite, chalcopyrite, covellite, digenite, gold, hessite, isomertieite, kotulskite, magnetite, pyrite, pyrrhotite, sopcheite, sperrylite, stibiopalladonite, temagamite

Gangue minerals: Calcite, clinopyroxene, epidote, plagioclase

Geologic description:

The Salt Chuck Mine is in a mafic pluton about 4.5 miles long and up to a mile wide in outcrop. The pluton consists of gabbro, clinopyoxenite, and diorite; most workers believe that the pluton is roughly cogenetic with the mineral deposit (Gault, 1945; Sainsbury, 1961; Gault and Wahrhaftig, 1992; Loney and others, 1987). Detailed studies by Watkinson and Melling (1992) and by Loney and Himmelberg (1992) describe the rocks in the vicinity of the mine as layered gabbro intruded by magnetite-bearing pyroxenite. The host rocks at the deposit are variably altered to epidote, actinolite, chlorite, sericite, titanite, and calcite. The pluton has been dated at 429 Ma (Loney and others, 1987). It intrudes metamorphosed volcanic and sedimentary rocks of the Descon Formation of Silurian and Devonian age (Eberlein and others, 1983; Brew, 1996).

The deposit consists chiefly of bornite, chalcopyrite, and platinum-group minerals that occur as disseminations or as veinlets and irregular masses in the gabbro and clinopyroxenite (Wright 1915; Mertie, 1921; Buddington and Chapin, 1929; Gault, 1945; Sainsbury, 1961; Page and others, 1973). The ore bodies are generally pods, lenses, and irregular masses with higher-grade cores. Numerous small faults cut the ore bodies. Most of the sulfides are in clinopyroxenite near its contact with gabbro. The ore minerals include varying amounts of digenite, chalcocite, and covellite that often rim bornite and chalcopyrite; they are mainly in irregular disseminated masses but some are in pyrite-pyrrhotite veins, and in epidote or calcite veinlets. The platinum-group minerals are mainly kotulskite (PdTe) or sperrylite ($PtAs_2$), with minor amounts of the palladium-antimony minerals stibiopalladonite and isomertieite. The kotulskite is variably altered to temanganite (Pd_3HgTe_3) or intergrown with or rimmed by sopocheite ($Pd_3Ag_4Te_4$) and hessite (Ag_2Te). The platinum-group minerals occur in small grains and masses in epidote, at sulfide grain boundaries, and, in decreasing order of abundance, in chalcopyrite, digenite, chalcocite, and covellite. Argentian gold occurs in chalcopyrite, in complex intergrowths with platinum-gourp minerals, and in epidote rims on clinopyroxene.

The deposit probably formed in two stages: 1) magmatic deposition of sulfides and platinum-group minerals, probably near the contact between layered gabbro and clinopyroxenite; and 2) remobilization of

the sulfides and platinum-group minerals by low-temperature deuteric, or externally derived, chlorine-rich fluids with redeposition near gabbro-clinopyroxenite contacts. As of late 2009, the Salt Chuck mine is being evaluated by EPA for listing in the National Priorities List as a site that would be cleaned up under the Superfund program (Environmental Protection Agency, 2009).

The deposit at the Salt Chuck Mine was discovered in 1906 and produced copper, silver, gold, and palladium intermittently until 1941 (Wright and Wright, 1908; Wright, 1915; Mertie, 1921; Gault, 1945; Holt and others, 1948; Roppel, 1991; Maas and others, 1995). In 1915, platinum was discovered in the ore but it wasn't until 1917 that palladium was recognized. A succession of companies operated the mine: the Goodro Mining Company from 1907 to 1916; the Salt Chuck Mining Company from 1918 to 1920; the Alaska Palladium Company from 1924 to 1926; the Solar Development Company from 1929 to 1931; and the Alaska Gold and Metals Company from 1935 to 1941. For most of its life, the mine was the only producer of palladium in the United States and the price of palladium, which varied markedly, was a key factor in the profitability of the mine. During World War II, the U.S. Geological Survey and the U.S. Bureau of Mines studied the deposit in detail, drilled 13 holes, and reinterpreted 7 holes that had been drilled earlier by Solar Development Company (Gault, 1945; Holt and others, 1948; Gault and Wahrhaftig, 1992).

The workings of the mine are shown in detail on the maps and diagrams of Gault (1945) and Gault and Wahrhaftig (1992). The deposit was mined in three glory holes connected by an intricate network of raises, stopes, and drifts at three levels. The workings connected to a main haulage tunnel at the 300-foot level that led to a mill (described in detail by Mertie, 1921) on the shore of the salt chuck at the head of Kasaan Bay.

Since at least the late 1970s, the deposit has been almost continuously active with varying degrees of intensity. Orbex Resources, in a joint venture with Alaska Platinum Company, did extensive mapping and geochemical work on the property from 1980 to 1989 and drilled several holes (Nevin and Reader, 1979; Peterson and Stevens, 1981; Payne, 1985; Goodall and Fox, 1988, 1989). Stealth Ventures worked at the property in 1997 and 1998 and Santoy Resources Ltd. was active on the property in the early part of the 2000s. In 2007, Pure Nickel Inc. (2007) did surface mapping and sampling over a 2,200-acre block of claims that covers the deposit. In late 2009, the Salt Chuck mine was being evaluated by EPA for listing in the National Priorities List as a site that would be cleaned up under the Superfund program (Environmental Protection Agency, 2009).

According to Gault (1945), the total production (from incomplete records) from 1907 to to 1941 was about 300,000 tons of ore. The ore averaged 0.9 percent copper, 0.01 ounce of gold per ton, 0.10 ounce of silver per ton, and 0.05 ounce of palladium per ton. In its later years of production under the Alaska Gold and Metals Company, the ore contained 0.94 percent copper, 0.04 ounce of gold per ton, 0.15 ounce of silver per ton, and 0.065 ounce of palladium per ton. Bundtzen and others (1988) indicated that the work by American Platinum Company defined several zones that contain up to 7.8 percent copper, 0.7 ounce of gold per ton, 0.25 ounce of palladium per ton, and 0.007 ounce of platinum per ton. Maas and others (1995) give the total production of the mine as about 6.2 million pounds of copper, 55,620 ounces of silver, 20,540 ounces of palladium, and 11,740 ounces of gold. According to almost all of the literature, the platinum content of the ore was negligible or not mentioned, but Mertie (1969) indicates that there may have been much more platinum in the ore than is generally recognized.

Gault (1945) gives a detailed analysis of the ore reserves at the mine. At a 0.2 percent cutoff for copper, the total reserves in three ore bodies are 251,000 tons of material with 0.65 to 0.92 percent copper, 0.005 to 0.25 ounce of gold per ton, 0.07 to 0.26 ounce of silver per ton, and 0.0 to 0.13 ounce of platinum-group elements per ton. The reserves are smaller at higher copper grades. Nevin and Reader (1979) estimate that the total resources and reserves of the deposit are about 244,000 tons of material with 0.6 percent copper, 0.45 parts per million (ppm) gold, 5.55 ppm silver, and 0.1 ppm palladium.

At various times over the life of the mine, it or claims that were eventually incorporated into the property have been given several names, including the Goodro, Stevens, Joker, and Leibrant.

Alteration:

The host rocks are variably altered to epidote, actinolite, chlorite, sericite, titanite, and calcite.

Age of mineralization:

The deposit is probably cogenetic with the 429 Ma gabbro-clinopyroxenite body that hosts it (Loney and others, 1987).

Generic deposit model:

Deposit model:

Cu and platinum-group minerals in gabbro-clinopyroxene intrusion.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes

Site Status: Active

Workings/exploration:

The workings of the Salt Chuck Mine are shown in detail on the maps and diagrams of Gault (1945) and Gault and Wahrhaftig (1992). The deposit was mined in three glory holes connected by an intricate network of raises, stopes, and drifts at three levels. The workings connected to a main haulage tunnel at the 300-foot level that led to a mill (described in detail by Mertie, 1921) on the shore of the salt chuck at the head of Kasaan Bay.

Since at least the late 1970s, the deposit has been almost continuously active with varying degrees of intensity. Orbex Resources, in a joint venture with Alaska Platinum Company, did extensive mapping and geochemical work on the property from 1980 to 1989 and drilled several holes (Nevin and Reader, 1979; Peterson and Stevens, 1981; Payne, 1985; Goodall and Fox, 1988, 1989). Stealth Ventures worked at the property in 1997 and 1998, and Santoy Resources Ltd. was active on the property in the early part of the 2000s. In 2007, Pure Nickel Inc. (2007) did surface mapping and sampling over the 2,200 acres of land that covers the deposit. As of late 2009, the Salt Chuck mine is being evaluated by EPA for listing in the National Priorities List as a site that would be cleaned up under the Superfund program (Environmental Protection Agency, 2009).

Production notes:

The deposit at the Salt Chuck Mine was discovered in 1906 and produced copper, silver, gold, and palladium intermittently until 1941 (Wright and Wright, 1908; Wright, 1915; Mertie, 1921; Gault, 1945, Holt and others, 1948; Roppel, 1991; Maas and others, 1995). In 1915, platinum was discovered in the ore but it wasn't until 1917 that palladium was recognized. A succession of companies operated the mine: the Goodro Mining Company from 1907 to 1916; the Salt Chuck Mining Company from 1918 to 1920; the Alaska Palladium Company from 1924 to 1926; the Solar Development Company from 1929 to 1931; and the Alaska Gold and Metals Company from 1935 to 1941. For most of its life, the mine was the only producer of palladium in the United States and the price of palladium, which varied markedly, was a key factor in the profitability of the mine. During World War II, the U.S. Geological Survey and the U.S. Bureau of Mines studied the deposit in detail, drilled 13 holes, and reinterpreted 7 holes that had been drilled earlier by Solar Development Company (Gault, 1945; Holt and others, 1948; Gault and Wahrhaftig, 1992).

According to Gault (1945), the total production (from incomplete records) from 1907 to to 1941 was about 300,000 tons of ore. The ore averaged 0.9 percent copper, 0.01 ounce of gold per ton, 0.10 ounce of silver per ton, and 0.05 ounce of palladium per ton. In its later years of production under the Alaska Gold and Metals Company, the ore contained 0.94 percent copper, 0.04 ounce of gold per ton, 0.15 ounce of silver per ton, and 0.065 ounce of palladium per ton. Bundtzen and others (1988) indicated that the work by American Platinum Company defined several zones that contain up to 7.8 percent copper, 0.7 ounce of gold per ton, 0.25 ounce of palladium per ton, and 0.007 ounce of platinum per ton. Maas and others (1995) give the total production of the mine as about 6.2 million pounds of copper, 55,620 ounces of silver, 20,540 ounces of palladium, and 11,740 ounces of gold. According to almost all of the literature, the platinum content of the ore was negligible or not mentioned, but Mertie (1969) indicates that there may have been much more platinum in the ore than is generally recognized.

Reserves:

Gault (1945) gives a detailed analysis of the ore reserves at the mine. At a 0.2 percent cutoff for copper,

the total reserves in three ore bodies are 251,000 tons of material with 0.65 to 0.92 percent copper, 0.005 to 0.25 ounce of gold per ton, 0.07 to 0.26 ounce of silver per ton, and 0.0 to 0.13 ounce of platinum-group elements per ton. The reserves are smaller at higher copper grades. Nevin and Reader (1979) estimate that the total resources and reserves of the deposit are about 244,000 tons of material with 0.6 percent copper, 0.45 parts per million (ppm) gold, 5.55 ppm silver, and 0.1 ppm palladium.

Additional comments:

As of late 2009, the Salt Chuck mine is being evaluated by EPA for listing in the National Priorities List as a site that would be cleaned up under the Superfund program (Environmental Protection Agency, 2009).

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Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-01

Site name(s): Iron King; Iron King No. 1

Site type: Prospects

ARDF no.: CR059

Latitude: 55.5452 **Quadrangle:** CR C-2

Longitude: 132.4248

Location description and accuracy:

The Iron King prospects are about 0.4 mile north-northwest of Sunny Hat Point, and about 0.5 mile west-southwest of the northeast corner of section 13, T. 73 S., R. 85 E. The geology and workings at the Iron King prospects are shown on figure 32 of Warner and others (1961).

Commodities:

Main: Au, Cu, Fe

Other:

Ore minerals: Chalcopyrite, magnetite, pyrite

Gangue minerals: Calcite, epidote, garnet

Geologic description:

The Iron King prospect is in folded and metamorphosed greenstone that is cut by northeast- and north-trending dikes of basalt, andesite, and dacite (Warner and others, 1961). Near the deposit, the greenstone is epidotized. The deposit is an irregular zone about 150 feet long and 10-15 feet wide that trends about N15 E and dips 64NW; it is probably localized along a fault. Magnetite locally makes up 50 percent of the mineralized zone, and chalcopyrite, pyrite, and magnetite are disseminated widely in it. The U.S. Bureau of Mines diamond drilled four holes which did not cut mineralization; their surface sampling indicates that the mineralized zone contains about 2 percent copper. The deposit has been explored by several trenches and prospect pits; most of the area is covered by glacial drift, alluvium, and vegetation. As of early 2011, the Iron King prospect is being developed primarily for its magnetite by Eagle Industrial Minerals (2011). They indicate that the prospect has about 3 million tons of 'good quality magnetite with small but recoverable amounts of copper and gold'.

Recent sampling shows an unusually high gold content in the deposit. Hedderly-Smith (1999 [Inventory]) cites a high-grade sample with over 10 percent copper and 37 percent iron, that contained 19.3 parts per million (ppm) gold, and 79.5 ppm silver. Several other samples across 17 feet of old trench contained 0.246 to to 0.301 ounce of gold per ton and 13.8 to 20.7 ounces of silver per ton. These and other samples contained 2.22 to 3.68 percent copper, and 31.2 to 50.97 percent iron. Hedderly-Smith (1999 [Inventory]) estimates that the deposit has one or more million tons of material that contains 2 to 4 percent copper, one-quarter of an ounce of gold per ton, and more than 35 percent iron.

The Iron King prospect is one of many copper-iron deposits on the Kasaan Peninsula having similar geology and origin (Warner and others, 1961; Eberlein and others, 1983; Brew, 1996). The rocks on the peninsula consist mainly of andesite ('greenstone' in much of the older literature) interbedded with about 25 percent sedimentary rocks comprising approximately equal amounts of limestone or marble, calcareous mudstone and sandstone, and graywacke and conglomerate. These units are part of the Luck Creek Breccia of Silurian and Devonian age, but many of the sedimentary units are similar to and probably grade into rocks of the Silurian and Ordovician, Descon Formation. The bedded rocks are intruded by a profusion of Silurian or Ordovician dikes, sills, and irregular masses of porphyritic gabbro, basalt, andesite, diorite, dacite, and granodiorite. Near some of the deposits, these intrusions may make up 20 percent or more of the outcrop and usually are associated with the development of tactite and alteration of the greenstone. The area

subsequently was intruded by several large Silurian or Ordovician plutons; they are mainly granodiorite but locally are diorite and gabbro.

The ore deposits are typically small and of irregular shape; often the ore bodies form lenses or mantos. Some of the deposits conform to the layering in the greenstone and sedimentary rocks. The principal ore minerals are chalcopyrite, pyrite, and magnetite; hematite is often present and a little molybdenite occurs in some deposits. Most of the deposits are associated with tactite or skarn with varying amounts of actinolite, calcite, chlorite, garnet, diopside, epidote, and hornblende. There was significant by-product silver and gold in the ore that was mined in the past, and the gold values in some deposits are high enough to have encouraged exploration in recent years. Marble is more common in the deposits in the western part of the peninsula, where the gold values are generally higher as well (Wright and Wright, 1908; Wright, 1915; Warner and others, 1961; Myers, 1985; Bond, 1993; Maas and others, 1995).

Early interpretations of the ore deposits on the Kasaan Peninsula emphasize their contact metamorphic origin and their probable Mesozoic age (for example, Warner and others, 1961). However, recent radiometric dating and mapping indicate that the deposits formed in a Silurian or Ordovician, arc-related environment characterized by deposition of andesite and submarine sedimentary rocks that were intruded by swarms of dikes of varying composition, mineralized, and then intruded by large granodiorite plutons (Hedderly-Smith, 1999 [Inventory]).

The copper deposits of the Kasaan Peninsula were known to the Russians and the first claim was staked in 1867. Most of the production and development occurred from about 1900 to 1918, especially from 1905 to 1907, when copper prices soared and a smelter was built at Hadley on the north side of the Kasaan Peninsula. After World War I, copper supply exceeded demand, prices fell, and there has been no further copper production since 1918 (Wright, 1915; Warner and others, 1961; Roppel, 1991; Maas and others, 1995). However, because of the intense and widespread mineralization on the peninsula, the area has repeatedly been re-examined for copper, iron, and gold, notably during WW II (Warner and others, 1961) and in the last several decades.

Alteration:

Greenstone is altered to epidote. Development of calc-silicate skarn.

Age of mineralization:

The deposit formed in a Silurian or Ordovician, submarine arc-related environment characterized by the deposition of volcanic and sedimentary rocks, the intrusion of swarms of dikes of diverse composition, and the emplacement of several large plutons.

Generic deposit model:

Deposit model:

Cu-Fe skarn (Cox and Singer, 1986; model 18d).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18d

Production Status: None

Site Status: Active

Workings/exploration:

The deposit has been explored by several trenches and prospect pits. During WW II, the U.S. Bureau of mines diamond drilled 4 holes that did not cut mineralization. Recent sampling shows an unusually high gold content in the deposit. As of early 2011, the Iron King prospect is being developed primarily for its magnetite by Eagle Industrial Minerals (2011).

Production notes:

None.

Reserves:

Hedderly-Smith (1999 [Inventory]) estimates that the deposit has one or more million tons of material that contains 2 to 4 percent copper, one-quarter of an ounce of gold per ton, and more than 35 percent iron. As of early 2011, the Iron King prospect is being developed primarily for its magnetite by Eagle Industrial Minerals (2011). They indicate that the prospect has about 3 million tons of 'good quality magnetite with small but recoverable amounts of copper and gold'.

Additional comments:

The Iron King prospects are on or surrounded by land whose subsurface rights are held by the Sealaska Corporation.

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Wright, C.W., 1915, Geology and ore deposits of Copper Mountain and Kasaan Peninsula, Alaska: U.S. Geological Survey Professional Paper 87, 110 p.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Warner and others, 1961; Hedderly-Smith, 1999 (Inventory)

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Mount Andrew

Site type: Mine

ARDF no.: CR071

Latitude: 55.5167 **Quadrangle:** CR C-1

Longitude: 132.3021

Location description and accuracy:

The location of the Mount Andrew Mine is shown on the USGS 1:63,360-scale topographic map. It is about 0.5 mile north-northwest of the center of section 26, T. 73 S., R. 86 E. The extensive surface and underground workings of the Mount Andrew Mine and the geology of the mine area are shown on plates 7 to 11 of Warner and others (1961).

Commodities:

Main: Cu, Fe

Other: Ag, Au

Ore minerals:

Gangue minerals: Calcite, epidote, garnet, hornblende

Geologic description:

The Mount Andrew is one of the principal mines on the Kasaan Peninsula (Wright and Wright, 1908; Wright, 1915; Wright and Tolonen, 1947; Warner and others, 1961; Maas and others, 1995; Hedderly-Smith, 1999 [Inventory]). The host rocks are mainly greenstone, largely altered to tactite composed of garnet, epidote, and hornblende, and scattered small marble lenses. The dominant structure in the deposit is a syncline that outcrops over an area at least 600 feet long and 550 feet wide, and exposes about 550 feet of layered rocks. The syncline trends about N10W. Nearly half the rock in the syncline is massive magnetite in conformable layers or mantos a few feet to 50 feet thick, interlayered with the greenstone. The greenstone and magnetite layers are cut by numerous north-trending, steeply dipping dikes of alkalic granodiorite, gabbro, andesite, and diorite porphyry. Pyrite and chalcopyrite are disseminated widely in the tactite and magnetite; there were probably local concentrations of chalcopyrite-rich ore, but most such high-grade pockets were probably mined prior to 1919.

The Mount Andrew Mine comprises three adits, 4 glory holes, several winzes, and a sublevel, to a depth of about 250 feet. The geology and workings are shown in detail on plates 7 to 11 of Warner and others (1991). The deposit was discovered in 1898 and the first ore was shipped in 1906 to the Tacoma smelter (Wright and Wright, 1915; Warner and others, 1961; Roppel, 1991). There was intermittent production until 1918, but none since. In 1944, the U.S. Bureau of Mines trenched the deposit and drilled 14 holes. The U.S. Geological Survey mapped the deposit in detail from 1942 to 1944. Utah Construction and Mining did geologic mapping and geophysical surveys in 1957 and drilled the deposit from 1960 to 1962 and in 1968.

In 2006, Full Metal Minerals began work at Mount Andrew and they drilled 5 shallow holes that totaled 481 meters to test the periphery of the old surface and underground workings (Full Metal Minerals, 2008, Mount Andrew Property). The holes cut several zones of mineralization including: 1) 13.2 meters that contained 1.41 percent copper, 0.25 gram of gold per ton, and 5.33 grams of silver per ton, 2) 18.0 meters that contained 1.05 percent copper, 0.13 gram of gold per ton, and 4.06 grams of silver per ton, 3) 13.8 meters that contained 1.01 percent copper, 0.11 gram of gold per ton, and 4.40 grams of silver per ton, 4) 7.7 meters that contained 1.53 percent copper, 0.08 gram of gold per ton, and 5.15 grams of silver per ton, and 5) 38.7 meters that contained 0.42 percent copper, 0.09 gram of gold per ton, and 1.40 gram of silver per ton. The work suggests that the mineralization is of the iron oxide-copper-gold deposit in andesitic

volcanic rocks and intermediate intrusive rocks that are cut by post-mineralization dikes. In 2007, Full Metal drilled 1,500 meters in another 13 holes and cut several intervals with strong chalcopyrite-magnetite mineralization (Full Metal Minerals, 2008, Mount Andrew Property; 2008, Mount Andrew drilling; 2008, Mount Andrew locations). Some notable intercepts were: 4.89 meters with 4.45 percent copper, 15.25 grams of silver per ton, and 0.89 grams of gold per tonne and 2.95 meters with 3.75 percent copper and 12.44 grams of silver per tonne (with gold values yet to be received).

There have been several estimates of the remaining resources in the Mount Andrew, Stevenstown (CR072), and Mamie (CR073) mines. Warner and others (1961) and Wright and Tolonen (1947) estimate a collective resource of 2,684,000 long tons of ore, of which about 80 percent is in the Mount Andrew deposit. The weighted average grade of this resource is 47.8 percent iron, 0.32 percent copper, and 0.011 ounce of gold and 0.55 ounce of silver per ton (Wright and Tolonen, 1947). Twenhofel (1953) estimated that about 3,500,000 tons of ore remain in the deposits. Carr and Dutton (1959) estimated that the deposits still contain about 2.3 million tons of indicated magnetite ore with 50 percent iron, and 0.91 million tons of inferrred ore. The total production from the Mount Andrew, Stevenstown, and Mamie mines from 1905 to 1918 was about 270,000 tons of ore with an average grade of 2.37 percent copper, and 0.026 ounce of gold and 0.212 ounce of silver per ton (Warner and others, 1961). Little copper-rich ore such as was mined prior to 1919 probably remains.

Warner and others (1961) and Maas and others (1995) describe several geologically similar, small deposits east of the Mount Andrew Mine. They were originally under the same management as the Mount Andrew Mine and some produced small amounts of ore. These include the Peacock, Rico, North Star, Glory, and Good Luck claims, and the Good Luck-Mayflower group.

The Mount Andrew Mine is one of many copper-iron deposits on the Kasaan Peninsula having similar geology and origin (Warner and others, 1961; Eberlein and others, 1983; Brew, 1996). The rocks on the peninsula consist mainly of andesite ('greenstone' in much of the older literature) interbedded with about 25 percent sedimentary rocks comprising approximately equal amounts of limestone or marble, calcareous mudstone and sandstone, and graywacke and conglomerate. These units are part of the Luck Creek Breccia of Silurian and Devonian age, but many of the sedimentary units are similar to and probably grade into rocks of the Silurian and Ordovician, Descon Formation. The bedded rocks are intruded by a profusion of Silurian or Ordovician dikes, sills, and irregular masses of porphyritic gabbro, basalt, andesite, diorite, dacite, and granodiorite. Near some of the deposits, these intrusions may make up 20 percent or more of the outcrop and usually are associated with the development of tactite and alteration of the greenstone. The area subsequently was intruded by several large Silurian or Ordovician plutons; they are mainly granodiorite but locally are diorite and gabbro.

The ore deposits are typically small and of irregular shape; often the ore bodies form lenses or mantos. Some of the deposits conform to the layering in the greenstone and sedimentary rocks. The principal ore minerals are chalcopyrite, pyrite, and magnetite; hematite is often present and a little molybdenite occurs in some deposits. Most of the deposits are associated with tactite or skarn with varying amounts of actinolite, calcite, chlorite, garnet, diopside, epidote, and hornblende. There was significant by-product silver and gold in the ore that was mined in the past, and the gold values in some deposits are high enough to have encouraged exploration in recent years. Marble is more common in the deposits in the western part of the peninsula, where the gold values are generally higher as well (Wright and Wright, 1908; Wright, 1915; Warner and others, 1961; Myers, 1985; Bond, 1993; Maas and others, 1995).

Early interpretations of the ore deposits on the Kasaan Peninsula emphasize their contact metamorphic origin and their probable Mesozoic age (for example, Warner and others, 1961). However, recent radiometric dating and mapping indicate that the deposits formed in a Silurian or Ordovician, arc-related environment characterized by deposition of andesite and submarine sedimentary rocks that were intruded by swarms of dikes of varying composition, mineralized, and then intruded by large granodiorite plutons (Hedderly-Smith, 1999 [Inventory]).

The copper deposits of the Kasaan Peninsula were known to the Russians and the first claim was staked in 1867. Most of the production and development occurred from about 1900 to 1918, especially from 1905 to 1907, when copper prices soared and a smelter was built at Hadley on the north side of the Kasaan Peninsula. After World War I, copper supply exceeded demand, prices fell, and there has been no further copper production since 1918 (Wright, 1915; Warner and others, 1961; Roppel, 1991; Maas and others, 1995). However, because of the intense and widespread mineralization on the peninsula, the area has repeatedly been re-examined for copper, iron, and gold, notably during WW II (Warner and others, 1961)

and since 1990.

Alteration:

Pervasive development of tactite.

Age of mineralization:

The deposit formed in a Silurian or Ordovician, submarine arc-related environment characterized by the deposition of volcanic and sedimentary rocks, the intrusion of swarms of dikes of diverse composition, and the emplacement of several large plutons.

Generic deposit model:

Deposit model:

Cu-Fe skarn (Cox and Singer, 1986; model 18d).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18d

Production Status: Yes; medium

Site Status: Active

Workings/exploration:

The Mount Andrew Mine comprises three adits, 4 glory holes, several winzes, and a sublevel, to a depth of about 250 feet. The geology and workings are shown in detail on plates 7 to 11 of Warner and others (1991). The deposit was discovered in 1898 and the first ore was shipped in 1906 to the Tacoma smelter (Wright and Wright, 1915; Warner and others, 1961; Roppel, 1991). There was intermittent production until 1918, but none since. In 1944, the U.S. Bureau of Mines trenched the deposit and drilled 14 holes. The U.S. Geological Survey mapped the deposit in detail from 1942 to 1944. Utah Construction and Mining did geologic mapping and geophysical surveys in 1957 and drilled the deposit from 1960 to 1962 and in 1968. In 2006, Full Metal Minerals began work at Mount Andrew ; they drilled 5 shallow holes that totaled 481 meters to test the periphery of the old surface and underground workings (Full Metal Minerals, 2008, Mount Andrew Property). In 2007, Full Metal drilled 1,500 meters in another 13 holes and cut several intervals with strong chalcopyrite-magnetite mineralization (Full Metal Minerals, 2008, Mount Andrew Property; 2008, Mount Andrew drilling; 2008, Mount Andrew locations).

Production notes:

No figures are available solely for the production of the Mount Andrew Mine. However, the cumulative production from it and the nearby Stevenstown (CR072) and Mamie (CR073) mines from 1905 to 1918 was about 270,000 tons of ore with an average grade of 2.37 percent copper, and 0.026 ounce of gold and 0.212 ounce of silver per ton (Warner and others, 1961).

Reserves:

There have been several estimates of the remaining resources of the Mount Andrew, Stevenstown (CR72), and Mamie (CR73) mines. Warner and others (1961) and Wright and Tolonen (1947) estimate a collective resource of 2,684,000 long tons of ore, of which about 80 percent is in the Mount Andrew deposit. The weighted average grade of this resource is 47.8 percent iron, 0.32 percent copper, and 0.011 ounce of gold and 0.55 ounce of silver per ton (Wright and Tolonen, 1947). Twenhofel (1953) estimated that about 3,500,000 tons of ore remain in the deposits. Carr and Dutton (1959) estimated that the deposits still contain about 2.3 million tons of indicated magnetite ore with 50 percent iron, and 0.91 million tons of inferrred ore. Little copper-rich ore such as was mined prior to 1919 probably remains.

Additional comments:

The Mount Andrews Mine is covered by patented claims. The Sealaska Corporation holds the subsurface

rights to the land around it.

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Primary Reference: Warner and others, 1961

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Gold Standard

Site type:

ARDF no.: CR081

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

When this record was originally compiled the Gold Standard Mine was artificially separated into two parts. The mine is now only considered a single ARDF site, KC028. This site number is only preserved for accounting purposes.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-03-05

Site name(s): Harris River; Julia; Rogers; Dunton

Site type: Mine

ARDF no.: CR098

Latitude: 55.4615 **Quadrangle:** CR B-3

Longitude: 132.709

Location description and accuracy:

The Harris River Mine is on the north bank of the Harris River, about 0.5 mile above its mouth. It is about 0.6 mile south-southwest of the center of section 7, T. 74 S., R. 84 E. and is marked by old mining equipment in the river. Several early geologists, notably Wright and Wright (1908), and Roppel (2005) combine their descriptions of the Harris River Mine and the Dawson Mine (CR099) about a half mile to the north. They were mined at different periods by different parties however, and are described separately in ARDF.

Commodities:

Main: Ag, Au, Cu, Pb

Other: Te?

Ore minerals: Chalcopyrite, galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

Much of the history of the mines near the mouth of the Harris River was compiled by Roppel (2005). The first claims were staked in 1899 but soon allowed to lapse. The property was restaked in 1905 as the Julia claims which extended over an uncertain area but what was to become the Harris River Mine, and then or later probably the area to the north that included what became the Dawson Mine (CE099).

The early workings on these claims was concentrated on the Harris River Mine along the Harris River. The claims were purchased by C.H. Dunton in 1906 who sank an inclined shaft near the Harris River. By 1912, there was a 5-stamp mill run by hydro power on the property and 3,000 tons of ore had been mined that yielded $37,000 (probably all in gold at $20.67 per ounce). Another leaser worked the property from 1913 to 1919 and produced 7,000 tons of ore with a gross value of $81,570. When visited by Sales (1916), the workings consisted of a 280-foot shaft inclined at 30 degrees, with levels at 50, 100, and 200 feet. About 4,000 to 6,000 tons of ore had been produced; the ore averaged about $7.00 per ton in gold (at $20.67 per ounce), and some ran as high as $60 in gold per ton. In 1919, the Kasaan Gold Mining Company took the property over and built a 60-ton-a-day mill powered by a new hydroelectric plant on the Harris River. From 1920 to 1928, the Kasaan company produced about $160,000, probably all in gold (at $20.67 per ounce).

In 1930, the company was reorganized as the Kasaan Mining Company. What were then called the Handy claims (to the north of the Harris River) were leased to Wendell Dawson who shifted the mining to what is now called the Dawson Mine (CR099) about a half mile north of the Harris River Mine. There apparently was no further mining at the Harris River Mine.

The Harris River Mine is in a band of black graphitic slate and quartzite; however, most of the rocks exposed along the river for several hundred yards above and below the mine are massive to schistose, intermediate to felsic volcanic rocks of the Silurian and Ordovician Descon Formation (Sales, 1916; Herreid and Rose, 1966; Wilcox, 1938 [PE 119-5]; D.J. Grybeck, unpublished field notes, 1984). The deposit consists of quartz-cemented brecciated slate and conformable quartz veins and lenses in the slate; the width of the mineralized zone varies from 1 to 12 feet and averages about 6 feet (Sales, 1916; Wilcox, 1938 [PE 119-5]; Herreid and Rose, 1966). Fine-grained to porphyritic dikes commonly are conformable to the

foliation but crosscut the veins. The individual quartz veins and lenses are several inches to 1 or 2 feet thick. Sulfides, mainly disseminated pyrite and rare galena and sphalerite, are sparse; the best ore was associated with the most abundant pyrite. Tellurides were reported but have not been verified in recent studies.

The total production was substantial but uncertain because the mill treated ore from other mines in the area. Maas and others (1991) indicate that the total production from 1910 to 1929 (from the mine or the mill?) was 5,814 ounces of gold, 6,457 ounces of silver, 4,390 pounds of copper, and 1,159 pounds of lead from 8,173 tons of ore. However, the production was probably greater in so much as the Kasaan Gold Mining Company produced about $160,000 of ore from 1920 to 1928 from the Harris River Mine.

Alteration:

Age of mineralization:

Unknown, other than that the deposit is Silurian or Ordovician, or younger.

Generic deposit model:

Deposit model:

Gold-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Active?

Workings/exploration:

Much of the history of the mines near the mouth of the Harris River was compiled by Roppel (2005). The first claims were staked in 1899 but soon allowed to lapse. The property was restaked in 1905 as the Julia claims which extended over an uncertain area but what was to become the Harris River Mine, and then or later probably the area to the north that included what became the Dawson Mine (CR099).

The early workings on these claims was concentrated on the Harris River Mine along the Harris River. The claims were purchased by C.H. Dunton in 1906 who sank an inclined shaft near the Harris River. By 1912, there was a 5-stamp mill run by hydro power on the property and 3,000 tons of ore had been mined that yielded $37,000 (probably all in gold at $20.67 per ounce). Another leaser worked the property from 1913 to 1919 and produced 7,000 tons of ore with a gross value of $81,570. When visited by Sales (1916), the workings consisted of a 280-foot shaft inclined at 30 degrees, with levels at 50, 100, and 200 feet. About 4,000 to 6,000 tons of ore had been produced; the ore averaged about $7.00 per ton in gold (at $20.67 per ounce), and some ran as high as $60 in gold per ton. In 1919, the Kasaan Gold Mining Company took the property over and built a 60-ton-a-day mill powered by a new hydroelectric plant on the Harris River. From 1920 to 1928, the Kasaan company produced about $160,000, probably all in gold (at $20.67 per ounce).

In 1930, the company was reorganized as the Kasaan Mining Company. What were then called the Handy claims (to the north of the Harris River) were leased to Wendell Dawson who shifted the mining to what is now called the Dawson Mine (CR099) about a half mile north of the Harris River Mine. There apparently was no further mining at the Harris River Mine.

Production notes:

The total production was substantial but uncertain because the mill treated ore from other mines in the area. Maas and others (1991) indicate that the total production from 1910 to 1929 (from the mine or the mill?) was 5,814 ounces of gold, 6,457 ounces of silver, 4,390 pounds of copper, and 1,159 pounds of lead from 8,173 tons of ore. However, the production was probably greater in so much as the Kasaan Gold Mining Company produced about $160,000 of ore from 1920 to 1928 from the Harris River Mine.

Reserves:

None.

Additional comments:

References:

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Primary Reference: Herreid and Rose, 1966

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Dawson

Site type: Mine

ARDF no.: CR099

Latitude: 55.4705 **Quadrangle:** CR B-3

Longitude: 132.70527

Location description and accuracy:

The Dawson Mine is named on the USGS 1:63,360-scale topographic map. It is about 0.1 mile north of the center of section 7, T. 74 S., R. 84 E. The workings extend south to just north of the Hollis-Klawock road. Herreid and Rose (1966, figure 3) provide a map of the workings. Several early geologists, notably Wright and Wright (1908), and Roppel (2005), combine their descriptions of the Dawson and the Harris River (CR098) Mines because for much of their history they shared the same ownership. They have different histories, however, and are are described separately in ARDF.

Commodities:

Main: Ag, Au, Cu, Pb

Other: As, Sb

Ore minerals: Chalcopyrite, galena, gold, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

Much of the history of the mines near the mouth of the Harris River was compiled by Roppel (2005). The first claims were staked in 1899 but soon allowed to lapse. The property was restaked in 1905 as the Julia claims, which covered an uncertain area but certainly the area that included what was to become the Harris River Mine (CE098) and then or later probably the area to the north that included what became the Dawson Mine.

The early workings on these claims was concentrated at the Harris River Mine (CE098) and its mill along the Harris River that was in operation until about 1929 by the Kasaan Gold Mining Company. In 1930, the company was reorganized as the Kasaan Mining Company and what were then called the Handy claims were leased to Wendell Dawson who shifted the mining about a half mile north of the Harris River Mine to what is now called the Dawson Mine. Dawson mined intermittently until 1952. There apparently was no further mining at the Harris River Mine. The Dawson mine was restaked in 1976, and from 1979 to 1981, MAPCO, Inc. explored the property and drilled several holes. Discovery Gold Explorations, Inc. drilled 5 holes in 1984 and several more holes in 1985 (Harris, 1985). The drilling defined a resource of 43,800 tons of ore averaging about 1 ounce of gold per ton. In 2008, the Dawson Mine is being explored under an agreement between Full Metals Minerals and Altair Ventures Inc. (Altair Ventures, Inc., 2008; Full Metal Minerals, 2008). and they drilled 3 holes in 2007.

Herreid and Rose (1966) mapped the rocks in the vicinity of the Dawson Mine as graywacke, banded siltstone and argillite with minor slate, limestone, and phyllite. They are part of the Descon Formation of Silurian and Ordovician age (Eberlein and others, 1983; Brew, 1996).

The deposit consists of quartz veins and stringers that generally strike about N35E and dip northwest at about 28 degrees (Smith, 1914; Mertie, 1921; Roehm, 1936 [PE 119-2]; Wilcox, 1938 [119-5]). The veins are in a zone 2 to more than 6 feet thick. Most of the value is in free gold that occurs along contacts between quartz stringers and slate; minor amounts of sulfides including pyrite, sphalerite, chalcopyrite, and galena are disseminated in the veins and country rocks. Pyritized, fine-grained felsic dikes parallel and crosscut the veins. Two principal veins were mined, the Freegold and Humboldt. Only the Freegold vein was mined; it

extends for about 210 feet along strike but it is segmented by several near-horizontal faults.

In the 1980s and 1990s, a considerable area was stripped and trenched just north of the Hollis-Klawock road (D.J. Grybeck, unpublished field notes, 1984 and 1991). Three veins, 10-24 inches thick, were exposed that dip west at about 26-55 degrees. The veins are in deformed black shale with graphitic partings; the footwalls for up to several feet from the veins are highly sheared gouge zones. The veins contain up to 1 percent sulfides, mainly pyrite and sphalerite. Three short(?) adits were driven on the veins in this area. In the 1990s, a road had been cleared to the older workings and mill site to the north. About 200 feet higher in elevation, there were several drill sites in the vicinity of the old workings and the mill. Several selected samples of quartz vein material from dumps at the old mill site contained up to 1,000 parts per million (ppm) silver, 700 ppm arsenic, 3,000 ppm copper, 1,000 ppm antimony, more than 1 percent zinc, and 59 ppm gold, but most values were much lower.

Maas and others (1991) sampled most of the accessible workings. Their samples had a wide range of values, but several of the quartz veins contained 0.3 to more than 5 ounces of gold per ton, up to several ounces of silver per ton, and lead, zinc, and copper values that reflect as much as 1 to 2 percent sulfides in the veins.

In the 1930s, the Dawson mine was developed by 2 short crosscut tunnels and at least 150 feet of underground workings. In 1938, Roehm (1936 [PE 119-2]) reported that about $22,000 in gold (at $35 per ounce?) had been produced since 1933; the ore ran about $20 to $30 in gold per ton. Wilcox (1938 [PE 119-5]), who may have been describing the Harris River Mine (CR098) to the south, indicated that the total production was about $16,000 to $17,000 in gold (at $35 per ounce?). His samples assayed up to about $30 in gold per ton across 5 feet. Maas and others (1995) indicate that the Dawson Mine operated intermittently from the 1930s to 1952, with a total production of nearly 10,000 ounces of gold, 7,000 ounces of silver, and minor lead and copper. There was a small mill on the property.

As of 2008, the Crackerjack mine and several nearby properties are being explored under an agreement between Full Metals Minerals and Altair Ventures Inc. (Altair Ventures, Inc., 2008; Full Metal Minerals, 2008, CJ property). The drilled 3 holes on the veins at the Dawson Mine as well as two holes at the Hollis tunnel near the Crackerjack mine (CR101) and three holes at the Crackerjack mine itself to test the mineralization along a belt several miles long. Some of the notable mineralized intercepts cut in the drilling at the Dawson mine included 2.05 meters that contained 9.56 grams of gold per tonne and 76.7 grams of silver per tonne.

Alteration:

None specifically mentioned, although the felsic dikes that cross the veins commonly are bleached and altered.

Age of mineralization:

Unknown, other than that the veins are in Silurian or Ordovician black shale and graywacke.

Generic deposit model:

Deposit model:

Gold-quartz vein (Cox and Singer, 1986, model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Much of the history of the mines near the mouth of the Harris River was compiled by Roppel (2005). The first claims were staked in 1899 but soon allowed to lapse. The property was restaked in 1905 as the Julia claims, which covered an uncertain area but certainly the area that included what was to become the Harris

River Mine (CE098) and then or later probably the area to the north that included what became the Dawson Mine.

The early workings on these claims was concentrated at the Harris River Mine (CE098) and its mill along the Harris River that was in operation until about 1929 by the Kasaan Gold Mining Company. In 1930, the company was reorganized as the Kasaan Mining Company and what were then called the Handy claims were leased to Wendell Dawson who shifted the mining about a half mile north of the Harris River Mine to what is now called the Dawson Mine. Dawson mined intermittently until 1952. There apparently was no further mining at the Harris River Mine. The Dawson mine was restaked in 1976, and from 1979 to 1981, MAPCO, Inc. explored the property and drilled several holes. Discovery Gold Explorations, Inc. drilled 5 holes in 1984 and several more holes in 1985 (Harris, 1985). The drilling defined a resource of 43,800 tons of ore averaging about 1 ounce of gold per ton. In 2008, the Dawson Mine is being explored under an agreement between Full Metals Minerals and Altair Ventures Inc. (Altair Ventures, Inc., 2008; Full Metal Minerals, 2008, CJ property) and they drilled 3 holes in 2007.

Production notes:

In 1938, Roehm (1936 [PE 119-2]) reported that about $22,000 in gold (at $35 per ounce?) had been produced at the Dawson Mine since 1933; the ore ran about $20 to $30 in gold per ton. Wilcox (1938) indicated that the total production was about $16,000 to $17,000 in gold (at $35 per ounce?). His samples assayed up to about $30 in gold per ton across 5 feet. Maas and others (1995) indicate that the mine operated intermittently from the 1930s to 1952, with a total production of nearly 10,000 ounces of gold, 7,000 ounces of silver, and minor lead and copper.

Reserves:

Discovery Gold Explorations, Inc. drilled 5 holes in 1984 and several more holes in 1985 (Harris, 1985). The drilling defined a resource of 43,800 tons of ore averaging about 1 ounce of gold per ton.

Additional comments:

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Primary Reference: Herreid and Rose, 1966

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Crackerjack

Site type: Mine

ARDF no.: CR101

Latitude: 55.48956

Quadrangle: CR B-3

Longitude: 132.70226

Location description and accuracy:

The main adit of the Crackerjack Mine, Adit No. 2, is at an elevation of about 800 feet, about 0.5 mile south of the Puyallup Mine, which is shown on the USGS 1:63,360-scale topographic map. The adit is on what is locally called Crackerjack Creek, near the middle of the south boundary of section 31, T. 73 S., R. 84 E. The property consists of ten claims and numerous workings that are shown on figure 2 of Herreid and Rose (1966) and on figure 18 of Mass and others (1995).

Commodities:

Main: Ag, Au

Other: As, Cu, Pb, Sb, Zn

Ore minerals: Chalcopyrite, galena, pyrite, sphalerite, tetrahedrite

Gangue minerals: Quartz

Geologic description:

The rocks in the vicinity of the Crackerjack Mine are mainly thin beds of interlayered black slate and black siltstone with subordinate argillite and graywacke, that are part of the Descon Formation of Silurian and Ordovician age (Herreid and Rose, 1966). The mineralization at the Crackerjack Mine consists of two parallel quartz veins about 100 feet apart that closely follow two porphyry dikes for over a mile (Wright and Wright, 1908; Roehm, 1938, PE 119-7; Herreid and Rose, 1966; Maas and others, 1991; Maas and others, 1995). The veins and dikes strike about N20-30W and dip 20-48SW. Different workers have variously called the dikes gray porphyritic diorite, green porphyry, greenstone, or dacite porphyry. Near the veins, the dikes are intensely altered to quartz, pyrite, calcite, chlorite, and epidote. The quartz veins are banded and vary from 1 to 5 feet wide. They contain free gold, and, in order of abundance: pyrite, chalcopyrite, galena, sphalerite, tetrahedrite, and an antimony or bismuth sulfosalt. The gold content of the ore is tied to the abundance of the sulfides. The ore occurs in shoots that Roehm (1938, PE 119-7) suggests rake gently to the west; they were formed along rolls or irregularities in shear zones along the veins.

The Crackerjack Mine was discovered prior to 1902 (Brooks, 1902). By 1938, there were 8 tunnels and numerous open cuts and trenches for about 6,000 feet along the west side of what is locally called Crackerjack Creek (Roehm, 1938; Herreid and Rose, 1966, figure 2). Most of the workings apparently were driven before 1909. Maas and others (1991; 1995, figure 18) mapped and sampled extensively in the workings; the gold content of their samples varied widely from almost nothing to several ounces per ton. Roehm's map (1938) shows the location of 176 samples across the veins; they contained from a trace to 14.14 ounces of gold per ton and a trace to 29.41 ounces of silver per ton. He also cites an old report that shows 185 channel samples that averaged $7.50 per ton in gold (at $20.67 per ounce). Apparently there has been no production since 1908 (Maas and others, 1995). A mill was in operation before 1905 at the nearby Puyallup Mine (CR103); that mill processed ore from both the Puyallup and Crackerjack mines (Wright and Wright, 1905). Bureau of Mines production records cited by Maas and others (1991) indicate that from 1900 to 1916, the two mines produced an estimated 10,466 ounces of gold; the average grade was 0.840 ounce of gold per ton and 0.668 ounce of silver per ton.

As of 2008, the Crackerjack mine and several nearby properties were being explored under an agreement

between Full Metals Minerals and Altair Ventures Inc. (Altair Ventures, Inc., 2008; Full Metal Minerals, 2008). In 2007, they drilled 3 holes on the vein at the Crackerjack mine, two holes at the Hollis tunnel about 800 meters to the southeast and 2 holes at the Dawson Mine (CR099) about a mile to the south; the drilling totaled 1,105 meters. The drilling on the Crackerjack vein cut several intervals of mineralization including: 3.21 meters that contained 4.94 grams of gold per ton and 5.7 grams of silver per ton; 3.60 meters with 4.23 grams of gold per ton and 11.4 ounces of silver per ton; and 6.26 meters with 2.74 grams of gold per ton and 42.7 grams of silver per ton. The best intercept at the Hollis Tunnel was 2.05 meters that contained 9.56 ounces of gold per ton and 76.7 ounces of silver per ton. Additional drilling began in March, 2008.

Alteration:

The dikes that are associated with the gold-quartz veins are intensely altered to quartz, pyrite, calcite, chlorite, and epidote near the veins.

Age of mineralization:

Unknown, other than that the veins are in Silurian or Ordovician rocks.

Generic deposit model:

Deposit model:

Gold-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The Crackerjack Mine was discovered prior to 1902 (Brooks, 1902). By 1938, there were 8 tunnels and numerous open cuts and trenches for about 6,000 feet along the west side of what is locally called Crackerjack Creek (Roehm, 1938, PE 119-7; Herreid and Rose, 1966, figure 2). Most of the workings apparently were driven before 1909. Apparently there has been no production since 1908 and little activity until recently, other than patenting the claims in 1926 (Maas and others, 1995). Maas and others (1991; 1995, figure 18) mapped and sampled extensively in the workings.

As of 2008, the Crackerjack mine and several nearby properties are being explored under an agreement between Full Metals Minerals and Altair Ventures Inc. (Altair Ventures, Inc., 2008; Full Metal Minerals, 2008). In 2007, they drilled 3 holes on the vein at the Crackerjack mine, two holes on the Hollis tunnel about 800 meters to the southeast and 3 holes on the Dawson Mine (CR099) about a mile to the south. Additional drilling began in March, 2008.

Production notes:

A mill was in operation before 1905 at the nearby Puyallup Mine (CR103); the mill processed ore from both the Puyallup and Crackerjack mines (Wright and Wright, 1905). Bureau of Mines production records cited by Maas and others (1991) indicate that from 1900 to 1916, the two mines produced an estimated 10,466 ounces of gold; the average grade was 0.840 ounce of gold per ton and 0.668 ounce of silver per ton. Apparently there has been no production since 1908 from the Crackerjack Mine.

Reserves:

Probably none.

Additional comments:

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Primary Reference: Herreid and Rose, 1966; Maas and others, 1995

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Khayyam; Kiam; Cayenne

Site type: Mine

ARDF no.: CR129

Latitude: 55.29603 **Quadrangle:** CR B-2

Longitude: 132.39288

Location description and accuracy:

The Khayyam Mine is incorrectly located on the USGS 1:63,360-scale topographic map. It is at an elevation of about 2,500 feet, about 0.3 mile southwest of the mine symbol on the topographic map and about 0.3 mile east-northeast of the center of section 7, T. 76 S., R. 86 E. This location is accurate.

Commodities:

Main: Ag, Au, Cu, Zn

Other: Pb

Ore minerals: Chalcopyrite, copper, gahnite, magnetite, pyrite, pyrrhotite, sphalerite

Gangue minerals:

Geologic description:

The first claims were staked on the deposit at the Khayyam Mine in 1898 and most of the development work took place between 1901 and 1907 (Brooks, 1902; Wright and Wright, 1908; Roppel, 1991; Maas and others, 1995). The mine has 8 adits with a total of about 1,800 feet of underground workings, and numerous pits, trenches, and open cuts. The mine was serviced by aerial and surface trams that connected to the head of McKenzie Inlet. The mine produced 177,769 pounds of copper, 1,711 ounces of silver, and 129 ounces of gold in 1907. In 2007, The Niblack Mining Corp. acquired the Khayyam Mine and the Stumble-on prospect (CR13) and they are being explored together as the Cayenne property (Niblack Mining Corp., 2008). In 2007, Niblack carried out geologic mapping, collected rock samples, and did a geophysical ground, resistivity survey along 2.5 kilometers of line. Their samples (at the Khayyam?) included a 2-meter chip sample of massive sulfides that contained 0.88 percent copper, 9.66 percent zinc, 6.2 grams of silver per tonne, and 0.30 gram of gold per tonne. Several large boulders from the mine dump contained up to 14.6 percent zinc, 15.4 percent copper, 109 grams of silver per tonne, and 5.72 grams of gold per tonne.

Recent detailed mapping (Barrie, 1984; Barrie and Kyle, 1988) indicate that the deposits at the Khayyam Mine are stratiform, massive-sulfide lenses in Late Proterozoic or Cambrian metamorphic rocks of the Wales Group. The host rocks are mainly schist of volcanic origin. The main units are: felsic plagioclase-quartz-chlorite-biotite schist; intermediate (hornblende-quartz-)chlorite-plagioclase schist; and mafic (chlorite-)hornblende-plagioclase schist. The rocks consistently strike about N75W and dip steeply to the north and south. Minor amounts of garnet, sericite, stilpnomelane, and epidote are possibly related to hydrothermal alteration from a nearby Cretaceous diorite intrusion.

The deposit consists of at least 6 massive sulfide lenses in a 200-foot- thick layer of mafic and intermediate schist that grades laterally into felsic schist. Individual massive-sulfide lenses are up to 22 feet thick and can be traced for up to 230 feet along strike. The lenses consist of 50-95 percent pyrite with varying amounts of chalcopyrite, sphalerite, and pyrrhotite. Gahnite occurs in the schist near the massive sulfide layers. Copper, gold, and silver are distributed irregularly through the deposit; zinc is enriched at the periphery. The deposit is associated with coarse, fragmental volcanic rocks that were at or near hydrothermal, submarine vents. The ore lenses characteristically have chloritic alteration in their footwall, and the mafic and intermediate schist is silicified near the vents. Recent detailed geochemical and isotopic work by Slack and others (2002) confirm that the deposit is of Late Proterozoic or Cambrian age.

The deposit was extensively sampled by the U.S. Bureau of Mines in 1944 and 1945 (Fosse, 1946). They defined an inferred resource of 84,000 tons of material that contains an average of 1.71 percent copper, 0.93 percent zinc, 0.06 ounce of gold per ton, and 0.30 ounce of silver per ton. Banner Mining Company drilled 14 holes in 1971 at the Khayyam Mine and 11 holes at the Mammoth (Stumble-On) prospect (CR130). Cominco Exploration mapped and sampled the property in 1972 and 1973. Homestake Mining Company examined the property in 1975 (Hite, 1976). More recently, the deposit was sampled by the U.S. Bureau of Mines (Maas and others, 1995), who collected 41 samples. Their best values were 2.14 parts per million (ppm) gold, 43.7 ppm silver, 9.5 percent copper, 1.66 percent zinc, and minor lead; most values were much lower.

Alteration:

The ore lenses characteristically have chloritic alteration in their footwall, and the mafic and intermediate schist is silicified near the vents.

Age of mineralization:

Massive sulfide deposit in Late Proterozoic or Cambrian metamorphic rocks.

Generic deposit model:

Deposit model:

Besshi massive-sulfide deposit (Cox and Singer, 1986; model 24b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24b

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The first claims were staked on the deposit at the Khayyam Mine in 1898 and most of the development work took place between 1901 and 1907 (Brooks, 1902; Wright and Wright, 1908; Roppel, 1991; Maas and others, 1995). The mine has 8 adits with a total of about 1,800 feet of underground workings, and numerous pits, trenches, and open cuts. The mine was serviced by aerial and surface trams that connected to the head of McKenzie Inlet. The deposit was extensively sampled by the U.S. Bureau of Mines in 1944 and 1945 (Fosse, 1946). Banner Mining Company drilled 14 holes in 1971 at the Khayyam Mine and 11 holes at the Mammoth (Stumble-On) prospect (CR130). Cominco Exploration mapped and sampled the property in 1972 and 1973. Homestake Mining Company examined the property in 1975 (Hite, 1976). The deposit was sampled by the U.S. Bureau of Mines in the mid-1990s (Maas and others, 1995).

In 2007, The Niblack Mining Corp. acquired the Khayyam Mine and the Stumble-on prospect (CR013) and they are being explored together as the Cayenne property (Niblack Mining Corp., 2008). In 2007, Niblack carried out geologic mapping, collected rock samples, and did a geophysical ground, resistivity survey along 2.5 kilometers of line.

Production notes:

The mine produced 177,769 pounds of copper, 1,711 ounces of silver, and 129 ounces of gold in 1907.

Reserves:

The U.S. Bureau of Mines estimated an inferred resource of 84,000 tons of material that contains an average of 1.71 percent copper, 0.93 percent zinc, 0.06 ounce of gold per ton, and 0.30 ounce of silver per ton (Fosse, 1946).

Additional comments:

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Primary Reference: Barrie and Kyle, 1988

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Stumble-on; Mammoth; Cayenne

Site type: Prospect

ARDF no.: CR130

Latitude: 55.29674 **Quadrangle:** CR B-2

Longitude: 132.37202

Location description and accuracy:

The Stumble-on prospect is at an elevation of about 1,300 feet, 0.8 mile east-southeast of the mine symbol for the Khayyam Mine on the USGS, 1:63,360 scale topographic map. (The Khayyam Mine is not at the symbol; see CR129 for its actual location.) The Stumble-on prospect is about 0.2 mile north-northeast of the center of section 8, T. 76 S., R. 86 E. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Zn

Other:

Ore minerals:

Gangue minerals:

Geologic description:

The deposit at the Stumble-on Mine was discovered in about 1899, probably at the same time as the nearby Khayyam Mine (CR129) (Brooks, 1902; Wright and Wright, 1908; Fosse, 1946; Bufvers, 1967; Barrie, 1984; Barrie and Kyle, 1988; Roppel, 1991; Maas and others, 1995). The Stumble-on, first called the Mammoth, was developed by 2 adits with about 530 feet of workings, an open cut, and several trenches. There is no record of production.

In 2007, The Niblack Mining Corp. acquired the Stumble-on prospect and the Khayyam Mine (CR129) and they are being explored together as the Cayenne property (Niblack Mining Corp., 2008) In 2007, Niblack carried out geologic mapping, collected rock samples, and did a geophysical ground, resistivity survey along 2.5 kilometers of line. Their Cayenne samples (at the Khayyam Mine?) included a 2-meter chip sample of massive sulfides that contained 0.88 percent copper, 9.66 percent zinc, 6.2 grams of silver per tonne, and 0.30 gram of gold per tonne. Several large boulders from the mine dump contained up to 14.6 percent zinc, 15.4 percent copper, 109 grams of silver per tonne, and 5.72 grams of gold per tonne.

Detailed mapping (Barrie, 1984; Barrie and Kyle, 1988) indicates that the deposit at the Stumble-on prospect is a stratiform, massive-sulfide lens in Late Proterozoic or Cambrian metamorphic rocks of the Wales Group. The host rocks consist mainly of schist of volcanic origin. The main units are (hornblende-quartz-)chlorite-plagioclase schist and (chlorite-)hornblende-plagioclase schist. The rocks consistently strike about N75W and dip steeply to the north and south. Minor amounts of garnet, sericite, stilpnomelane, and epidote also occur in the schist. Recent detailed geochemical and isotopic work by Slack and others (2002) confirm that the deposit is of late Proterozoic or Cambrian age.

The deposit at the Stumble-on prospect consists of a single, massive-sulfide lens about 6 feet thick that is exposed for about 560 feet (Barrie, 1984; Barrie and Kyle, 1984; Maas and others, 1995). The lens consists mainly of pyrite with subordinate chalcopyrite, pyrrhotite, and magnetite. A ground geophysical survey (VLF-EM) indicates that the body continues to the east under surficial material. The deposit is essentially the same as the one at the nearby Khayyam Mine (CR129), and much of the geologic and exploration work there probably extends to the area of the Stumble-on prospect. Bedrock between the two deposits is largely covered by surficial material, but they may be on the same stratigraphic horizon. The Stumble-on prospect has been sampled many times with similar results that vary mostly by the sample selection. Maas and

others (1995), for example, sampled extensively. Their best samples contained 5.96 percent copper, 3.61 percent zinc, 43.7 parts per million (ppm) silver, and 3.916 ppm gold; the average value of their 24 samples was 0.92 percent copper, 0.20 percent zinc, 691 ppm silver, and 1.12 ppm gold.

Alteration:

Probably similar to that at the Khayyam Mine (CR129).

Age of mineralization:

Volcanogenic, massive sulfide deposit in late Proterozoic or Cambrian metamorphic rocks.

Generic deposit model:

Deposit model:

Besshi massive-sulfide deposit (Cox and Singer, 1986; model 24b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24b

Production Status: None

Site Status: Active

Workings/exploration:

The Stumble-on prospect was developed by 2 adits with about 530 feet of workings, an open cut, and several trenches. Banner Mining Company drilled 14 holes in 1971 at the Khayyam Mine (CR129) and 11 holes at the Mammoth (Stumble-On) prospect. Cominco Exploration mapped and sampled the property in 1972 and 1973. Homestake Mining Company examined the property in 1975 (Hite, 1976). The deposit was sampled by the U.S. Bureau of Mines (Maas and others, 1995). In 2007, The Niblack Mining Corp. acquired the Stumble-on prospect and the Khayyam Mine (CR129) and they are being explored together as the Cayenne property (Niblack Mining Corp., 2008). In 2007, Niblack carried out geologic mapping, collected rock samples, and did a geophysical ground, resistivity survey along 2.5 kilometers of line.

Production notes:

There is no record of production.

Reserves:

None.

Additional comments:

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Wright, C.W., 1907, Lode mining in southeastern Alaska: U.S. Geological Survey Bulletin 314, p. 47-72.

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Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Barrie and Kyle, 1988

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Polymetal; Ruby Tuesday; Research; Chomly; Ketchikan Copper Company

Site type:

Prospects

ARDF no.: CR169

Latitude: 55.2157 **Quadrangle:** CR A-1

Longitude: 132.3248

Location description and accuracy:

This property was staked prior to 1902 by the Ketchikan Copper Company and it is so named in several old reports. A 297-foot adit was driven under the mineralization and the ARDF site is at the portal of that adit. The adit is at an elevation of about 1,300 feet, about 2.5 miles southwest of the mouth of the South Arm of Cholmondeley Sound, and near the southwest corner of section 4, T. 77 S., R. 87 E. After WW II, the property was restaked several times by several parties and there was considerable exploration in the 1980's and early 1990's, when the property consisted of more than 70 claims. Most of the work was in an area about 1,800 feet in diameter centered near the location of the original claims.

Commodities:

Main: Ag, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

This property was staked before 1902 (Brooks, 1902) by the Ketchikan Copper Company and it is so named in the early reports. A tunnel was driven for about 300 feet to intersect the ore body at depth, but apparently stopped short of it. The deposit was restaked as the Polymetal Lode in 1948 and was explored by one or more shallow drill holes in the mid-50s (Maas and others, 1991, 1995). It was restaked in 1973 and drilled by ASARCO under lease. Noranda restaked a large area around it in 1978 and 1979 as the Ruby Tuesday claim block. LAC Minerals (USA) Incorporated gained a controlling interest in the property in 1988 and brought in Kennecott Exploration as a partner in 1993. There were at least 11 holes totaling more than 7,300 feet drilled on the property through early 1993 (LAC Minerals (USA) Incorporated, 1989). There has been no production and no reserve figures have been published. In 2007, the property which consists of 120 claims was acquired by the Niblack Mining Corporation (2007).

The rocks in the area consist of intricately folded and faulted, greenschist-grade, chlorite schist, sericite schist, marble, siliceous and graphitic pelitic rocks, felsic tuff, and undivided pelitic and volcaniclastic rocks (Herreid and others, 1978; Kucinski, 1987; Maas and others, 1991, 1995). The rocks are part of the Wales Group of Late Proterozoic and/or Cambrian age. The main deposit, the Polymetal, is a stratiform volcanogenic massive-sulfide deposit that consists of thin stringers and layers of sphalerite, pyrite, galena, and chalcopyrite in siliceous felsic tuff near its contact with black argillaceous chert. Recent detailed geochemical and isotopic work by Slack and others (2002) confirm that the deposit is of Late Proterozoic and/or Cambrian age. Fowler (1949) sampled the outcrop of a 20-foot-thick mineralized zone; it averages 11.1 percent zinc, 3.1 percent lead, and a trace of silver. The nearby Chomly deposit is in a different stratigraphic horizon; it consists of patches of sphalerite and galena up to 4 inches thick and 3 feet long in black argillaceous chert.

Alteration:

Intense alteration was noted in one report but was not described specifically. The mineralized zone is oxidized and iron stained at the surface.

Age of mineralization:

Probably contemporaneous with the deposition the Late Proterozoic or Cambrian host rocks.

Generic deposit model:

Deposit model:

Volcanogenic Cu-Pb-Zn massive sulfide deposit (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Active

Workings/exploration:

This property was staked before 1902 (Brooks, 1902) by the Ketchikan Copper Company and it is so named in the early reports. A tunnel was driven for about 300 feet to intersect the ore body at depth but apparently stopped short of it. The deposit was restaked as the Polymetal Lode in 1948 and was explored by one or more shallow drill holes in the mid-50s (Maas and others, 1991, 1995). It was restaked in 1973 and drilled by ASARCO under lease. Noranda restaked a large area around it in 1978 and 1979 as the Ruby Tuesday claim block. LAC Minerals (USA) Incorporated gained a controlling interest in the property in 1988 and brought in Kennecott Exploration as a partner in 1993. There were at least 11 holes totaling more than 7,300 feet drilled on the property through early 1993 (LAC Minerals (USA) Incorporated, 1989). In 2007, the property which consists of 120 claims was acquired by the Niblack Mining Corporation (2007).

Production notes:

None.

Reserves:

None.

Additional comments:

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Swainbank, R.C., Bundtzen, T.K., and Wood, J.E., 1991, Alaska's mineral industry, 1990: Alaska Division of Geological and Geophysical Surveys Special Report 45, 78 p.

Primary Reference: Kucinski, 1987

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Valpariso

Site type: Mine

ARDF no.: CR197

Latitude: 55.1456 **Quadrangle:** CR A-1

Longitude: 132.0793

Location description and accuracy:

The Valpariso Mine is near the north shore of Paul Lake, about 0.4 mile southwest of Dolomi Mountain. It is not at the mine symbol that is misplaced about a half mile to the west on the USGS 1:63,360-scale topographic map. Instead, it is about 0.3 mile south-southeast of the center of section 36, T. 77 S., R. 88 E. The Paul or Jessie prospect (CR200) to the east is an extension of the vein at the Valpariso Mine and descriptions of that prospect sometimes have been combined with that of the mine; they were often managed by the same company. The underground workings of the mine are shown on figure 30 of Maas and others (1995).

Commodities:

Main: Ag, Au

Other: Cu, Pb, Sb, Zn

Ore minerals: Chalcopyrite, galena, gold, pyrite, sphalerite, tetrahedrite

Gangue minerals: Calcite, quartz

Geologic description:

The Valpariso Mine was the most productive mine in the Dolomi area and has been described in many publications (for example: Brooks, 1902; Wright and Wright 1905, 1906, 1908; Smith, 1914; Smith, 1934a, Smith, 1934b, ; Galloway, 1952; Dyer, 1952, 1956; Herreid, 1967; Maas and others, 1991, 1995). By 1902, the mine had been developed by two shafts and three ore shipments of 31, 50, and 60 tons has been made to a smelter in California. Development and production took place intermittently from 1898 to 1920, and the deposit was mined by a lessor in 1927 and again in 1932. The surface mine plant and mill were extensively rebuilt in 1935 and again from 1946 to 1948 but no ore was produced before funds ran out. Roppel (2005) presents a detailed historical survey of the mine from its earliest days and the many legal, personality , water, and power problems, and management changes that repeatedly stymied mining.

The workings consisted of two (four?) shafts, the deepest of which was 400 feet deep, and extensive workings on at least three levels. Smith (1934a, 1934b) and Dyer (1952, 1956) reported that the mine produced about 5,000 ounces of gold to 1933. U.S. Bureau of Mines records document the production of about 730 ounces of gold and 521 ounces of silver from 1914 to 1933 (Maas and others, 1991, 1995). Galloway (1952) estimated that the total production from the mine was about $100,000 (plus some production, probably small, from leasers), mostly from 1901 to 1908. In 1983 and 1984, Houston Oil and Mineral Exploration Corporation drilled 21 holes at the mine and at the Paul Lake (CR200), Amazon (CR209), and Boston (CR207) properties (Oliver and Adams, 1984).

The host rocks at the Valpariso Mine are marble and schist of the Wales Group of Late Proterozoic and Cambrian age (Eberlein and others, 1983). The deposit consists of a vein up to 14 feet thick of quartz, quartz breccia, and quartz-marble breccia cemented by calcite; the vein is locally faulted and the marble is extensively silicified. The vein is conformable to the bedding of a thick marble layer. In an adit about 600 feet west of the mill, the marble is in contact with chlorite schist and quartzite or jasperoid. The vein strikes about N55W and dips 30-70N; it can be traced for as much as 6,000 feet to the east, to and beyond the Paul or Jessie prospect (CR200). The vein typically contains about 1 percent ore minerals, including free gold,

tetrahedrite, pyrite, chalcopyrite, galena, and sphalerite. Some of the ore was very rich; some ore mined in early 1900s ran $200-$250 a ton in gold (at $20.67 an ounce) and silver (Brooks, 1902). Samples of veins and old dumps collected in 1934 ran $5.50 to $42.07 a ton in gold (at $35 per ounce) and silver (Smith, 1934). In 1934, after the last mining, Smith estimated that the deposit contained 22,500 tons of probable ore in place with an average grade of 0.28 ounce of gold per ton and minor silver. Maas and others (1991) collected 34 samples in the underground workings. Their gold values varied greatly; the best was 4.660 ounces of gold per ton across 1.2 feet, but most samples contained much less. The highest silver value was 6.18 ounces of silver per ton.

Alteration:

The vein is locally faulted and the marble is extensively silicified.

Age of mineralization:

The vein is younger than the Late Proterozoic or Cambrian host rocks.

Generic deposit model:

Deposit model:

Low-sulfide, brecciated gold-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Active?

Workings/exploration:

The workings consisted of two (four?) shafts, the deepest of which was 400 feet deep, and there were extensive workings on at least three levels. In 1983 and 1984, Houston Oil and Mineral Exploration Corporation drilled 21 holes at the mine and at the Paul Lake (CR200), Amazon (CR209), and Boston (CR207) properties (Oliver and Adams, 1984).

Production notes:

Smith (1934) and Dyer (1952, 1956) reported that the mine produced about 5,000 ounces of gold to 1933. U.S. Bureau of Mines records document the production of about 730 ounces of gold and 521 ounces of silver from 1914 to 1933 (Maas and others, 1991, 1995). Galloway (1952) estimated that the total production from the mine was about $100,000 (plus some production, probably small, from leasers), mostly from 1901 to 1908.

Reserves:

In 1934, after the last mining, Smith estimated that the deposit contained 22,500 tons of probable ore in place with an average grade of 0.28 ounce of gold per ton and minor silver.

Additional comments:

Roppel (2005) includes an extensive bibliography of the history of the mine.

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Primary Reference: Herreid, 1967; Maas and others, 1991

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Golden Fleece

Site type: Mine

ARDF no.: CR201

Latitude: 55.1519 **Quadrangle:** CR A-1

Longitude: 132.0542

Location description and accuracy:

This site marks the portals of the two main adits of the Golden Fleece Mine, about 0.2 mile north of the north end of James Lake. It is about 0.2 mile east-northeast of the center of section 31, T. 77 S., R. 89 E. Maas and others (1995) provide a detailed map of the underground workings.

Commodities:

Main: Ag, Au, Cu

Other:

Ore minerals: Gold, pyrite, tetrahedrite

Gangue minerals: Quartz

Geologic description:

The Golden Fleece Mine was discovered in 1899,. By 1902, a 5-stamp mill was erected at the north end of James Lake, and the mine was developed by considerable underground workings (Brooks, 1902; Wright and Wright, 1908; Bufvers, 1967; Herreid, 1967; Maas and others, 1992, 1995). The mine was active from 1901 to 1905, and produced ore that contained about $40 to $60 in gold per ton (at $20.67 per ounce). Roppel (2005) recounts much of the early history of the mine and the many legal and financial problems that swirled around the actual mining. Bufvers (1967) indicated some mining in 1933 but the production was probably minor. Production records are not available. As mapped by Maas and others (1992, 1995), the underground workings included a lower adit 428 feet long, an upper adit 195 feet long, a raise 222 feet long that connects the two levels, and stopes that extend to the surface.

The deposit consists of auriferous quartz veins along two parallel faults that trend north-northwest to north and dip about 20-50E (Brooks, 1902; Wright and Wright, 1908; Maas and others, 1991, 1995). The faults are marked by quartz lenses inches to more than 8 feet thick that pinch and swell along the trend. The faults follow the contact between blue marble and white marble; the marble is silicified and cut by diabase dikes. Several large natural caverns also are along the faults. The quartz contains minor pyrite, chalcopyrite, tetrahedrite, and native gold. Maas and others (1991, 1995) collected 15 samples in the underground workings. Most assayed between 328 and 2,493 parts per billion gold, but several samples across 0.5 to 3 feet of a quartz-rich portion of an old stope contained 0.550 to 1.585 ounces of gold per ton.

The rocks in the Dolomi area are part of the Wales Group of Late Proterozoic and Cambrian age (Herreid, 1967). They are folded into a large dome centered over the eastern third of Paul Lake, and consist of several marble layers 200 to 1300 feet thick, interbedded with calcareous chlorite schist and marble.

Alteration:

Silicification of marble.

Age of mineralization:

The mineralization is younger than the Late Proterozoic or Cambrian host rocks.

Generic deposit model:

Deposit model:
Low-sulfide gold-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
36a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:
As mapped by Maas and others (1991, 1995), the underground workings included a lower adit 428 feet long, an upper adit 195 feet long, a raise 222 feet long, and several stopes that extend to the surface.

Production notes:
The mine was most active from 1901 to 1905, and produced ore that contained about $40 to $60 in gold per ton (at $20.67 per ounce). Bufvers (1967) indicated some mining in 1933.

Reserves:
None.

Additional comments:

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Primary Reference: Brooks, 1902; Maas and others, 1995

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Niblack

Site type: Mine

ARDF no.: CR216

Latitude: 55.0666 **Quadrangle:** CR A-1

Longitude: 132.1475

Location description and accuracy:

This site is the old Niblack Mine that operated from 1902 to 1909. It is just above the shoreline at the head of Niblack Anchorage. It is identified on the USGS 1:63,360-scale topographic map by the name of the old settlement, and it is about 0.6 mile east-northeast of the center of section 33, T. 78 S., R. 88 E.

From the late 1970's to the present (2004), there has been nearly continuous exploration of several geologically similar deposits in an area of about a square mile southeast of the old Niblack Mine. Those deposits are described separately (CR217-223), but in the recent literature, the Niblack Mine and other deposits in the area are commonly grouped together under the name 'Niblack,' or 'Niblack project'. In 2010, most of the work is concentrated on an orebody near the old Lookout prospect (CR221) which is often identified as the 'Niblack project' or 'Niblack'.

Commodities:

Main: Ag, Au, Cu, Zn

Other: Pb

Ore minerals: Chalcopyrite, galena, hematite, pyrite, sphalerite

Gangue minerals:

Geologic description:

The deposit at the Niblack Mine was first developed in 1902 and soon was put in production (Brooks, 1902; Wright and Wright, 1908; Berg and Cobb, 1967). Production continued until 1909, when the mine was closed due to legal actions and it has not produced since. The total production (from incomplete records) is 1,400,000 pounds of copper, 1,100 ounces of gold, and 15,000 ounces of silver. The mine was worked from several shafts, one to a depth of 300 feet. There were 5 levels of workings with a total of about 5,500 feet of drifts, raises, and winzes. Roppel (1991) provides a fascinating study of the personalities and the travails of mining at Niblack.

The deposit that was mined consisted of three large masses of sulfides, 90 to 200 feet long, 5 to 20 feet thick, and 50 to 100 feet deep, that were cut by numerous faults. The ore bodies consisted largely of pyrite and chalcopyrite, with minor sphalerite, galena, and hematite. In the older publications, the host rocks are described as greenstone schist with bands of quartzite, metamorphosed sandstone, and quartz-sericite schist.

Beginning in the mid-70s, a succession of companies, including Cominco-Alaska, Inc., Anaconda Minerals, Noranda Exploration, Houston Oil and Minerals, Lac Minerals, Abacus Minerals Corp., Niblack Mining Corp., Committee Bay Resources Ltd., and the operator as of early 2010, CBR Gold Corporation (2010) have carried out extensive exploration on several deposits in the Niblack Mine area (CR217-223), testing the now widely accepted theory that they are volcanogenic, stratabound, massive-sulfide deposits (Ghayemghamian, 2010). Those deposits are commonly referred to as the 'Niblack' or 'Niblack Project'. However most of the work since at least 2005, has been concentrated on mineralization near the old Lookout prospect (CR221) that is best know and studied deposits. There has apparently been little recent work at the old Niblack Mine although Cominco-America drilled 6 holes near it in the mid-1970s.

The rocks in the area are part of the Ordovician to Lower Silurian, Moira Sound unit. Locally, the rocks consist of footwall dacite and rhyodacite; the Lookout rhyolite that hosts the massive-sulfide mineralization;

and hanging wall, mafic volcanic and volcaniclastic rocks (Maas and others, 1995; Ghayemghamian and others, 2010). Rhyolite from near the Lookout prospect has a U-Pb age of 476.7 +/- 1.5 Ma (Ordovician) (Karl and others, 2009). The rocks are metamorphosed to greenschist facies. The structure in the area is dominated by several large north-verging folds and two major faults are known. Karl and others (2009) interpret the environment of deposition as a rifted, oceanic arc.

The sulfide mineralization was emplaced on the sea floor in porous, unconsolidated fragmental, volcanic sediments, resulting in zones of semi-massive and massive sulfide bodies up to 20 feet thick, dominated by chalcopyrite, pyrite, and sphalerite, that generally follow the sedimentary layering (Maas and others, 1995; Ghayemghamian and others, 2010). The massive-sulfide bodies often grade laterally into disseminated, stringer, and replacement sulfides. The main metals of economic significance are copper, zinc, gold, and silver; lead is low and arsenic, antimony, cadmium, mercury, and selenium are too low to pose a metallurgical problem.

Alteration:

Not specifically noted, but probably typical of volcanogenic massive-sulfide deposits.

Age of mineralization:

The Lookout rhyolite that hosts the mineralization has been dated at 476.7 +/- 1.5 Ma (Ordovician).

Generic deposit model:

Deposit model:

Besshi-type volcanogenic Ag-Au-Cu massive-sulfide deposit (Cox and Singer, 1986; model 24b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24b

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The deposit at the Niblack Mine was first developed in 1902 and soon was put in production (Brooks, 1902; Wright and Wright, 1908). Production continued until 1909, when the mine was closed due to legal actions and it has not produced since. Roppel (1991) provides a fascinating study of the personalities and the travails of the early mining at Niblack.

Beginning in the mid-70s, a succession of companies, including Cominco-Alaska, Inc., Anaconda Minerals, Noranda Exploration, Houston Oil and Minerals, Lac Minerals, Abacus Minerals Corp., Niblack Mining Corp., Committee Bay Resources Ltd., and the operator as of early 2010, CBR Gold Corporation (2010) have carried out extensive exploration on several deposits in the Niblack Mine area (CR217-223), testing the now widely accepted theory that they are volcanogenic, stratabound, massive-sulfide deposits (Ghayemghamian, 2010). Those deposits are commonly referred to as the 'Niblack' or 'Niblack Project'. However most of the work since at least 2005, has been concentrated on mineralization near the old Lookout prospect (CR221) that is best know and studied deposits. Apparently, there has been little recent work at the old Niblack Mine although Cominco-America drilled 6 holes near it in the mid-1970s.

Production notes:

The total production of the Niblack Mine from 1902 to 1909 (based on incomplete records) was 1,400,000 pounds of copper, 1,100 ounces of gold, and 15,000 ounces of silver.

Reserves:

Apparently none at this, the old Niblack Mine, but considerable at what is being called the 'Niblack' or 'Niblack project', near the nearby, old Lookout prospect (CR221).

Additional comments:

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Primary Reference: Ghayemghamian and others, 2010

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Niblack; Lookout; Conundrum; Trio

Site type: Prospect

ARDF no.: CR221

Latitude: 55.0576 **Quadrangle:** CR A-1

Longitude: 132.1461

Location description and accuracy:

The old Lookout prospect is at an elevation of about 1,800 feet, about 0.2 mile northeast of elevation 2230 and about 0.1 mile north-northeast of the southwest corner of section 34, T. 78 S., R. 88 E.

From the late 1970s to the present (late 2011) there has been nearly continuous exploration of several geologically similar deposits in an area of about a square mile southeast of the pre-World War I, Niblack Mine (CR216). Those deposits are described separately (CR217-223). However, the bodies of mineralization that are receiving most of the current (early 2012) attention and are being explored together are near the old Lookout and Trio prospects (CR222). In the recent media and professional publications, the property is generally referred to as the 'Niblack project' or just 'Niblack'.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, covellite, galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The Lookout prospect as described by Brooks (1902) and Wright and Wright (1908) was a mineralized zone up to 300 feet thick in quartz-sericite schist. Within the zone, mineralized bands consist largely of covellite, chalcopyrite, and pyrite. Locally, there are quartz veinlets that have gold values. As of 1908, the workings consisted of two adits, one 160 feet long and the other 60 feet long, and several trenches.

Beginning in the mid-1970s, a succession of companies, including Cominco-Alaska, Inc., Anaconda Minerals, Noranda Exploration, Houston Oil and Minerals, Lac Minerals, Abacus Minerals Corp., Niblack Mining Corp., Committee Bay Resources Ltd., CBR Gold Corporation, and Heatherdale Resources Ltd., the operator in early 2012, have extensively explored the several deposits in the Niblack Mine area (CR217-223), testing the now widely accepted theory that they are volcanogenic, stratabound, massive-sulfide deposits (Ghayemghamian, 2010). Those deposits are commonly grouped with the old Niblack Mine under the name 'Niblack' or 'Niblack Project'. However, most of the work since at least 2005, has been concentrated near the old Lookout prospect described in this record and the Trio prospect (CR222) which now are nearly always referred to as the Niblack project or just Niblack.

From the mid-1970s to 2008, 218 holes were drilled on the Niblack-Lookout deposit from the surface and 28 holes were drilled underground; these total 59,289 meters (Ghayemghamian and others, 2010). There was more drilling in 2009 (but these holes were not included in the 2010 Ghayemghamian resource estimate). In 2008, an 880-meter exploration drift was completed to test the deposit at depth. The various companies have also done considerable surface mapping and sampling and carried out numerous geochemical and geophysical surveys.

In July, 2009, Heatherdale optioned the property from CBR Gold Corporation (Heatherdale Resources Ltd., 2011). A 25,000-foot underground drill program in 2010 expanded the extent of the known mineralization and they had begun a 50,000-foot drill program to test the limits of the ore body.

The rocks in the area are part of the Ordovician to Lower Silurian, Moira Sound unit. At the deposit, the

rocks consist of footwall dacite and rhyodacite; the Lookout rhyolite, which hosts the massive-sulfide mineralization; and hanging wall, mafic volcanic and volcaniclastic rocks (Maas and others, 1995; Ghayemghamian and others, 2010). The age of the rocks in the area has been variously interpreted. Eberlein and others (1983) mapped the strata as locally metamorphosed graywacke of Silurian or Ordovician age, near a large Paleozoic or Mesozoic granitic intrusion. Gehrels (1992) and Maas and others (1995) mapped them as pre-Ordovician metamorphosed volcanic and sedimentary rocks near a Silurian or Ordovician granitic intrusion. Brew (1996) saw the host rocks as part of the Late Proterozoic and Cambrian Wales Group schist, phyllite, and marble, near a Tertiary granitic intrusion of intermediate composition. Most recently, Slack and others (2002) and S.M. Karl (oral communication, 2003) mapped the strata as Silurian and Ordovician, low-grade, regionally metamorphosed sedimentary and volcanic rocks. However, the most recent date based on 3 zircon analyses from flows and volcaniclastic rocks immediately above and below the mineralized horizon using CA-TIMS U/Pb techniques is that the mineralization is Neoproterozoic, 565 +/- 3 Ma (Oliver and others, 2011).

The rocks are metamorphosed to greenschist facies. The structure in the area is dominated by several large, north-verging, overturned folds and two major faults. The Lookout body of mineralization is on the overturned limb of a large syncline. Karl and others (2009) interpret the environment of deposition as a rifted, oceanic arc.

The sulfides precipitated on the sea floor in porous, unconsolidated fragmental, volcanic sediments, resulting in zones of semi-massive and massive sulfide bodies up to 20 feet thick. The dominant sulfides are chalcopyrite, pyrite, and sphalerite which generally follow the sedimentary layering (Maas and others, 1995; Ghayemghamian and others, 2010). The massive-sulfide bodies often grade laterally into disseminated, stringer, and replacement sulfides. The main metals of economic significance are copper, zinc, gold, and silver; lead is low, and arsenic, antimony, cadmium, mercury, and selenium values are too low to pose a metallurgical problem.

There have been several increasingly-better estimates of the resources of the Niblack-Lookout deposit as the drilling and exploration has progressed.

As of November 29, 2011, Heatherdale Resources Ltd. (2011) announced that at a cut-off grade of $50, the Lookout deposit has an indicated resource of 5,638,000 tonnes of material with a grade of 0.95 percent copper, 1.75 grams of gold per tonne, 1.73 percent zinc, and 29.52 grams of silver per tonne. The Lookout deposit has an inferred resource of 2,370,000 tonne of material with a grade of 0.73 percent copper, 1.42 grams of gold per tonne, 1.17 percent zinc, and 21.63 grams of silver per tonne. The Trio deposit (which is usually aggregated with the Lookout deposits in referring to 'Niblack' has an inferred resource of 1,023,000 tonnes of material with a grade of 1.00 percent copper, 1.11 grams of gold per tonne, 1.56 percent zinc, and 16.56 grams of silver per tonne. This resource estimate is based on 373 holes drilled to November 4, 2011. As then known, the Lookout deposit was about 2,200 by 1,700 feet in size with an average thickness of 70 feet; the Trio deposit was about 1,100 by 350 feet in size with an average thickness of 220 feet.

Alteration:

Not specified, but probably typical of volcanogenic massive-sulfide deposits.

Age of mineralization:

The age of the rocks in the area has been variously interpreted. Eberlein and others (1983) mapped the strata as locally metamorphosed graywacke of Silurian or Ordovician age, near a large Paleozoic or Mesozoic granitic intrusion. Gehrels (1992) and Maas and others (1995) mapped them as pre-Ordovician metamorphosed volcanic and sedimentary rocks near a Silurian or Ordovician granitic intrusion. Brew (1996) saw the host rocks as part of the Late Proterozoic and Cambrian Wales Group schist, phyllite, and marble, near a Tertiary granitic intrusion of intermediate composition. Most recently, Slack and others (2002) and S.M. Karl (oral communication, 2003) mapped the strata as Silurian and Ordovician, low-grade, regionally metamorphosed sedimentary and volcanic rocks. However, the most recent date based on 3 zircon analyses from flows and volcaniclastic rocks immediately above and below the mineralized horizon using CA-TIMS U/Pb techniques is that the mineralization is Neoproterozoic, 565 +/- 3 Ma (Oliver and others, 2011).

Generic deposit model:

Deposit model:

Besshi-type volcanogenic Ag-Au-Cu-Zn massive-sulfide deposit (Cox and Singer, 1986; model 24b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24b

Production Status: None

Site Status: Active

Workings/exploration:

The Lookout prospect was known before World War I but beginning in the mid-1970s, a succession of companies, including Cominco-Alaska, Inc., Anaconda Minerals, Noranda Exploration, Houston Oil and Minerals, Lac Minerals, Abacus Minerals Corp., Niblack Mining Corp., Committee Bay Resources Ltd., CBR Gold Corporation, and Heatherdale Resources, the operator in early 2011, have extensively explored several deposits in the Niblack Mine area (CR217-223), testing the now widely accepted theory that they are volcanogenic, stratabound, massive-sulfide deposits (Ghayemghamian, 2010). Those deposits are commonly grouped with the old Niblack Mine under the name 'Niblack' or 'Niblack Project'. However, most of the work since at least 2005, has been concentrated on mineralization near the old Lookout prospect described in this record, and it now is the best known of the deposits. In 2008, a 880-meter exploration drift was completed to test the deposit at depth and much of the drilling since then has been from this drift. The various companies have also done considerable surface mapping and sampling and carried out numerous geochemical and geophysical surveys. As of November 4, 2011, 343 holes have been drilled on the Lookout and Trio deposits (Heatherdale Resources Ltd., 2011).

Production notes:

None.

Reserves:

There have been several increasingly-better estimates of the resources of the Niblack prospect as the drilling and exploration has progressed. As of November 29, 2011, Heatherdale Resources Ltd. (2011) announced that at a cut-off grade of $50, the Lookout deposit has an indicated resource of 5,638,000 tonnes of material with a grade of 0.95 percent copper, 1.75 grams of gold per tonne, 1.73 percent zinc, and 29.52 grams of silver per tonne. The Lookout deposit has an inferred resource of 2.370 million tonnes with a grade of 0.73 percent copper, 1.42 grams of gold per tonne, 1.17 percent zinc, and 21.63 grams of silver per tonne. The Trio deposit (which is usually aggregated with the Lookout deposits in referring to 'Niblack' has an inferred resource of 1.023 million tonnes with a grade of 1.00 percent copper, 1.11 grams of gold per tonne, 1.56 percent zinc, and 16.56 grams of silver per tonne.

Additional comments:

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Wright, C.W., 1907, Lode mining in southeastern Alaska: U.S. Geological Survey Bulletin 314, p. 47-72.

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Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S.

Geological Survey Bulletin 347, 210 p.

Primary Reference: Ghayemghamian and others, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Trio

Site type: Prospect

ARDF no.: CR222

Latitude: 55.05752 **Quadrangle:** CR A-1

Longitude: 132.13734

Location description and accuracy:

The Trio prospect is about 0.5 mile east-northeast of hill 2230 and about 0.5 mile south of the center of section 34, T. 78 S., R. 88 E. From the late 1970s to the present (2004), there has been nearly continuous exploration of several geologically similar deposits in an area of about a square mile southeast of the old Niblack Mine (CR216). Those deposits are described separately (CR217-223), but in the recent literature, the Trio prospect and other deposits in the area are commonly grouped together under the name 'Niblack' or 'Niblack project' (CR221).

Commodities:

Main: Ag, Au, Cu, Zn

Other:

Ore minerals: Chalcopyrite, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The deposit on the Trio claims was described by Brooks (1902) as similar to the deposit at the nearby Lookout prospect (CR221); the only workings were a short crosscut that exposed a 10-foot-wide ore body.

Beginning in the mid-1970s, a succession of companies, including Cominco-Alaska, Inc., Anaconda Minerals, Noranda Exploration, Houston Oil and Minerals, Long Lac Minerals, and, beginning in 1995, Abacus Minerals, have carried out extensive exploration on several deposits in the Niblack Mine area (CR217-223), testing the now widely accepted theory that they are volcanogenic, stratabound, massive-sulfide deposits. Those deposits are commonly grouped with the old Niblack Mine under the name 'Niblack' or 'Niblack Project'.

The exact location of most of the recent exploration in the Niblack area, including several generations of drilling, is not well documented in the public literature. Anaconda Minerals drilled at least two holes in 1978. Green and others (1989) note that Noranda and Lac Minerals drilled 24,000 feet on the deposits in the Niblack area through 1988, and Abacus Minerals drilled 39,000 feet in 1996 (1997?) (Swainbank and others, 1998). The exploration has been mentioned frequently in the annual reports of the Alaska Division of Geological and Geophysical Surveys since the early 80s. In their most recent annual report (Swainbank, and others, 2002), the deposits are grouped under the name 'Niblack'. The area currently is being explored by Abacus Minerals, and information about their work can be found on their web site (www.amemining.com/properties/niblack_project/; Jan. 26. 2004).

As described by Lac Minerals USA Inc. (1989) and Maas and others (1995), and from a cross-section by Abacus Minerals (www.abacusminerals.com/niblackxsec.htm; April 18, 2000), the area features several large folds that trend west-northwest. The folds consist of a layered sequence of rhyolitic flows and volcaniclastic rocks that host the ore deposits, a hanging wall of mafic flows and sedimentary rocks, and a foot wall of amygdaloidal mafic flows. All of the rocks are regionally metamorphosed to greenschist grade. Maas and others (1991) describe three types of deposits at the Lookout prospect (CR221). It is the best-known deposit and probably typifies the other deposits in the area, including the one at the Niblack Mine. The three types are: 1) volcanogenic massive-sulfide bodies up to 20 feet thick with values of up to 4.9

percent copper, 8.0 percent zinc, 0.265 ounce of gold per ton, and 4.6 ounces of silver per ton; 2) stringer-type sphalerite mineralization in lithic tuffs in the footwalls of the massive sulfide bodies; and 3) auriferous, pyrite-bearing volcaniclastic rocks and polylithic breccia that typically contain about 0.05 ounce of gold per ton, 0.5 to 1.0 ounce of silver per ton, and 1 percent combined copper-zinc across widths of more than 50 feet.

Maas and others (1992, 1995) collected several samples at the Trio prospect that contained up to 215 parts per billion gold, 1.2 parts per million (ppm) silver, 7,874 ppm copper, and 418 ppm zinc. Abacus Minerals drilled at least one hole on the Trio prospect in 1996 or 1997; 16.1 feet of that hole averaged 0.069 ounce of gold per ton, 1.35 ounce of silver per ton, 6.96 percent copper, and 8.18 percent zinc (www.amemining.com/properties/niblack_project/ Jan. 26, 2004).

The age of the rocks in the area has been variously interpreted. Eberlein and others (1983) mapped the strata as locally metamorphosed graywacke of Silurian or Ordovician age, near a large Paleozoic or Mesozoic granitic intrusion. Gehrels (1992) and Maas and others (1995) mapped them as pre-Ordovician metamorphosed volcanic and sedimentary rocks near a Silurian or Ordovician granitic intrusion. Brew (1996) saw the host rocks as part of the Late Proterozoic and Cambrian Wales Group schist, phyllite, and marble, near a Tertiary granitic intrusion of intermediate composition. Most recently, Slack and others (2002) and S.M. Karl (oral communication, 2003) mapped the strata as Silurian and Ordovician, low-grade, regionally metamorphosed sedimentary and volcanic rocks. But see the record for the nearby and probably contiguous NIblack deposit (CR221) that has recently been dated as Neoproterozoic, 565 +/- 3 Ma.

As of late 2011, the Trio deposit is often aggregated with the Lookout deposit and referred to as the Niblack deposit (CR221), for instance in the November 2011 estimate of the resources of the Niblack deposit (CR221) (Heatherdale Resources Ltd., 2011).

Alteration:

Not specifically noted, but probably typical of volcanogenic massive-sulfide deposits.

Age of mineralization:

The age of the rocks in the area has been variously interpreted. Eberlein and others (1983) mapped the strata as locally metamorphosed graywacke of Silurian or Ordovician age, near a large Paleozoic or Mesozoic granitic intrusion. Gehrels (1992) and Maas and others (1995) mapped them as pre-Ordovician metamorphosed volcanic and sedimentary rocks near a Silurian or Ordovician granitic intrusion. Brew (1996) saw the host rocks as part of the Late Proterozoic and Cambrian Wales Group schist, phyllite, and marble, near a Tertiary granitic intrusion of intermediate composition. Most recently, Slack and others (2002) and S.M. Karl (oral communication, 2003) mapped the strata as Silurian and Ordovician, low-grade, regionally metamorphosed sedimentary and volcanic rocks. But see the record for the nearby and probably contiguous NIblack deposit (CR221) that has recently been dated as Neoproterozoic, 565 +/- 3 Ma.

Generic deposit model:

Deposit model:

Besshi-type volcanogenic Ag-Au-Cu massive-sulfide deposit (Cox and Singer, 1986; model 24b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24b

Production Status: None

Site Status: Active

Workings/exploration:

A short adit was driven prior to 1902; at least one hole was diamond drilled in 1996 or 1997. As of late 2011, the Trio deposit was being explored as part of the Niblack prospect (CR221). By that time, 343 holes had been drilled on the modern Niblack that mainly consisted of the old Lookout and Trio deposits (Heaterdale Resources Ltd., 2011).

Production notes:

None.

Reserves:

The Trio deposit (which is usually aggregated with the Lookout deposits in referring to 'Niblack' (CR221) has an inferred resource of 1.023,000 tonnes of material with a grade of 1.00 percent copper, 1.11 grams of gold per tonne, 1.56 percent zinc, and 16.56 grams of silver per tonne. This Niblack resource estimate is based on 373 drill holes drilled to November 4, 2011. As know then, the Lookout deposit was about 2,200 by 1,700 feet in size with an average thickness of 70 feet; the Trio deposit was about 1,100 by 350 in size with an average thickness of 220 feet.

Additional comments:

References:

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

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Herreid, Gordon, 1964, Geology of the Niblack Anchorage area, southeastern Alaska: Alaska Division of Mines and Minerals Geologic Report 5, 10 p.

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Maas, K.M., Still, J. C., Clough, A. H., and Oliver, L. K., 1991, Mineral investigations in the Ketchikan mining district, Alaska, 1990: Southern Prince of Wales Island and vicinity--Preliminary sample location maps and descriptions: U.S. Bureau of Mines Open-File Report 33-91, 139 p.

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Roppel, Patricia, 1991, Fortunes from the earth: Manhattan, Kansas, Sunflower University Press, 139 p.

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Swainbank, R.C., Clautice, K.C., and Nauman, J.L., 1998, Alaska's mineral industry, 1997: Alaska Division of Geological and Geophysical Surveys Special Report 52, 65 p.

Swainbank, R.C., Szumigala, D.J., Henning, M.W., and Pillifant, F.M., 2002; Alaska’s mineral industry, 2001: Alaska Division of Geological and Geophysical Surveys Special Report 56, 65 p.

Primary Reference: Maas and others, 1995

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Unnamed (near Alikula Bay)

Site type: Prospect

ARDF no.: CR225

Latitude: 55.9184 **Quadrangle:** CR D-7

Longitude: 134.2985

Location description and accuracy:

This prospect is near the shore on the east side of Alikula Bay near its mouth. It is about 1.3 miles east-northeast of Pin Peak and about 0.2 mile northeast of the center of section 1, T. 69 S., R. 72 E. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Pyrite, pyrrhotite, sphalerite

Gangue minerals:

Geologic description:

This prospect was briefly noted by Roehm (1942, 1943) but it was largely unrecognized until it was later described and mapped in detail by Still and others (2002). The host rock is Silurian Heceta Limestone that is intruded by an intermediate Cretaceous intrusion a few hundred feet away from the mineralization and mafic dikes up to 50 feet thick. (Eberlein and Churkin, 1983). The mineralization consists of irregular masses of sulfides exposed over a diameter of about 50 feet. The largest surface exposure is about 10 feet by 28 feet in size. The sulfide masses consist of about 80 percent pyrite with pyrrhotite and sphalerite. Still and others (2002) collected 7 samples; the richest taken across 8 feet contained 8,483 parts per billion (ppb) gold, 22.5 parts per million (ppm) silver, 1,173 ppm copper, 7,515 ppm lead, and 4.85 percent zinc. Of the seven samples, six had gold values over 1,200 ppb, all had silver over 10 ppm, lead was over 2,500 ppm in all, and one had more than 1 percent lead. Four of the seven had over 1.4 percent zinc and one had 8.69 percent zinc. All had bismuth over 40 ppm, one had 336 ppm bismuth, and all had high arsenic, antimony and mercury. The sulfides are locally oxidized to gossan but there are no skarn minerals.

Alteration:

Age of mineralization:

Probably related to a nearby Cretaceous intermediate pluton.

Generic deposit model:

Deposit model:

Polymetallic replacement deposit in limestone.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Known (and staked?) before 1942 but went unrecognized for decades; rediscovered, mapped, and sampled by staff of the U.S. Bureau of Land Management in the late 1990s.

Production notes:

None.

Reserves:

None.

Additional comments:

This prospect is now in a Forest Service Wilderness that is closed to mineral exploration and mining.

References:

Eberlein, G. D., Churkin, Michael, Jr., Carter, Claire, Berg, H. C., and Ovenshine, A. T., 1983, Geology of the Craig quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-91, 52 p.

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Roehm, J.C., 1943, Strategic and critical mineral occurrences in southeastern Alaska: Alaska Division of Geological and Geophysical Surveys Miscellaneous Report MR 195-33, 87 p.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Reynolds-Alaska Development Co.

Site type: Mine

ARDF no.: CV007

Latitude: 60.833 **Quadrangle:** CV D-8

Longitude: 146.628

Location description and accuracy:

The map site of this mine is at the position of the main tunnel, which is at sea level on the east side of Boulder Bay. The site is in the S1/2 sec. 27, T. 11 S., R 8 W., of the Copper River Meridian. The location is accurate to within 1000 ft. This mine is shown as #7 in Cobb (1972: MF-392) and as C-87 in Jansons and others (1984).

Commodities:

Main: Cu, Zn

Other: Ag

Ore minerals: Chalcopyrite, pyrrhotite, sphalerite

Gangue minerals:

Geologic description:

The country rocks at this mine are mafic volcanic rocks and sedimentary rocks of the Tertiary Orca Group (Nelson and others, 1985). The deposit consists of massive sulfide lenses, and sulfide veins, disseminations, and thin selvages in shear zones (Jansons and others, 1984). The sulfide minerals are chalcopyrite, pyrrhotite, and sphalerite. The ore minerals are restricted to north-trending and steeply-dipping shears at the contact of volcanic and sedimentary rock.

Grant and Higgins (1909) report that some large beach boulders were shipped as ore. Chip samples collected in the 1980s contained 0.6 to 1.7 percent Cu, 225 parts per million (ppm) to 0.6 percent Zn, and 2.4 ppm to 8.9 ppm Ag; grab samples contained 60 ppm to 6 percent Cu, 67 ppm to 1.7 percent Zn, and 1.1 ppm to 13 ppm Ag (Jansons and others, 1984).

Three grab samples were collected in 2014 for analyses. Sample 1 contained 0.93 ppm Au, 10.9 ppm Ag, 1.67 percent Cu, and 0.1520 percent Zn. Sample 2 contained 0.396 ppm Au, 1.01 ppm Ag, 0.13 percent Cu, and 0.506 percent Zn. Sample 3 contained 0.077 ppm Au, 1.24 ppm Ag, 0.691 percent Cu, and 0.164 percent Zn (Angel, 2014).

Alteration:

Oxidation of copper minerals (Angel, 2014).

Age of mineralization:

Probably Tertiary based on the age of the host rocks (Nelson and others, 1985).

Generic deposit model:

Deposit model:

Cyprus massive sulfide (Cox and Singer, 1986; model 24a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

The mine was developed in the early 1900s by 2100 feet of drifts (main tunnel), numerous crosscuts, winzes and raises, and at least 500 ft. of additional tunnels (Capps and Johnson, 1915). One 200 ft. tunnel was caved by the early 1980s (Jansons and others, 1984). Grant and Higgins (1909) report that some large beach boulders were shipped as ore. Chip samples collected in the 1980s contained 0.6 to 1.7 percent Cu, 225 parts per million (ppm) to 0.6 percent Zn, and 2.4 ppm to 8.9 ppm Ag; grab samples contained 60 ppm to 6 percent Cu, 67 ppm to 1.7 percent Zn, and 1.1 ppm to 13 ppm Ag (Jansons and others, 1984).

Field work including sampling was performed in 2014. Three grab samples were collected in 2014 for analyses. Sample 1 contained 0.93 ppm Au, 10.9 ppm Ag, 1.67 percent Cu, and 0.1520 percent Zn. Sample 2 contained 0.396 ppm Au, 1.01 ppm Ag, 0.13 percent Cu, and 0.506 percent Zn. Sample 3 contained 0.077 ppm Au, 1.24 ppm Ag, 0.691 percent Cu, and 0.164 percent Zn (Angel, 2014).

Production notes:

215,000 pounds of copper were recovered from 2,850 tons of ore (Jansons and others, 1984).

Reserves:

Inferred reserves of 600 tons at 1.37 percent Cu, 0.28 percent Zn, and 6.67 ppm Ag (Jansons and others, 1984).

Additional comments:

Nelson and others (1985) interpret the country rocks as accreted ocean crust. Crowe and others (1992; 1993) and Sainsbury (1993) discuss the genesis of the volcanogenic massive sulfide deposits in this area.

Chugach Alaska Corporation, Anchorage, Alaska has control of these lands.

References:

Angel, A.K., 2014 Mineral Assessment of Chugach Alaska Lands, Unpublished Report, 21p. (Report held by Chugach Alaska Corporation, Anchorage, Alaska).

Capps, S.R., and Johnson, B.L., 1915, The Ellamar district, Alaska: U.S. Geological Survey Bulletin 605, 125 p.

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Cobb, E.H., 1979, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Cordova quadragle, Alaska: U.S. Geological Survey Open-file Report OF 79-973, 73 p.

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

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Grant, U.S., and Higgins, D.F., Jr., 1909, Copper mining and prospecting on Prince William Sound: U.S.

Geological Survey Bulletin 379-C, p. 87-96.

Jansons, Uldis, Hoekzema, R.B., Kurtak, J.M., and Fechner, S.A., 1984, Mineral occurrences in the Chugach National Forest, southcentral Alaska: U.S. Bureau of Mines Mineral Land Assessment 5-84, 218 p., 2 sheets, scale 1:250,000.

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Sainsbury, C.L., 1993, Geology and geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound, south-central Alaska, A discussion: Economic Geology, v. 88, p. 1284-1285.

Primary Reference: Jansons and others, 1984

Reporter(s): S.W. Nelson, Anchorage, AK; A.K. Angel (Alaska Earth Sciences, Inc.)

Last report date: 2015-01-14

Site name(s): Galena Bay Mining Co. (Vesuvius Valley)

Site type: Prospect

ARDF no.: CV011

Latitude: 60.878 **Quadrangle:** CV D-7

Longitude: 146.594

Location description and accuracy:

This site represents several prospects in a roughly circular, half-mile-square, area at about 2000 feet elevation on the northeast face of Bells Butte. The area is in the N1/2 secs. 26 and 35, T. 11 S., R. 8 W., of the Copper River Meridian. The location is accurate to within 1000 ft. This area of prospects is shown in Cobb (1972: MF-392) as sites #9 and #10; in Jansons and others it is shown as site C-83.

Commodities:

Main: Cu, Zn

Other: Ag, Au

Ore minerals: Chalcopyrite, pyrite, pyrrhotite, sphalerite

Gangue minerals: Calcite, quartz

Geologic description:

The country rocks at these prospects are mafic volcanic rocks and sedimentary rocks of the Tertiary Orca Group (Nelson and others, 1985). The deposit consists of shear-zone-hosted masses of calcite, quartz, chalcopyrite, pyrite, pyrrhotite, and sphalerite. Capps and Johnson (1915) reported that most of the ore was found in numerous 1- to 20-ft.-wide shear zones in pillow basalt (greenstone). The shear zone containing most of the early workings is 1000 ft. long.

Jansons and others (1984) collected chip samples that contained 58 parts per million (ppm) to 13 percent Cu, 46 ppm to 2 percent Zn, and <0.1 ppm to 32.8 ppm Ag; their grab samples contained 80 ppm to 6.1 percent Cu, 790 ppm to 20.1 percent Zn, and 1.1 ppm to 20 ppm Ag. Small amounts of gold were reported in earlier assays (Capps and Johnson, 1915).

Four grab samples were collected in 2014 at approximately 60.886 N 146.601 W. Three samples were taken from an ore stockpile below an adit, the other sample was collected above the adit, at an exploration trench. The trenching was conducted on a quartz rich epithermal breccia. Sample 1 from ore stockpile contained 0.056 ppm Au, 25.6 ppm Ag, 3.57 percent Cu, and 5.4 percent Zn. Sample 2 contained 0.178 ppm Au, 74.2 ppm Ag, 10.65 percent Cu, and 2.15 percent Zn. Sample 3 contained 0.021 ppm Au, 5.81 ppm Ag, 0.692 percent Cu, and 0.772 percent Zn. Sample 4 taken from the trench contained 0.013 ppm Au, 3.13 ppm Ag, 0.449 percent Cu and 1.36 percent Zn (Angel, 2014).

Alteration:

Age of mineralization:

Probably Tertiary based on the age of the host rocks.

Generic deposit model:

Deposit model:

Cyprus massive sulfide (Cox and Singer, 1986; model 24a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24a

Production Status: None

Site Status: Inactive

Workings/exploration:

Capps and Johnson (1915) reported nine adits with a total of about 3000 ft. of underground workings, and some open cuts and buildings. The longest (2200 ft) adit was caved by the early 1980s (Jansons and others, 1984). Jansons and others (1984) collected chip samples that contained 58 parts per million (ppm) to 13 percent Cu, 46 ppm to 2 percent Zn, and <0.1 ppm to 32.8 ppm Ag; their grab samples contained 80 ppm to 6.1 percent Cu, 790 ppm to 20.1 percent Zn, and 1.1 ppm to 20 ppm Ag. Small amounts of gold were reported in earlier assays (Capps and Johnson, 1915).

Field work including sampling was performed in 2014. Four grab samples were collected in 2014 at approximately 60.886 N 146.601 W. Three samples were taken from an ore stockpile below an adit, the other sample was collected above the adit, at an exploration trench. The trenching was conducted on a quartz rich epithermal breccia. Sample 1 from ore stockpile contained 0.056 ppm Au, 25.6 ppm Ag, 3.57 percent Cu, and 5.4 percent Zn. Sample 2 contained 0.178 ppm Au, 74.2 ppm Ag, 10.65 percent Cu, and 2.15 percent Zn. Sample 3 contained 0.021 ppm Au, 5.81 ppm Ag, 0.692 percent Cu, and 0.772 percent Zn. Sample 4 taken from the trench contained 0.013 ppm Au, 3.13 ppm Ag, 0.449 percent Cu and 1.36 percent Zn (Angel, 2014).

Production notes:

None.

Reserves:

Inferred reserves of 5,800 tons at 7.9 percent Cu, 1.3 percent Zn, and 5 ppm Ag (Jansons and others, 1984).

Additional comments:

Nelson and others (1985) interpret the country rocks as accreted ocean crust. Crowe and others (1992; 1993) and Sainsbury (1993) discuss the genesis of the volcanogenic massive sulfide deposits in this area.

Chugach Alaska Corporation, Anchorage, Alaska has control of these lands.

References:

Angel, A.K., 2014 Mineral Assessment of Chugach Alaska Lands, Unpublished Report, 21p. (Report held by Chugach Alaska Corporation, Anchorage, Alaska).

Capps, S.R., and Johnson, B.L., 1915, The Ellamar district, Alaska: U.S. Geological Survey Bulletin 605, 125 p.

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Crowe, D.E., Nelson, S.W., Brown, P.E., Valley, J.W., and Shanks, W.C., III, 1993, Geology and

geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound, south-central Alaska--Reply: Economic Geology, v. 88, p. 1285-1288.

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Sainsbury, C.L., 1993, Geology and geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound, south-central Alaska, A discussion: Economic Geology, v. 88, p. 1284-1285.

Primary Reference: Jansons and others, 1984

Reporter(s): S.W. Nelson, Anchorage, AK; A.K. Angel (Alaska Earth Sciences, Inc.)

Last report date: 2014-09-09

Site name(s): Falck

Site type: Prospect

ARDF no.: CV015

Latitude: 60.866 **Quadrangle:** CV D-7

Longitude: 146.569

Location description and accuracy:

The Falck prospect is at an elevation of about 2400 ft., about 0.5 mile east of Copper Mountain. It is in S1/2 sec. 36, T. 11 S., R. 8 W., of the Copper River Meridian. The location is accurate to within 1000 ft. This prospect is shown as #12 in Cobb (1972: MF-392) and as C-78 in Jansons and others (1984).

Commodities:

Main: Cu, Zn

Other: Ag

Ore minerals: Chalcopyrite, pyrite, pyrrhotite, native Cu, sphalerite

Gangue minerals: Calcite, quartz

Geologic description:

The country rocks at this prospect are mafic volcanic rocks and sedimentary rocks of the Tertiary Orca Group (Nelson and others, 1985). The deposit consists of sulfide minerals and native copper in veinlets and as disseminations in a northwest-striking, steeply-dipping shear zone in the volcanic and sedimentary rocks (Capps and Johnson, 1915). The sulfides are chalcopyrite, pyrite, pyrrhotite, and sphalerite.

Analyses of chip samples contained 0.11percent to 7.5 0.11percent Cu, 240 parts per million (ppm) to 0.68 0.11percent Zn, and 0.7 ppm to 18.3 ppm Ag (Jansons and others, 1984).

A 2014 grab sample collect near the Falck prospect contained 0.034 ppm Au, 0.11 ppm Ag, 112 ppm Cu, and 100 ppm Zn. Another grab sample collected roughly 1000 ft to the east of the Falck prospect coordinates contained 0.04 ppm Ag, 122.5 ppm Cu, and 94 ppm Zn (Angel, 2014).

Alteration:

Age of mineralization:

Probably Tertiary based on the age of the host rocks.

Generic deposit model:

Deposit model:

Cyprus massive sulfide (Cox and Singer, 1986; model 24a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24a

Production Status: None

Site Status: Inactive

Workings/exploration:

Capps and Johnson (1915) report a 25 ft. adit and a 15 ft. adit, along with minor surface cuts. In the 1980s only the 25 ft. adit was still accessible (Jansons and others, 1984). Analyses of chip samples contained 0.11percent to 7.5 0.11percent Cu, 240 parts per million (ppm) to 0.68 0.11percent Zn, and 0.7 ppm to 18.3 ppm Ag (Jansons and others, 1984).

Field work including sampling was performed in 2014. A 2014 grab sample collect near the Falck prospect contained 0.034 ppm Au, 0.11 ppm Ag, 112 ppm Cu, and 100 ppm Zn. Another grab sample collected roughly 1000 ft to the east of the Falck prospect coordinates contained 0.04 ppm Ag, 122.5 ppm Cu, and 94 ppm Zn (Angel, 2014).

Production notes:

None.

Reserves:

Inferred reserves of 200 tons at 2.03 percent Cu, 0.23 percent Zn, 13 ppm Ag (Jansons and others, 1984).

Additional comments:

Nelson and others (1985) interpret the country rocks as accreted ocean crust. Crowe and others (1992; 1993) and Sainsbury (1993) discuss the genesis of the volcanogenic massive sulfide deposits in this area.

Chugach Alaska Corporation, Anchorage, Alaska has control of these lands.

References:

Angel, A.K., 2014 Mineral Assessment of Chugach Alaska Lands, Unpublished Report, 21p. (Report held by Chugach Alaska Corporation, Anchorage, Alaska).

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Crowe, D.E., Nelson, S.W., Brown, P.E., Valley, J.W., and Shanks, W.C., III, 1992 (1993), Geology and geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound region, south-central Alaska: Economic Geology, v. 87, no. 7, p. 1722-1746.

Crowe, D.E., Nelson, S.W., Brown, P.E., Valley, J.W., and Shanks, W.C., III, 1993, Geology and geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound, south-central Alaska--Reply: Economic Geology, v. 88, p. 1285-1288.

Jansons, Uldis, Hoekzema, R.B., Kurtak, J.M., and Fechner, S.A., 1984, Mineral occurrences in the Chugach National Forest, southcentral Alaska: U.S. Bureau of Mines Mineral Land Assessment 5-84, 218 p., 2 sheets, scale 1:250,000.

Nelson, S.W., Dumoulin, J. A., and Miller, M.L., 1985, Geologic map of the Chugach National Forest, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1645-B, 16 p., 1 sheet, scale 1:250,000.

Sainsbury, C.L., 1993, Geology and geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound, south-central Alaska, A discussion: Economic Geology, v. 88, p. 1284-1285.

Primary Reference: Jansons and others, 1984

Reporter(s): S.W. Nelson, Anchorage, AK; A.K. Angel (Alaska Earth Sciences, Inc.)

Last report date: 2014-09-09

Site name(s): Standard Copper Mines Co.

Site type: Mine

ARDF no.: CV016

Latitude: 60.862 **Quadrangle:** CV D-7

Longitude: 146.577

Location description and accuracy:

This mine is at an elevation of about 1800 feet, about 0.5 mile southeast of Copper Mountain. It is in the NW1/4 sec. 1, T. 12 S., R. 8 W., of the Copper River Meridian. The location of the site is accurate to within 1000 ft. This site is loc. 13 in Cobb (1972: MF-392) and loc. C-77 in Jansons and others (1984).

Commodities:

Main: Cu, Zn

Other: Ag, Au

Ore minerals: Chalcopyrite, pyrite, pyrrhotite, sphalerite

Gangue minerals: Calcite, quartz

Geologic description:

The country rocks at this mine are mafic volcanic rocks and sedimentary rocks of the Tertiary Orca Group (Nelson and others, 1985). The deposit consists of quartz, calcite, and massive sulfides in shear zones cutting the volcanic rocks. A 6 ft. x 32 ft. lens of massive sulfide was observed by Mihelich and Wells (1957), but most of the sulfide bodies are smaller (Jansons and others, 1984). The sulfide minerals are chalcopyrite, pyrite, pyrrhotite, and sphalerite.

Chip samples collected in 1955 (Mihelich and Wells, 1957) contained 0.07 percent to 6.1 percent Cu. Jansons and others (1984) report that three chip samples from the 660-ft.-long adit contained 280 ppm to 0.89 percent Cu, 200 ppm to 0.9 percent Zn, 0.01 parts per million (ppm) to 0.11 ppm Au, and 0.5 ppm to 2.5 ppm Ag. Three grab samples from the adit contained 0.70 percent to 2 percent Cu, 200 ppm to 2 percent Zn, 0.08 ppm to 0.19 ppm Au, and 2.3 ppm to 6.1 ppm Ag.

A 2014 grab sample contained 0.175 ppm Au, 5.35 ppm Ag,1.145 percent Cu, and 4.43 percent Zn. A stream sediment sample from below the historical workings contained 0.008 ppm Au, 0.24 ppm Ag, 729 ppm Cu, and 160 ppm Zn (Angel, 2014).

Alteration:

Age of mineralization:

Probably Tertiary based on the age of the host rocks.

Generic deposit model:

Deposit model:

Cyprus massive sulfide (Cox and Singer, 1986; model 24a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24a

Production Status: Yes

Site Status: Inactive

Workings/exploration:

Grant and Higgins (1909) report five adits on the steep slopes of Copper Mountain and a tram to an ore bunker on the shore of Landlocked Bay. Only three of the adits could be located in the 1980s (Jansons and others, 1984). Chip samples collected in 1955 (Mihelich and Wells,1957) contained 0.07 percent to 6.1 percent Cu. Jansons and others (1984) report that three chip samples from the 660-ft.-long adit contained 280 ppm to 0.89 percent Cu, 200 ppm to 0.9 percent Zn, 0.01 parts per million (ppm) to 0.11 ppm Au, and 0.5 ppm to 2.5 ppm Ag. Three grab samples from the adit contained 0.70 percent to 2 percent Cu, 200 ppm to 2 percent Zn, 0.08 ppm to 0.19 ppm Au, and 2.3 ppm to 6.1 ppm Ag.

Field work including sampling was performed in 2014. A 2014 grab sample contained 0.175 ppm Au, 5.35 ppm Ag,1.145 percent Cu, and 4.43 percent Zn. A stream sediment sample from below the historical workings contained 0.008 ppm Au, 0.24 ppm Ag, 729 ppm Cu, and 160 ppm Zn (Angel, 2014).

Production notes:

32,000 lbs. Cu, 518 oz. Ag, and 36 oz. Au were recovered from 1,100 tons of ore. However, it is felt that not all the recovered gold and silver were reported (Mihelich and Wells, 1957).

Reserves:

Inferred reserves of 4,300 tons at 2.89 percent Cu (Jansons and others, 1984).

Additional comments:

Nelson and others (1985) interpret the country rocks as accreted ocean crust. Crowe and others (1992; 1993) and Sainsbury (1993) discuss the genesis of the volcanogenic massive sulfide deposits in this area.

Chugach Alaska Corporation, Anchorage, Alaska has control of these lands.

References:

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Grant, U.S., and Higgins, D.F., Jr., 1909, Copper mining and prospecting on Prince William Sound: U.S. Geological Survey Bulletin 379-C, p. 87-96.

Jansons, Uldis, Hoekzema, R.B., Kurtak, J.M., and Fechner, S.A., 1984, Mineral occurrences in the Chugach National Forest, southcentral Alaska: U.S. Bureau of Mines Mineral Land Assessment 5-84, 218 p., 2 sheets, scale 1:250,000.

Mihelich, M., and Wells, R.R., 1957, Copper mines and prospects adjacent to Landlocked Bay, Prince William Sound, Alaska: U.S. Bureau of Mines Report of Investigations 5320, 21 p.

Nelson, S.W., Dumoulin, J. A., and Miller, M.L., 1985, Geologic map of the Chugach National Forest, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1645-B, 16 p., 1 sheet, scale 1:250,000.

Sainsbury, C.L., 1993, Geology and geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound, south-central Alaska, A discussion: Economic Geology, v. 88, p. 1284-1285.

Primary Reference: Jansons and others, 1984

Reporter(s): S.W. Nelson, Anchorage, AK; A.K. Angel (Alaska Earth Sciences, Inc.)

Last report date: 2014-09-08

Site name(s): Montezuma (Threeman Mining Co.)

Site type: Prospect

ARDF no.: CV017

Latitude: 60.862 **Quadrangle:** CV D-7

Longitude: 146.568

Location description and accuracy:

The Montezuma prospect is at an elevation of about 1500 feet, about 0.5 mile southeast of Copper Mountain. It is in the N1/2 sec. 1, T. 12 S., R. 8 W., of the Copper River Meridian. The site location is accurate to within 1000 ft. This prospect is shown as site C-76 in Jansons and others (1984) and as site #13 in Cobb (1972: MF-392).

Commodities:

Main: Cu

Other: Ag, Au

Ore minerals: Chalcopyrite, pyrite, pyrrhotite

Gangue minerals: Quartz

Geologic description:

The country rocks at this prospect are mafic volcanic rocks and sedimentary rocks of the Tertiary Orca Group (Nelson and others, 1985). The deposit consists of irregular lenses of quartz, chalcopyrite, pyrite, and pyrrhotite in several highly mineralized shear zones in the volcanic rocks (Mihelich and Wells, 1957).

A sample from a quartz-filled shear zone one foot wide in volcanic rocks contained 0.5 percent Cu, 0.08 oz. Ag/ton, and 0.18 oz. Au/ton (Mihelich and Wells, 1957). Jansons and others (1984) report that chip samples contained 0.74 percent to 3.2 percent Cu, 3.2 parts per million (ppm) to 20 ppm Ag, and grab samples contained 125 ppm to 0.75 percent Cu, and 0.92 ppm to 10 ppm Ag.

A 2014 stream sediment sample collected below the workings contained 0.008 ppm Au, 0.23 ppm Ag, 804 ppm Cu, and 207 ppm Zn (Angel, 2014).

Alteration:

Age of mineralization:

Tertiary based on the age of the host rocks.

Generic deposit model:

Deposit model:

Cyprus massive sulfide (Cox and Singer, 1986; model 24a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24a

Production Status: None

Site Status: Inactive

Workings/exploration:

Mihelich and Wells (1957) report more than 300 feet of underground workings and 900 feet of surface stripping. A sample from a quartz-filled shear zone one foot wide in volcanic rocks contained 0.5 percent Cu, 0.08 oz. Ag/ton, and 0.18 oz. Au/ton (Mihelich and Wells, 1957). Jansons and others (1984) report that chip samples contained 0.74 percent to 3.2 percent Cu, 3.2 parts per million (ppm) to 20 ppm Ag, and grab samples contained 125 ppm to 0.75 percent Cu, and 0.92 ppm to 10 ppm Ag.

Field work including sampling was performed in 2014. A 2014 stream sediment sample collected below the workings contained 0.008 ppm Au, 0.23 ppm Ag, 804 ppm Cu, and 207 ppm Zn (Angel, 2014).

Production notes:

None.

Reserves:

Inferred reserves of 200 tons at 1.67 percent Cu and 9.88 ppm Ag (Jansons and others, 1984).

Additional comments:

Nelson and others (1985) interpret the country rocks as accreted ocean crust. Crowe and others (1992; 1993) and Sainsbury (1993) discuss the genesis of the volcanogenic massive sulfide deposits in this area.

Chugach Alaska Corporation, Anchorage, Alaska has control of these lands.

References:

Angel, A.K., 2014 Mineral Assessment of Chugach Alaska Lands, Unpublished Report, 21p. (Report held by Chugach Alaska Corporation, Anchorage, Alaska).

Cobb, E.H., 1972, Metallic mineral resources map of the Cordova quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-392, 1 sheet, scale 1:250,000.

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Jansons, Uldis, Hoekzema, R.B., Kurtak, J.M., and Fechner, S.A., 1984, Mineral occurrences in the Chugach National Forest, southcentral Alaska: U.S. Bureau of Mines Mineral Land Assessment 5-84, 218 p., 2 sheets, scale 1:250,000.

Mihelich, M., and Wells, R.R., 1957, Copper mines and prospects adjacent to Landlocked Bay, Prince William Sound, Alaska: U.S. Bureau of Mines Report of Investigations 5320, 21 p.

Nelson, S.W., Dumoulin, J. A., and Miller, M.L., 1985, Geologic map of the Chugach National Forest, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1645-B, 16 p., 1 sheet, scale 1:250,000.

Sainsbury, C.L., 1993, Geology and geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound, south-central Alaska, A discussion: Economic Geology, v. 88, p. 1284-1285.

Primary Reference: Jansons and others, 1984

Reporter(s): S.W. Nelson, Anchorage, AK; A.K. Angel (Alaska Earth Sciences, Inc.)

Last report date: 2014-09-09

Site name(s): Threeman (Standard Copper)

Site type: Mine

ARDF no.: CV020

Latitude: 60.855 **Quadrangle:** CV D-7

Longitude: 146.537

Location description and accuracy:

The mine is at an elevation of about 300 feet above the north shore of inner Landlocked Bay, and about 0.25 mile north-northeast of VABM Dick. It is in the S1/2 sec. 6, T. 12 S., R. 7 W., of the Copper River Meridian. The site location is accurate to within 1000 ft. The location corresponds to site C-73 in Jansons and others (1984) and to #14 in Cobb (1972: MF-392).

Commodities:

Main: Cu, Zn

Other: Ag, Au, Co

Ore minerals: Chalcopyrite, cubanite, galena, pyrite, pyrrhotite, sphalerite

Gangue minerals:

Geologic description:

The deposit at this mine is in mafic volcanic and sedimentary rocks of the Tertiary Orca Group (Nelson and others, 1985). It consists of two sulfide lenses up to about 6 ft wide and over 300 ft. long in pillow basalt and sedimentary rocks (Mihelich and Wells, 1957). Sulfide minerals include chalcopyrite, cubanite, galena, pyrite, pyrrhotite, and sphalerite.

Chip and grab samples contained 53 parts per million (ppm) to 5.25 percent Cu, 40 ppm to 2.85 percent Zn, <0.02 ppm to 0.10 ppm Au, <1 ppm to 22 ppm Ag, and 5 to 700 ppm Co (Jansons and others, 1984). Sixteen chip samples taken in 1955 contained 0.3 percent to 8.6 percent Cu, 0.05 percent to 0.64 percent Zn, trace to 0.07 oz. Au/ton and trace to 0.78 oz. Ag/ton (Mihelich and Wells, 1957).

A 2014 grab sample contained 0.025 ppm Au, 8.63 ppm Ag, 4.09 percent Cu, and 1.62 percent Zn. A stream sediment sample collect roughly 1000 ft to the northeast contained 0.25 ppm Ag, 330 ppm Cu, and 482 ppm Zn (Angel, 2014).

Alteration:

Age of mineralization:

Probably Tertiary based on the age of the host rocks.

Generic deposit model:

Deposit model:

Cyprus massive sulfide (Cox and Singer, 1986; model 24a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24a

Production Status: Yes; medium

Site Status: Inactive

Workings/exploration:

There are several thousand feet of workings on three levels. Three adits were caved when visited by this reporter in 1974 and 1986 (also see Sainsbury, 1993). Chip and grab samples contained 53 parts per million (ppm) to 5.25 percent Cu, 40 ppm to 2.85 percent Zn, <0.02 ppm to 0.10 ppm Au, <1 ppm to 22 ppm Ag, and 5 to 700 ppm Co (Jansons and others, 1984). Sixteen chip samples taken in 1955 contained 0.3 percent to 8.6 percent Cu, 0.05 percent to 0.64 percent Zn, trace to 0.07 oz. Au/ton and trace to 0.78 oz. Ag/ton (Mihelich and Wells, 1957).

Field work including sampling was performed in 2014. A 2014 grab sample contained 0.025 ppm Au, 8.63 ppm Ag, 4.09 percent Cu, and 1.62 percent Zn. A stream sediment sample collect roughly 1000 ft to the northeast contained 0.25 ppm Ag, 330 ppm Cu, and 482 ppm Zn (Angel, 2014).

Production notes:

1,159,660 lbs. Cu, 101 oz. Au, 5,308 oz. Ag from 6,196.5 tons ore (Mihelich and Wells, 1957).

Reserves:

Inferred reserves of 1,902,000 tons at 1.05 percent Cu (Sainsbury, 1953).

Additional comments:

Nelson and others (1985) interpret the country rocks as accreted ocean crust. Crowe and others (1992; 1993) and Sainsbury (1993) discuss the genesis of the volcanogenic massive sulfide deposits in this area.

Chugach Alaska Corporation, Anchorage, Alaska has control of these lands.

References:

Angel, A.K., 2014 Mineral Assessment of Chugach Alaska Lands, Unpublished Report, 21p. (Report held by Chugach Alaska Corporation, Anchorage, Alaska).

Cobb, E.H., 1972, Metallic mineral resources map of the Cordova quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-392, 1 sheet, scale 1:250,000.

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Crowe, D.E., Nelson, S.W., Brown, P.E., Valley, J.W., and Shanks, W.C., III, 1992 (1993), Geology and geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound region, south-central Alaska: Economic Geology, v. 87, no. 7, p. 1722-1746.

Crowe, D.E., Nelson, S.W., Brown, P.E., Valley, J.W., and Shanks, W.C., III, 1993, Geology and geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound, south-central Alaska--Reply: Economic Geology, v. 88, p. 1285-1288.

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Sainsbury, C.L., 1993, Geology and geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound, south-central Alaska, A discussion: Economic Geology, v. 88, p. 1284-1285.

Primary Reference: Mihelich and Wells, 1957

Reporter(s): S.W. Nelson, Anchorage, AK; A.K. Angel (Alaska Earth Sciences, Inc.)

Last report date: 2014-09-09

Site name(s): Hoodoo and South Landlocked Bay Mining Co.

Site type: Mine

ARDF no.: CV021

Latitude: 60.848 **Quadrangle:** CV D-7

Longitude: 146.549

Location description and accuracy:

This site represents a mine and a prospect along the south shore of Landlocked Bay. The map site is at an elevation of about 150 feet, just inland from the bay. It is in the NW1/4 sec. 7, T. 12 S., R. 7 W., of the Copper River Meridian. The site location is accurate to within 2000 ft. This site combines both sites C-70 and C-71 of Jansons and others (1984) and site #15 of Cobb (1972: MF-392). The site location was updated from a 2014 site visit.

Commodities:

Main: Cu, Zn

Other: Ag, Au

Ore minerals: Chalcopyrite, native copper, sphalerite

Gangue minerals: Quartz

Geologic description:

The mineral deposits at this site are in mafic volcanic rocks (greenstone) of the Tertiary Orca Group (Nelson and others, 1985) and consist of massive sulfide lenses in shear zones 1.5 ft. to 3 ft. wide (Jansons and others, 1984). The ore minerals are mainly chalcopyrite and sphalerite; native copper is also reported.

Development work began in 1904 (Cobb, 1979: OFR 79-973). Extensive surface stripping at 230 feet elevation exposed about 75 feet of a 3-foot-wide mineralized zone in metavolcanic rock striking N45W, and dipping 60 NE. Four tunnels were driven, the longest of which was 180 feet (Capps and Johnson, 1913). In 1953 one tunnel was inaccessible (Mihelich and Wells, 1957). Early assays contained 0.48 to 1.06 oz. Au/ton. Recent sampling (Jansons and others, 1984) of five chip samples from one adit contained 0.11 ppm to 2.9 percent Cu, 680 ppm to 0.95 percent Zn, <0.03 to 0.03 parts permillion (ppm) Au, and 0.2 to 13.9 ppm Ag. Three grab samples contained 1.14 percent to 19.3 percent Cu, 0.95 to 2.25 percent Zn, 0.15 ppm to 44 ppm Au, and 0.23 ppm to 34 ppm Ag.

A 2014 grab sample contained 0.075 ppm Au, 39.2 ppm Ag, 8.7 percent Cu, and 3.26 percent Zn (Angel, 2014).

Alteration:

Age of mineralization:

Tertiary based on the age of the host rocks.

Generic deposit model:

Deposit model:

Cyprus massive sulfide (Cox and SInger, 1986; model 24a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

Development work began in 1904 (Cobb, 1979: OFR 79-973) Extensive surface stripping at 230 feet elevation exposed about 75 feet of a 3-foot-wide mineralized zone in metavolcanic rock striking N45W, and dipping 60 NE. Four tunnels were driven, the longest of which was 180 feet (Capps and Johnson, 1913). In 1953 one tunnel was inaccessible (Mihelich and Wells, 1957). Early assays contained 0.48 to 1.06 oz. Au/ton. Recent sampling (Jansons and others, 1984) of five chip samples from one adit contained 0.11 parts per million (ppm) to 2.9 percent Cu, 680 ppm to 0.95 percentZn, <0.03 to 0.03 ppm Au, and 0.2 to 13.9 ppm Ag. Three grab samples contained 1.14 percent to 19.3 percent Cu, 0.95 to 2.25 percent Zn, 0.15 ppm to 44 ppm Au, and 0.23 ppm to 34 ppm Ag.

Field work including sampling was performed in 2014. A grab sample contained 0.075 ppm Au, 39.2 ppm Ag, 8.7 percent Cu, and 3.26 percent Zn (Angel, 2014).

Production notes:

None reported from Hoodo. The South Landlocked Bay mine produced 74, 240 lbs. Cu (Mihelich and Wells, 1957).

Reserves:

Hoodo: inferred reserves of 300 tons @ 1.29 percent Cu, 0.34 percent Zn, and 7.97 ppm Ag. South Landlocked Bay: inferred reserves of 600 tons @ 4.7 percent Cu and 2.6 percent Zn (Jansons and others, 1984).

Additional comments:

Crowe and others (1992; 1993) and Sainsbury (1993) discuss the genesis of the volcanogenic massive sulfide deposits in this area.

Chugach Alaska Corporation, Anchorage, Alaska has control of these lands.

References:

Angel, A.K., 2014 Mineral Assessment of Chugach Alaska Lands, Unpublished Report, 21p. (Report held by Chugach Alaska Corporation, Anchorage, Alaska).

Capps, S.R., and Johnson, B.L., 1913, Mineral deposits of the Ellamar district: U.S. Geological Survey Bulletin 542-D, p. 86-124.

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Crowe, D.E., Nelson, S.W., Brown, P.E., Valley, J.W., and Shanks, W.C., III, 1992 (1993), Geology and geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound region, south-central Alaska: Economic Geology, v. 87, no. 7, p. 1722-1746.

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Mihelich, M., and Wells, R.R., 1957, Copper mines and prospects adjacent to Landlocked Bay, Prince William Sound, Alaska: U.S. Bureau of Mines Report of Investigations 5320, 21 p.

Nelson, S.W., Dumoulin, J. A., and Miller, M.L., 1985, Geologic map of the Chugach National Forest, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1645-B, 16 p., 1 sheet, scale 1:250,000.

Primary Reference: Jansons and others, 1984

Reporter(s): S.W. Nelson, Anchorage, AK; A.K. Angel (Alaska Earth Sciences, Inc.)

Last report date: 2014-09-08

Site name(s): Threeman Mining Co.; Billygoat Mountain

Site type: Prospect

ARDF no.: CV023

Latitude: 60.8281 **Quadrangle:** CV D-7

Longitude: 146.5133

Location description and accuracy:

This prospect is at an elevation of about 1750 feet, about 0.1 mile east of the summit of Billygoat Mountain. It is in the SW1/4 sec. 17, T. 12 S., R. 7 W., of the Copper River Meridian. The location of the site is accurate to within 100 ft. This prospect was located in the field in 2014. This prospect is shown as site C-68 by Janson and others (1984) and as #18 by Cobb (1972: MF-392).

Commodities:

Main: Cu, Zn

Other: Ag

Ore minerals: Chalcopyrite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

This prospect consists of two sulfide-bearing shear zones in mafic volcanic rocks of the Tertiary Orca Group (Nelson and others, 1985). The zones range in width from a few inches to five feet and contain lenses and stringer zones of chalcopyrite, pyrite, and pyrrhotite. Samples grade up to 6 percent Cu (Capps and Johnson, 1913).

Capps and Johnson (1913) reported adits at 1150 ft. and 1750 ft. elevation. The lower adit was 30 ft. long and the upper adit was 70 ft. long. Jansons and others (1984) reported that a grab sample from the 70 ft. adit contained 3.8 percent Cu, 0.2 percent Zn, and 7.5 parts per million (ppm) Ag. Gossan from the area contained 1.55 percent Cu, 0.4 percent Zn, and 13 ppm Ag.

A 2014 grab sample from below the upper 1750 ft adit contained 0.04 percent Cu, 0.01 percent Zn and a trace of Ag at 0.006 ppm. A stream sediment sample collected approximately 1000 ft east of the 1750 ft adit contained 0.024 ppm Au, 0.17 ppm Ag, 0.02 percent Cu, and 0.0082 percent Zn (Angel, 2014).

Alteration:

Local oxidation of sulfide minerals.

Age of mineralization:

Tertiary based on the age of the host rocks.

Generic deposit model:

Deposit model:

Cyprus massive sulfide (Cox and Singer, 1986; model 24a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24a

Production Status: None

Site Status: Inactive

Workings/exploration:

Capps and Johnson (1913) reported adits at 1150 ft. and 1750 ft. elevation. The lower adit was 30 ft. long and the upper adit was 70 ft. long. Jansons and others (1984) reported that a grab sample from the 70 ft. adit contained 3.8 percent Cu, 0.2 percent Zn, and 7.5 ppm Ag. Gossan from the area contained 1.55 percent Cu, 0.4 percent Zn, and 13 ppm Ag.

A 2014 grab sample from below the upper 1750 ft adit contained 0.04 percent Cu, 0.01 percent Zn and a trace of Ag at 0.006 ppm. A stream sediment sample collected approximately 1000 ft east of the 1750ft adit contained 0.024 ppm Au, 0.17 ppm Ag, 0.02 percent Cu, and 0.0082 percent Zn (Angel, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

Crowe and others (1992; 1993) and Sainsbury (1993) discuss the genesis of the volcanogenic massive sulfide deposits in this area.

Chugach Alaska Corporation, Anchorage, Alaska has control of these lands.

In 2014 the coordinate location was updated and is accurate for the upper 1750 ft adit. The lower adit couldn't be located (Angel, 2014).

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Jansons, Uldis, Hoekzema, R.B., Kurtak, J.M., and Fechner, S.A., 1984, Mineral occurrences in the Chugach National Forest, southcentral Alaska: U.S. Bureau of Mines Mineral Land Assessment 5-84, 218 p., 2 sheets, scale 1:250,000.

Nelson, S.W., Dumoulin, J. A., and Miller, M.L., 1985, Geologic map of the Chugach National Forest, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1645-B, 16 p., 1 sheet, scale 1:250,000.

Sainsbury, C.L., 1993, Geology and geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound, south-central Alaska, A discussion: Economic Geology, v. 88, p. 1284-1285.

Primary Reference: Jansons and others, 1984

Reporter(s): S.W. Nelson, Anchorage, AK; A.K. Angel (Alaska Earth Sciences, Inc.)

Last report date: 2014-09-04

Site name(s): Fidalgo-Alaska; Schlosser

Site type: Mine

ARDF no.: CV028

Latitude: 60.774 **Quadrangle:** CV D-7

Longitude: 146.417

Location description and accuracy:

The Fidalgo-Alaska mine is at an elevation of about 500 feet, about 0.8 mile east of the mouth of Irish Cove and 0.5 mile north of peak 1430. It is in the NW1/4 sec. 2, T. 13 S., R. 7 W., of the Copper River Meridian. The site is accurately located to within 1000 ft. This mine is shown as site C-28 in Jansons and others (1984) and site #19 in Cobb (1972: MF-392).

Commodities:

Main: Cu, Zn

Other: Ag, Au

Ore minerals: Chalcopyrite, pyrite, pyrrhotite, sphalerite

Gangue minerals: Calcite, quartz

Geologic description:

This deposit consists of sulfide-bearing quartz-calcite veins in 150- to 300-foot-wide shear zones in folded and sheared slate and graywacke of the Tertiary Orca Group (Nelson and others, 1985). The sulfide minerals include chalcopyrite, pyrite, pyrrhotite, and sphalerite.

This mine was developed and productive from 1913 to about 1920 (Cobb, 1979: OF 79-973). Five adits with the following lengths are reported (Jansons and others, 1984): 1800 ft., 540 ft., 410 ft., 250 ft., and 50 ft. U.S Bureau of Mines samples from various adit levels and of surface materials contained 0.02 percent to 19.5 percent Cu, 150 parts per million (ppm) to 29 percent Zn, 2 ppm to 15 ppm Ag, and <0.02 ppm to 5.8 ppm Au. Industry evaluation of the property was undertaken in 1986 (B. Ellis, personal communication, 2000).

A grab sample taken in 2014 contained 1.095 ppm Au, 11.55 ppm Ag, 1.84 percent Cu, and 0.086 percent Zn (Angel, 2014).

Alteration:

Oxidation of copper minerals (Angel, 2014).

Age of mineralization:

Early Tertiary age based on the age of the host rocks (Nelson and others, 1985).

Generic deposit model:

Deposit model:

Besshi massive sulfide (Cox and Singer, 1986; model 24b)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24b

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

This mine was developed and productive from 1913 to about 1920 (Cobb, 1979: OF 79-973). Five adits with the following lengths are reported (Jansons and others, 1984): 1800 ft., 540 ft., 410 ft., 250 ft., and 50 ft. U.S Bureau of Mines samples from various adit levels and of surface materials contained 0.02 percent to 19.5 percent Cu, 150 parts per million (ppm) to 29 percent Zn, 2 ppm to 15 ppm Ag, and <0.02 ppm to 5.8 ppm Au. Industry evaluation of the property was undertaken in 1986 (B. Ellis, personal communication, 2000).

Field work including sampling was performed in 2014. A grab sample taken in 2014 contained 1.095 ppm Au, 11.55 ppm Ag, 1.84 percent Cu, and 0.086 percent Zn (Angel, 2014).

Production notes:

4,160,820 lbs. Cu and 1,384 oz Ag were produced from 21,434 tons of ore. Average grade was 10 percent Cu.

Reserves:

Jansons and others (1984) report indicated reserves of 25,625 tons at 3 percent Cu and inferred reserves of 224,000 tons at 3.18 percent Cu.

Additional comments:

Crowe and others (1992; 1993) and Sainsbury (1993) discuss the genesis of the volcanogenic massive sulfide deposits in this area.

Chugach Alaska Corporation, Anchorage, Alaska has control of these lands.

References:

Angel, A.K., 2014 Mineral Assessment of Chugach Alaska Lands, Unpublished Report, 21p. (Report held by Chugach Alaska Corporation, Anchorage, Alaska).

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Crowe, D.E., Nelson, S.W., Brown, P.E., Valley, J.W., and Shanks, W.C., III, 1992 (1993), Geology and geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound region, south-central Alaska: Economic Geology, v. 87, no. 7, p. 1722-1746.

Crowe, D.E., Nelson, S.W., Brown, P.E., Valley, J.W., and Shanks, W.C., III, 1993, Geology and geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound, south-central Alaska--Reply: Economic Geology, v. 88, p. 1285-1288.

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Nelson, S.W., Dumoulin, J. A., and Miller, M.L., 1985, Geologic map of the Chugach National Forest, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1645-B, 16 p., 1 sheet, scale 1:250,000.

Sainsbury, C.L., 1993, Geology and geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound, south-central Alaska, A discussion: Economic Geology, v. 88, p. 1284-1285.

Primary Reference: Jansons and others, 1984

Reporter(s): S.W. Nelson, Anchorage, AK; A.K. Angel (Alaska Earth Sciences, Inc.)

Last report date: 2014-09-09

Site name(s): Fidalgo Mining Co. (Blackney Prospect)

Site type: Mine

ARDF no.: CV030

Latitude: 60.7951 **Quadrangle:** CV D-7

Longitude: 146.2947

Location description and accuracy:

This mine is at an elevation of about 500 feet on the south side of Port Fidalgo, about 1.5 miles northwest of the head of Matthews Bay. It is in the SE1/4 sec. 28, T. 12 S., R. 6 W., of the Copper River Meridian. The location is accurate to within 500 ft. This mine is shown as site #21 in Cobb (1972: MF-392) and C-63 in Jansons and others (1984).

Commodities:

Main: Cu

Other: Ag, Au

Ore minerals: Chalcopyrite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

Most of the ore mined from this deposit was from two lens-shaped bodies of massive sulfides. The ore bodies were localized in a shear zone in interbedded volcanic and sedimentary rocks of the Tertiary Orca Group (Nelson and others, 1985; Moffit and Fellows, 1950). Sulfide minerals include chalcopyrite, pyrite, and pyrrhotite. Underground study by Jansons and others (1984) reported three main shear zones up to 30 feet wide and traceable for 4000 feet parallel to bedding.

Most of the mining activity took place in 1913. The average copper grade was 13 percent. The mine continued to be active until 1920 (Moffit and Fellows, 1950). Workings included four adits having the following lengths: 1200 ft., 735 ft., 350 ft., and 175 ft. The following assays are reported by Jansons and others (1984). Four chip samples from the 735-foot-long adit contained from 175 parts per million (ppm) to 0.23 percent Cu; nine chip samples across the main shear zone in the 1200-foot-long adit contained 0.12 percent to 1.25 percent copper; fifteen chip samples from the rest of the adit contained 9 ppm to 0.29 percent Cu; and three chip samples from the 175-foot-long adit contained 300 ppm to 0.73 percent Cu; three chip samples from the 350-foot-long adit contained 0.17 percent to 0.73 percent Cu. Grab samples from the dump contained 1 percent to 6.3 percent Cu. Industry evaluation of the property was undertaken in 1986 (B. Ellis, personal communication, 2000).

A 2014 grab sample contained 0.117 ppm Au, 3.96 ppm Ag, 0.819 percent Cu, and 0.236 percent Zn (Angel, 2014).

Alteration:

Age of mineralization:

Tertiary based on the age of the host rocks.

Generic deposit model:

Deposit model:
Besshi massive sulfide (Cox and Singer, 1986; model 24b)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
24b

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

Most of the mining activity took place in 1913. The average copper grade was 13 percent. The mine continued to be active until 1920 (Moffit and Fellows, 1950). Workings included four adits having the following lengths: 1200 ft., 735 ft., 350 ft., and 175 ft. The following assays are reported by Jansons and others (1984). Four chip samples from the 735-foot-long adit contained from 175 parts per million (ppm) to 0.23 percent Cu; nine chip samples across the main shear zone in the 1200-foot-long adit contained 0.12 percent to 1.25 percent copper; fifteen chip samples from the rest of the adit contained 9 ppm to 0.29 percent Cu; and three chip samples from the 175-foot-long adit contained 300 ppm to 0.73 percent Cu; three chip samples from the 350-foot-long adit contained 0.17 percent to 0.73 percent Cu. Grab samples from the dump contained 1 percent to 6.3 percent Cu. Industry evaluation of the property was undertaken in 1986 (B. Ellis, personal communication, 2000).

Field work including sampling was performed in 2014. A 2014 grab sample contained 0.117 ppm Au, 3.96 ppm Ag, 0.819 percent Cu, and 0.236 percent Zn (Angel, 2014).

Production notes:

360,376 lbs. Cu and 12 oz Ag were recovered from 2,747 tons ore, which also contained as much as 0.05 oz. Au/ton.

Reserves:

Inferred reserves: 45,500 tons at 0.3 percent Cu (Jansons and others, 1984).

Additional comments:

Crowe and others (1992; 1993) and Sainsbury (1993) discuss the genesis of the volcanogenic massive sulfide deposits in this area.

Chugach Alaska Corporation, Anchorage, Alaska has control of these lands.

References:

Angel, A.K., 2014 Mineral Assessment of Chugach Alaska Lands, Unpublished Report, 21p. (Report held by Chugach Alaska Corporation, Anchorage, Alaska).

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Moffit, F.H., and Fellows, R.E., 1950, Coper deposits of the Prince William Sound district, Alaska: U.S. Geological Survey Bulletin 963-B, p. 47-80.

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Sainsbury, C.L., 1993, Geology and geochemistry of volcanogenic massive sulfide deposits and related igneous rocks, Prince William Sound, south-central Alaska, A discussion: Economic Geology, v. 88, p. 1284-1285.

Primary Reference: Jansons and others, 1984

Reporter(s): S.W. Nelson, Anchorage, AK; A.K. Angel (Alaska Earth Sciences, Inc.)

Last report date: 2014-09-09

Site name(s): Sunday Lake

Site type: Prospect

ARDF no.: DE017

Latitude: 54.9295 **Quadrangle:** DE D-1

Longitude: 132.1724

Location description and accuracy:

The Sunday Lake prospect is at an elevation of about 750 feet, about 1.2 miles northwest of Bokan Mountain and about 0.7 mile east-southeast of the center of section 17, T. 80 S., R. 88 E. Its location relative to the other uranium and REE prospects in the vicinity of Bokan Mountain is best shown on Plate 1 of MacKevett (1963).

Commodities:

Main: Cb, Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pm, Pr, Sm, Tb, Th, Tm, U, Y, Yb, Zr

Other:

Ore minerals: Allanite, REE minerals

Gangue minerals:

Geologic description:

This and several other nearby uranium-thorium-REE deposits (DE015, DE016, and DE18 to DE031) are spatially and genetically related to a stock of Jurassic, peralkaline granite about 2 miles in outcrop diameter centered on Bokan Mountain. It commonly is referred to as the Bokan Mountain peralkaline granite or Bokan Mountain complex. The intrusion and its deposits have been mapped in detail several times using slightly different subdivisions of the granite (MacKevett, 1963; Thompson and others, 1980, 1982; Saint-Andre and others, 1983; Gehrels, 1992; Thompson, 1997). This description largely follows Gehrels' (1992) map units. The intrusion is a ring-dike complex with an outer border zone up to 14 meters thick of pegmatite and aplite; a nearly complete intermediate zone of aegirine granite porphyry, 15 to 180 meters thick; and a core of several varieties of riebeckite granite porphyry. It has been dated by several methods at 151 Ma to 191 Ma (Lanphere and others, 1964; Saint-Andre and others, 1983; Armstrong, 1985; Gehrels, 1992; Thompson, 1997). The peralkaline granite mainly intrudes a regionally extensive body of Silurian or Ordovician quartz monzonite, granite, and quartz diorite that makes up much of the southeast tip of Prince of Wales Island. The south and west sides of the peralkaline granite are in contact with a band up to about 3,000 feet wide of shale and argillite of the Silurian or Ordovician Descon Formation. The Bokan Mountain complex and surrounding Paleozoic rocks are cut by numerous pegmatite, andesite, dacite, and aplite dikes. The dikes are genetically related to the complex and commonly are associated with the uranium, thorium, and REE deposits. The deposits are marked by intense albitization, pervasive or fracture-controlled chloritization, calcite-fluorite replacement of aegirine, and hematitization. Three types of U-Th-REE deposits occur in the Bokan Mountain complex: 1) irregular cylindrical pipes; 2) steep, shear-zone-related pods or lenses ('veins'); and 3) quartz veins.

The Sunday Lake prospect has been explored by two short trenches and a small pit (Warner and Barker, 1989), and three holes were drilled in the fall of 2009 (Ucore Uranium, 2009b). The deposit is controlled by steeply dipping, north-northwest-trending shear zones and fractures which can be traced for about 300 feet in riebeckite granite. Allanite is locally abundant. Where exposed, the deposit is 3 to 7 feet thick and consists of highly radioactive, mottled, iron- and manganese-stained gouge and crushed rock.

In 2009, Ucore Uranium announced that samples taken at or near this prospect contained a significant content of heavy and light rare-earth elements (Ucore Uranium, 2009a). The analyses of the samples were

reported as the light rare-earth-element oxides or LREO (lanthanum, cerium, praseodymium, neodymium, and samarium) and the heavy rare-earth-element oxides or HREO (europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, and yttrium); together they are termed the TREO, the total rare-earth-element oxides. The two samples contained 7.19 and 0.37 percent HREO and 2.39 and 15.17 percent HREO. The analyses indicate that nearly all of the rare-earth-element oxides are the heavy rare-earth-element oxides. By early fall of 2009, two of the three Ucore holes cut high grade intercepts of rare-element minerals (Ucore Uranium, 2009b). The notable intercepts were 4.80 meters with 0.10 percent LREO and 1.93 percent HREO, 0.80 meters with 0.13 percent LREO and 3.82 percent HREO, and 1.72 meters with 0.07 percent LREO and 0.81 percent HREO. In other words, 92 to 97 percent of the rare-earth-element oxides were the heavy rare-earth-element oxides.

According to Warner and Barker (1989), the deposit has an inferred resource of 27,000 short tons of material that contains 26,000 pounds of columbium, 1,728,000 pounds of thorium, 270,000 pounds of uranium, 437,000 pounds of yttrium, 151,000 pounds of zirconium.

Alteration:

This prospect and the other uranium, thorium, and REE deposits associated with the Bokan Mountain peralkaline granite are marked by albitization, chloritization, and argillization. Minor calcite, fluorite, quartz, sulfide minerals, and tourmaline are common in the altered rocks and hematite often occurs in the periphery of high-grade ore zones.

Age of mineralization:

Genetically related to the Jurassic, Bokan Mountain peralkaline granite stock.

Generic deposit model:

Deposit model:

U-Th-REE deposit associated with peralkaline granite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Two short trenches and a small prospect pit to 2008. In 2009, Ucore Uranium sampled the prospect and drilled three holes.

Production notes:

None.

Reserves:

According to Warner and Barker (1989), the deposit has an inferred resource of 27,000 short tons of material that contains 26,000 pounds of columbium, 1,728,000 pounds of thorium, 270,000 pounds of uranium, 437,000 pounds of yttrium, 151,000 pounds of zirconium.

Additional comments:

References:

Armstrong, R. L., 1985, Rb-Sr dating of the Bokan Mountain granite complex and its country rocks: Canadian Journal of Earth Sciences, v. 22, p. 1233-1236.

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Thompson, T. B., Pierson, J. R., and Lyttle, T., 1982, Petrology and petrogenesis of the Bokan granite

complex, southeastern Alaska: Geological Society of America Bulletin, v. 93, p. 898-908.

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Ucore Uranium, 2009b, Ucore confirms new rare earth discovery at Sunday Lake, intersecting 4.8 meters of 1.8% TREO and 95% heady rare earth content: http://www.ucoreuranium.com/news2.asp?ID=114 (News release dated November 30, 2009).

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Primary Reference: Warner and Barker, 1989; Ucore Uranium, 2009a, 2009b

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): I and L; I and L Nos. 3-5

Site type: Prospects

ARDF no.: DE023

Latitude: 54.913 **Quadrangle:** DE D-1

Longitude: 132.1345

Location description and accuracy:

The I & L Nos. 3-5 prospects cover an area about 1,000 feet in diameter centered about 0.9 mile east-southeast of Bokan Mountain. The center of the area is just north of the midpoint of the south boundary of section 22, T. 80 S., R. 88 E, of the Copper River Meridian. As known in 2011, it is at the northwest end of the prospects along the Dotson dike and its persistent mineralization. The location of these prospects relative to the other uranium and REE prospects in the vicinity of Bokan Mountain is best shown on Plate 1 of MacKevett (1963). The location is accurate, though the degree of accuracy is not reported.

Commodities:

Main: Cb, Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pm, Pr, Sm, Tb, Th, Tm, U, Y, Yb, Zr

Other:

Ore minerals: Aeschynite, allanite, bastnaesite, brannerite, columbite-tantalite, euxenite-polycrase, fergusonite, fluorite, galena, monazite, parisite, phenakite, pyrite, samarskite, sphalerite, synchysite, tengerite, thalenite, thorite, unnamed REE fluorocarbonate, uranothorite, xenotime, zircon

Gangue minerals: Albite, calcite, fluorite, hematite, quartz, tourmaline

Geologic description:

This and several other nearby uranium-thorium-REE deposits (DE015 to DE022 and DE024 to DE031) are spatially and genetically related to a stock of Jurassic, peralkaline granite about 2 miles in diameter centered on Bokan Mountain. It commonly is referred to as the Bokan Mountain peralkaline granite or Bokan Mountain complex. The intrusion and its deposits have been mapped in detail several times using slightly different subdivisions of the granite (MacKevett, 1963; Thompson and others, 1980, 1982; Saint-Andre and others, 1983; Gehrels, 1992; Thompson, 1997). This description largely follows Gehrels' (1992) map units. The intrusion is a ring-dike complex with an outer border zone up to 14 meters thick of pegmatite and aplite; a nearly complete intermediate zone of aegirine granite porphyry, 15 to 180 meters thick; and a core of several varieties of riebeckite granite porphyry. It has been dated by several methods at 151 Ma to 191 Ma (Lanphere and others, 1964; Saint-Andre and others, 1983; Armstrong, 1985; Gehrels, 1992; Thompson, 1997). The peralkaline granite mainly intrudes a regionally extensive body of Silurian or Ordovician quartz monzonite, granite, and quartz diorite that makes up much of the southeast tip of Prince of Wales Island. The south and west sides of the peralkaline granite are in contact with a band up to about 3,000 feet wide of shale and argillite of the Silurian or Ordovician Descon Formation. The Bokan Mountain complex and surrounding Paleozoic rocks are cut by numerous pegmatite, andesite, dacite, and aplite dikes. The dikes are genetically related to the complex and commonly are associated with the uranium, thorium, and rare-earth-element (REE) deposits. The deposits are marked by intense albitization, pervasive or fracture-controlled chloritization, calcite-fluorite replacement of aegirine, and hematitization. Three types of U-Th-REE deposits occur in the Bokan Mountain complex: 1) irregular cylindrical pipes; 2) steep, shear-zone-related pods or lenses ('veins'); and 3) quartz veins.

As described by MacKevett (1963) and Warner and Barker (1989), the I and L prospects are on six principal and many smaller northwest-trending, quartz-cored, pegmatite dikes that cut riebeckite granite porphyry and aegirine granite of the Bokan Mountain peralkaline stock near its southeast border. Transverse

pegmatite dikes are also present. The dikes contain scattered concentrations and discrete grains of uranium, thorium, and REE minerals. The largest and northernmost dike (the No. 1 dike) is at least 900 feet long and up to 18 feet thick. The other dikes are parallel, vary from 100 to 500 feet in length, and are a few inches to 6 feet thick. The dikes are generally vertical but drilling on the No. 1 dike indicates that it is irregular in width and shape, and bends markedly at depth. Intense argillic alteration is common along the contacts of the dikes, and the better mineralization is generally associated with faults.

In a study of the mineralogy of the IL & M dikes, Staatz (1978) found that the uranium is generally in thorium-bearing uraninite, whereas brannerite predominates in some transverse dikes. Thorite is the principal thorium mineral in the northwest and central parts of the prospect area; allanite predominates in the southeastern part of the area and in transverse dikes. Rare earth minerals include bastnaesite, xenotime, monazite and an unidentified fluorocarbonate. The distribution of the individual rare earth minerals varies markedly. One part of a dike may contain predominantly cerium-group minerals, for example bastnaesite; another part may contain predominantly yttrium-bearing minerals, for example xenotime. Small amounts of sulfides including galena, sphalerite, and pyrite are common in many of the dikes. Zircon and fluorite are commonly present in minor amounts and two samples contained the beryllium mineral phenacite. The gangue is mostly quartz and albite. Scanning electron microscope study by Warner and Barker (1989) shows that the REE minerals are mainly thalenite, bastnaesite, and allanite; tengerite, parisite, synchysite, an unnamed REE flurocarbonate mineral, monazite, and xenotime also occur. The columbium-bearing mineral is mainly euxenite-polycrase, although columbite-tantalite, samarskite, fergusonite, and aeschynite are present. The main radioactive mineral is thorite but uranothorite is also present.

In 2007 and 2008, Ucore Uranium drilled 27 holes on the I&L vein system (Ucore Uranium, 2010). All the holes intersected uranium mineralization. Some of the best values were a 50.24-meter intercept with 0.47 percent U308, including a 3.90-meter intercept with 2.43 percent U3O8; a 46.72-meter intercept with 0.16 percent U3O8; a 5.11-meter intercept with 0.46 percent U308; a 7.56 meter intercept with 0.59 percent U3O8; and a 15.23-meter intercept with 0.42 percent U3O8. In conjunction with the drilling, an airborne geophysical survey was flown over the Bokan Mountain area in 2007 and channel samples were cut across the I & L vein system to guide the drilling. The drilling and channel sampling indicated that the uranium mineralization extends along strike for at least 100 meters, to a depth of at least 35 meters, and is open both along strike and dip (Ucore Uranium, 2008).

In 2010, Ucore drilled 20 more holes, including 13 infill holes along the Dodson Dike at roughly regular intervals from this prospect, now considered to be the northwest end of the dike, through the Atom Marietta prospect (DE024), to the Carol Ann prospect (DE027) (Ucore, 2010 [News release]; Ucore, 2011). They also dug 45 trenches across the dike. As known in early 2011, the Dodson dike has a strike length of at least 2,180 meters, averages 50 meters wide, extends from 300 meters above sea level to at least 150 meters below sea level, has remarkably persistent mineralization. and it is open along strike and down dip.

With this additional drilling on the Dodson dike, a new and considerably larger 'Conceptual Estimate' was made for the dike. The estimate was made using a model of the dike 2,425 meters long and 200 meters deep. The new figures are an 'Estimated contained mineralized tonnage' of from 3.5 to 6.5 million tonnes, with an 'Estimated grade TREO' of from 0.76 to 1.42 percent. (TREO = total rare earth elements.)

Alteration:

These prospects and the other uranium, thorium, and REE deposits associated with the Bokan Mountain peralkaline granite are marked by albitization, chloritization, and argillization. Minor calcite, fluorite, quartz, sulfide minerals, and tourmaline are common in the altered rocks and hematite often occurs in the periphery of high-grade ore zones. Intense argillic alteration is common along the contacts of the dikes, and the better mineralization is generally associated with faults (source not cited by previous reporter).

Age of mineralization:

Genetically related to the Jurassic, Bokan Mountain peralkaline granite (source not cited by previous reporter).

Generic deposit model:

Deposit model:

U-Th-REE deposit related to a peralkaline granite stock.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The prospects have been explored by numerous pits and trenches, and in 1977 were drilled to a depth of 260 feet. In 2007 and 2008, Ucore Uranium drilled 23 holes, cut several channel samples across the vein system, and completed an airborne geophysical survey over the area. In 2010, Ucore drilled 13 infill holes along the Dodson Dike at roughly regular intervals from the I and L prospect which was considered to be the northwest end of the dike, through the Atom Marietta prospect (DE024) to the Carol Ann prospect (DE027) (Ucore, 2010 [News release]; Ucore, 2011). They also dug 45 trenches across the dike. As known in early 2011 through systematic drilling, the Dodson dike has a strike length of at least 2,180 meters, averages 50 meters wide, extends from 300 meters above sea level to at least 150 meters below sea level, and it is open along strike and down dip.

In 2009 and 2010, Ucore conducted airborne total magnetic field and radiometric surveys in order to map radiogenic rocks in order to directly locate uranium and rare earth mineralization with the radiometric survey, and to map structure and stratigraphy indirectly with the total magnetic field survey. In 2009, Ground total magnetic field and radiometric surveys were performed to map these zones prior to drilling. An induced polarization (IP) survey was run to attempt to discern controls on mineralization intersected in drillholes at this site. In 2010, 3,214 m of core were drilled in 13 holes (Bentzen and others, 2013). This exploration work from 2008-2010 led to the 2013 Preliminary Economic Assessment (Bentzen and others, 2013) and a 2013 updated resource estimate (Ucore Rare Metals Inc., 2013).

Although no exploration work was conducted in 2016, Ucore Rare Metals Inc. conducted mineral-separation tests on ore from their Bokan-Dotson Ridge rare-earth-element (REE) project in Southeast Alaska. The first batch of pregnant leach solution (PLS) derived from Bokan ore was treated by the SuperLig®-One Molecular Recognition Technology plant at IBC Advanced Technologies, Inc.’s Utah facility. Successful separations include: 1) separation of REE from gangue metals in the PLS; 2) greater than 99 percent purity of separation of light REE from heavy REE at greater than 99 percent recovery; 3) greater than 99 percent purity of separation and recovery of the sub-groups samarium-dysprosium (Dy sub-group) and holmium-lutetium (Ho sub-group) from the heavy REE class consisting of samarium and lutetium; and 4) greater than 99 percent separation of dysprosium from the Dy sub-group (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

With the partial results of the 2010 infill drilling, a new and considerably larger 'Conceptual Estimate' was made for the Dodson dike. The estimate was made using a model of a dike 2,425 meters long and 200 meters deep. The new figures are an 'Estimated contained mineralized tonnage' of from 3.5 to 6.5 million tonnes, and an 'Estimated grade TREO' of from 0.76 to 1.42 percent. (TREO = total rare earth elements.)

In October 2013, an upgraded resource estimate was reported combining I and L, Carol Ann (DE027) and Atom Marietta (DE024). The estimate was made using a model via five alternative total rare earth oxide (TREO) cut-off grades with a baseline case employing a TREO cut-off of 0.4 percent. The deposit has indicated resources of 2,936,000 tonnes containing 39,731,596 pounds of TREO composed of 0.365 percent LREO, 0.249 percent HREO, and 0.614 percent TREO with a TREO cut-off of 0.4, and an additional inferred resources of 1,995,000 tonnes containing 26,601,729 pounds of TREO composed of 0.366 percent LREO, 0.239 percent HREO, and 0.605 percent TREO with a TREO cutoff of 0.40 (Ucore Rare Minerals Inc., 2013).

A 2013 preliminary economic assessment for Ucore Rare Metals’ Bokan property states an inferred

resource of 5.228 million tonnes grading 0.653 percent total rare-earth oxide (Bentzen and others, 2013); it includes the Dotson (DE027), and I-and-L zones (DE023).

Additional comments:

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Primary Reference: Warner and Barker, 1989; Ucore Uranium, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Atom Marietta

Site type: Prospect

ARDF no.: DE024

Latitude: 54.9122 **Quadrangle:** DE D-1

Longitude: 132.1283

Location description and accuracy:

The Atom Marietta prospect is about 1.1 miles east-southeast of Bokan Mountain, near the center of the west boundary of the SE1/4 SE1/4 section 22, T. 80 S., R. 88 E, of the Copper River Meridian. As known in 2011, it is one of the prospects along the Dodson dike and its persistent mineralization. Its location relative to the other uranium and REE prospects in the vicinity of Bokan Mountain is best shown on Plate 1 of MacKevett (1963). The location is accurate, though the degree of accuracy is not reported.

Commodities:

Main: Cb, Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pm, Pr, Sm, Tb, Th, Tm, U, Y, Yb, Zr

Other:

Ore minerals: Brannerite?, dravite?, uraninite, uranophane

Gangue minerals: Albite, calcite, chlorite, fluorite, hematite, quartz, tourmaline

Geologic description:

This and several other nearby uranium-thorium-REE deposits (DE015 to DE023 and DE025 to DE031) are spatially and genetically related to a stock of Jurassic, peralkaline granite about 2 miles in diameter centered on Bokan Mountain. It commonly is referred to as the Bokan Mountain peralkaline granite or Bokan Mountain complex. The intrusion and its deposits have been mapped in detail several times using slightly different subdivisions of the granite (MacKevett, 1963; Thompson and others, 1980, 1982; Saint-Andre and others, 1983; Gehrels, 1992; Thompson, 1997). This description largely follows Gehrels' (1992) map units. The intrusion is a ring-dike complex with an outer border zone up to 14 meters thick of pegmatite and aplite; a nearly complete intermediate zone of aegirine granite porphyry, 15 to 180 meters thick; and a core of several varieties of riebeckite granite porphyry. It has been dated by several methods at 151 Ma to 191 Ma (Lanphere and others, 1964; Saint-Andre and others, 1983; Armstrong, 1985; Gehrels, 1992; Thompson, 1997). The peralkaline granite mainly intrudes a regionally extensive body of Silurian or Ordovician quartz monzonite, granite, and quartz diorite that makes up much of the southeast tip of Prince of Wales Island. The south and west sides of the peralkaline granite are in contact with a band up to about 3,000 feet wide of shale and argillite of the Silurian or Ordovician Descon Formation. The Bokan Mountain complex and surrounding Paleozoic rocks are cut by numerous pegmatite, andesite, dacite, and aplite dikes. The dikes are genetically related to the complex and commonly are associated with the uranium, thorium, and REE deposits. The deposits are marked by intense albitization, pervasive or fracture-controlled chloritization, calcite-fluorite replacement of aegirine, and hematitization. Three types of U-Th-REE deposits occur in the Bokan Mountain complex: 1) irregular cylindrical pipes; 2) steep, shear-zone-related pods or lenses ('veins'); and 3) quartz veins.

The Atom Marietta prospect consists of a few hand-dug cuts and pits on several claims located in 1955 (MacKevett, 1963). The prospect is in aplite near the southeastern edge of the Bokan Mountain peralkaline complex. The deposit is near the intersection of a major northeast-trending fault zone with a group of steep northwest faults. The deposit is associated with intensely altered and fractured dacite dikes that cut the aplite in or near the fault zones. The uranium-thorium minerals occur in narrow veinlets, as disseminations, and as irregular, sublinear masses. The primary radioactive mineral is uranothorite, although uraninite and other

unidentified minerals, possibly brannerite or davite, also occur. Secondary uranophane is present.

In 2008 and 2009, Ucore Uranium drilled a line of 24 holes for rare-earth elements at roughly equal intervals from near this prospect to the Carol Ann prospects (DE027), a distance of about 2,000 meters (Ucore Uranium, 2010). The line of holes follows the Dodson dike system. The analyses for the samples were reported as the light rare-earth-element oxides or LREO (lanthanum, cerium, praesodymium, neodymium, and samarium) and the heavy rare-earth-element oxides or HREO (euroipium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, and yttrium); together they are termed the TREO, the total rare-earth-element oxides. Some of the notable intercepts are: 1) 0.2 meter with 5.7 percent TREO, 0.4 meter with 3.0 percent TREO; 2) 0.3 meter with 3.3 percent TREO, 0.8 meter with 3.5 percent TREO; 3) 0.3 meter with 3.2 percent TREO; 4) 0.25 meter with 4.4 percent TREO; 5) 0.33 meter with 3.0 percent TREO: 6) 0.83 meter with 5.4 percent TREO; 7) 0.5 meter with 6.3 percent TREO; 8) 0.6 meter with 4.5 percent TREO); 9) 0.4 meter with 3.4 percent TREO; 10) 0.5 meter with 4.0 percent TREO; and 11) 0.4 meter with 3.4 percent TREO. Several of the holes had multiple intercepts of rare-earth-element mineralization which is notable persistent along the whole line of holes. The ratio of the the HREO to the TREO in the better intercepts varied from about 24 percent to about 70 percent, but roughly about half of the rare-earth elements in the samples are the heavy rare-earth elements.

In 2010, Ucore drilled 20 more holes, including 13 infill holes along the Dodson dike at roughly regular intervals from the I and L prospect (DE023), through this site, to the Carol Ann prospect (DE 027) (Ucore, 2010 [News release]; Ucore, 2011). They also dug 45 trenches across the dike. As known in early 2011, the Dodson dike has a strike length of at least 2,180 meters, averages 50 meters wide, extends from 300 meters above sea level to at least 150 meters below sea level, has remarkably persistent mineralization, and it is open along strike and down dip.

With this additional drilling on the Dodson dike, a new and considerably larger 'Conceptual Estimate' was made for it. The estimate was made using a model of a dike 2,425 meters long and 200 meters deep. The new figures are an 'Estimated contained mineralized tonnage' of from 3.5 to 6.5 million tonnes, with an 'Estimated grade TREO' of from 0.76 to 1.42 percent. (TREO = total rare earth elements.)

In October 2013, an upgraded resource estimate was reported combining Atom Marietta, I and L (DE023), and Carol Ann (DE027). The estimate was made using a model via five alternative total rare earth oxide (TREO) cut-off grades with a baseline case employing a TREO cut-off of 0.4 percent. The deposit has 1) indicated resources of 2,936,000 tonnes containing 39,731,596 pounds of TREO composed of 0.365 percent LREO, 0.249 percent HREO, and 0.614 percent TREO with a TREO cut-off of 0.4, and 2) inferred resources of 1,995,000 tonnes containing 26,601,729 pounds of TREO composed of 0.366 percent LREO, 0.239 percent HREO, and 0.605 percent TREO with a TREO cutoff of 0.40 (Ucore Rare Minerals Inc., 2013).

Alteration:

These prospects and the other uranium, thorium, and REE deposits associated with the Bokan Mountain peralkaline granite are marked by albitization, chloritization, and argillization. Minor calcite, fluorite, quartz, sulfide minerals, and tourmaline are common in the altered rocks and hematite often occurs in the periphery of high-grade ore zones.

Age of mineralization:

Genetically related to the Jurassic, Bokan Mountain peralkaline granite (Lanphere and others, 1964; Saint-Andre and others, 1983; Armstrong, 1985; Gehrels, 1992; Thompson, 1997).

Generic deposit model:

Deposit model:

U-Th-REE deposit associated with peralkaline granite stock.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Only several hand-dug pits and trenches prior to 2008. In 2008 and 2009, Ucore Uranium drilled a line of 24 holes for rare-earth elements at roughly equal intervals from near this prospect to the Carol Ann prospects (DE027), a distance of about 2,000 meters (Ucore Uranium, 2010). The line of holes follows the Dodson dike system. In 2010, Ucore drilled 13 infill holes along the Dodson Dike at roughly regular intervals from the I and L prospect (DE023), through the Atom Marietta prospect to the Carol Ann prospect (DE027) (Ucore, 2010 [News release]; Ucore, 2011). They also dug 45 trenches across the dike.

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Production notes:

None.

Reserves:

With the partial results of the 2010 infill drilling, a new and considerably larger 'Conceptual Estimate' was made for the Dodson dike. The estimate was made using a model of a dike 2,425 meters long and 200 meters deep. The new figures are an 'Estimated contained mineralized tonnage' of from 3.5 to 6.5 million tonnes, and an 'Estimated grade TREO' of from 0.76 to 1.42 percent. (TREO = total rare earth elements.)

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Additional comments:

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Primary Reference: MacKevett, 1963; Ucore Uranium, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-02-25

Site name(s): Carol Ann; Carol Ann No. 1; Carol Ann No. 2; Carol Ann No. 3; Dotson

Site type:

Prospects

ARDF no.: DE027

Latitude: 54.9053 **Quadrangle:** DE D-1

Longitude: 132.1072

Location description and accuracy:

The three Carol Ann prospects are at the southeast end of the Dodson dike and its persistent. The coordinates are at near the center of the prospect area, about 1.9 miles southeast of Bokan Mountain, near the middle of the N1/2 section 26, T. 80 S., R. 88 E of the Copper River Meridian. The locations of the Carol Ann prospects relative to the other uranium and REE prospects in the vicinity of Bokan Mountain are best shown on Plate 1 of MacKevett (1963). The location is accurate, though degree of accuracy is not reported.

Commodities:

Main: Cb, Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pm, Pr, Sm, Tb, Th, Tm, U, Y, Yb, Zr

Other:

Ore minerals: Aeschynite, allanite, bastnaesite, columbite-tantalite, euxenite-polycrase, fergusonite, fluorite, monazite, parisite, pyrite, samarskite, synchysite, tengerite, thalenite, thorite, unnamed REE fluorocarbonate, uranothorite, xenotime, zircon

Gangue minerals: Albite, calcite, fluorite, hematite, quartz, tourmaline

Geologic description:

This and several other nearby uranium-thorium-REE deposits (DE015 to DE026 and DE028 to DE031) are spatially and genetically related to a stock of Jurassic, peralkaline granite about 2 miles in outcrop diameter centered on Bokan Mountain. It commonly is referred to as the Bokan Mountain peralkaline granite or Bokan Mountain complex. The intrusion and its deposits have been mapped in detail several times using slightly different subdivisions of the granite (MacKevett, 1963; Thompson and others, 1980, 1982; Saint-Andre and others, 1983; Gehrels, 1992; Thompson, 1997). This description largely follows Gehrels' (1992) map units. The intrusion is a ring-dike complex with an outer border zone up to 14 meters thick of pegmatite and aplite; a nearly complete intermediate zone of aegirine granite porphyry, 15 to 180 meters thick; and a core of several varieties of riebeckite granite porphyry. It has been dated by several methods at 151 Ma to 191 Ma (Lanphere and others, 1964; Saint-Andre and others, 1983; Armstrong, 1985; Gehrels, 1992; Thompson, 1997). The peralkaline granite mainly intrudes a regionally extensive body of Silurian or Ordovician quartz monzonite, granite, and quartz diorite that makes up much of the southeast tip of Prince of Wales Island. The south and west sides of the peralkaline granite are in contact with a band up to about 3,000 feet wide of shale and argillite of the Silurian or Ordovician Descon Formation. The Bokan Mountain complex and surrounding Paleozoic rocks are cut by numerous pegmatite, andesite, dacite, and aplite dikes. The dikes are genetically related to the complex and commonly are associated with the uranium, thorium, and REE deposits. The deposits are marked by intense albitization, pervasive or fracture-controlled chloritization, calcite-fluorite replacement of aegirine, and hematitization. Three types of U-Th-REE deposits occur in the Bokan Mountain complex: 1) irregular cylindrical pipes; 2) steep, shear-zone-related pods or lenses ('veins'); and 3) quartz veins.

MacKevett (1963) describes three prospects under the name Carol Ann as surface pits on three claims located in 1955. The prospects are on a series of steep, subparallel, allanite-bearing andesite dikes that strike

about N60-75W for at least 3,500 feet. The dikes radiate out from the Bokan Mountain peralkaline granite into Silurian or Ordovician quartz monzonite.

Warner and Barker (1989) describes these prospects under the name Dotson and extend the dikes northwest to the I & L Nos. 3-5 prospects (DE023) at the periphery of the Bokan Mountain alkaline granite. Several parallel dikes occur over a width of less than 100 feet to 200 feet; the individual dikes vary in width from 0.6 feet to 3.1 feet. To northwest, near the Bokan Mountain granite, the dikes are pegmatitic; to the southeast, they generally are medium- to fine-grained and equigranular. The mineralization occurs in microfractures or in the interstices between silicate grains. The dominant radioactive mineral is allanite. Scanning electron microscope study shows that the REE minerals are mainly thalenite, bastnaesite, and allanite, with subordinate tengerite, parisite, synchysite, an unnamed REE flurocarbonate mineral, monazite, and xenotime. The columbium-bearing mineral is mainly euxenite-polycrase, accompanied by subordinate columbite-tantalite, samarskite, fergusonite, and aeschynite. The main radioactive mineral is thorite but uranothorite is also present.

In 2008 and 2009, Ucore Uranium drilled a line of 24 holes for rare-earth elements at roughly equal intervals from near this prospect to the Atom Marietta prospect (DE024), a distance of about 2,000 meters (Ucore Uranium, 2010). The line of holes follows the Dodson dike system. The analyses for the samples were reported as the light rare-earth-element oxides or LREO (lanthanum, cerium, praesodymium, neodymium, and samarium) and the heavy rare-earth-element oxides or HREO (euroipium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, and yttrium); together they are termed the TREO, the total rare-earth-element oxides. Some of the notable intercepts are: 0.2 meter with 5.7 percent TREO, 0.4 meter with 3.0 percent TREO, 0.3 meter with 3.3 percent TREO, 0.8 meter with 3.5 percent TREO, 0.3 meter with 3.2 percent TREO, 0.25 meter with 4.4 percent TREO, 0.33 meter with 3.0 percent TREO, 0.83 meter with 5.4 percent TREO, 0.5 meter with 6.3 percent TREO, 0.6 meter with 4.5 percent TREO), 0.4 meter with 3.4 percent TREO, 0.5 meter with 4.0 percent TREO, and 0.4 meter with 3.4 percent TREO. Several of the holes had multiple intercepts of rare-earth-element mineralization and it is notable persistent along the whole line of holes. The ratio of the the HREO to the TREO in the better intercepts varied from about 24 percent to about 70 percent, but roughly about half of the rare-earth elements in the samples are the heavy rare-earth elements.

In 2010, Ucore drilled 20 more holes, including 13 infill holes along the Dodson Dike at roughly regular intervals from the I and L prospect (DE023), through the Atom Marietta prospect (DE024), to this prospect. (Ucore, 2010 [News release]; Ucore, 2011). They also dug 45 trenches across the dike. As known in early 2011, the Dodson dike has a strike length of at least 2,180 meters, averages 50 meters wide, extends from 300 meters above sea level to at least 150 meters below sea level, has remarkably persistent mineralization, and it is open along strike and down dip.

With this additional drilling on the Dodson dike, a new and considerably larger 'Conceptual Estimate' was made for the dike. The estimate was made using a model of a dike 2,425 meters long and 200 meters deep. The new figures are an 'Estimated contained mineralized tonnage' of from 3.5 to 6.5 million tonnes, with an 'Estimated grade TREO' of from 0.76 to 1.42 percent. (TREO = total rare earth elements.)

Alteration:

Age of mineralization:

Genetically related to the Jurassic, Bokan Mountain peralkaline granite (Lanphere and others, 1964; Saint-Andre and others, 1983; Armstrong, 1985; Gehrels, 1992; Thompson, 1997).

Generic deposit model:

Deposit model:

U-Th-REE deposit associated with peralkaline granite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Only prospect pits to 2008. In 2008 and 2009, Ucore Uranium drilled a line of 24 holes for rare-earth elements at roughly equal intervals from near this prospect to the Atom Marietta prospect (DE024), a distance of about 2,000 meters (Ucore Uranium, 2010). In 2010, Ucore drilled 13 infill holes along the Dodson Dike at roughly regular intervals from the I and L prospect (DE023), through the Atom Marietta prospect (DE024), to this prospect. (Ucore, 2010; Ucore, 2011). They also dug 45 trenches across the dike.

In 2009 and 2010, Ucore conducted airborne total magnetic field and radiometric surveys in order to map radiogenic rocks in order to directly locate uranium and rare earth mineralization with the radiometric survey, and to map structure and stratigraphy indirectly with the total magnetic field survey. In 2009, Ground total magnetic field and radiometric surveys were performed to map these zones prior to drilling. An induced polarization (IP) survey was run to attempt to discern controls on mineralization intersected in drillholes at this site. In 2010, 3,214 m of core were drilled in 13 holes (Bentzen and others, 2013). This exploration work from 2008-2010 led to the 2013 Preliminary Economic Assessment (Bentzen and others, 2013) and a 2013 updated resource estimate (Ucore Rare Metals Inc., 2013).

Although no exploration work was conducted in 2016, Ucore Rare Metals Inc. conducted mineral-separation tests on ore from their Bokan-Dotson Ridge rare-earth-element (REE) project in Southeast Alaska. The first batch of pregnant leach solution (PLS) derived from Bokan ore was treated by the SuperLig®-One Molecular Recognition Technology plant at IBC Advanced Technologies, Inc.’s Utah facility. Successful separations include: 1) separation of REE from gangue metals in the PLS; 2) greater than 99 percent purity of separation of light REE from heavy REE at greater than 99 percent recovery; 3) greater than 99 percent purity of separation and recovery of the sub-groups samarium-dysprosium (Dy sub-group) and holmium-lutetium (Ho sub-group) from the heavy REE class consisting of samarium and lutetium; and 4) greater than 99 percent separation of dysprosium from the Dy sub-group (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

With partial results from the 2010 infill drilling, a new and considerably larger 'Conceptual Estimate' was made for the Dodson dike. The estimate was made using a model of a dike 2,425 meters long and 200 meters deep. The new figures are an 'Estimated contained mineralized tonnage' of from 3.5 to 6.5 million tonnes, with an 'Estimated grade TREO' of from 0.76 to 1.42 percent. (TREO = total rare earth elements.)

In October 2013, an upgraded resource estimate was reported combining Carol Ann, I and L (DE023), and Atom Marietta (DE024). The estimate was made using a model via five alternative total rare earth oxide (TREO) cut-off grades with a baseline case employing a TREO cut-off of 0.4 percent. The deposit has an indicated resources of 2,936,000 tonnes containing 39,731,596 pounds of TREO composed of 0.365 percent LREO, 0.249 percent HREO, and 0.614 percent TREO with a TREO cut-off of 0.4, and an additional inferred resources of 1,995,000 tonnes containing 26,601,729 pounds of TREO composed of 0.366 percent LREO, 0.239 percent HREO, and 0.605 percent TREO with a TREO cutoff of 0.40 (Ucore Rare Minerals Inc., 2013).

A 2013 preliminary economic assessment for Ucore Rare Metals’ Bokan property states an inferred resource of 5.228 million tonnes grading 0.653 percent total rare-earth oxide (Bentzen and others, 2013); it includes the Dotson (DE027), and I-and-L zones (DE023).

Additional comments:

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Primary Reference: Warner and Barker, 1989; Ucore Uranium, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Cheri; Cheri No. 1

Site type: Prospects

ARDF no.: DE029

Latitude: 54.8924 **Quadrangle:** DE D-1

Longitude: 132.1035

Location description and accuracy:

The Cheri prospects are centered about 0.7 mile south-southeast of the head of the West Arm of Kendrick Bay, near the center of the NE1/4 section 35, T. 80 S., R. 88 E., of the Copper River Meridian. Their locations relative to the other uranium and REE prospects in the vicinity of Bokan Mountain are best shown on Plate 1 of MacKevett (1963).

Commodities:

Main: Be, Cb, Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pm, Pr, Sm, Tb, Th, Tm, U, Y, Yb, Zr

Other:

Ore minerals: Allanite, hematite, magnetite, pyrite

Gangue minerals: Albite, quartz

Geologic description:

This and several other nearby uranium-thorium-REE deposits (DE015 to DE028 and DE030 to DE031) are spatially and genetically related to a stock of Jurassic, peralkaline granite about 2 miles in outcrop diameter centered on Bokan Mountain. It commonly is referred to as the Bokan Mountain peralkaline granite or Bokan Mountain complex. The intrusion and its deposits have been mapped in detail several times using slightly different subdivisions of the granite (MacKevett, 1963; Thompson and others, 1980, 1982; Saint-Andre and others, 1983; Gehrels, 1992; Thompson, 1997). This description largely follows Gehrels' (1992) map units. The intrusion is a ring-dike complex with an outer border zone up to 14 meters thick of pegmatite and aplite; a nearly complete intermediate zone of aegirine granite porphyry, 15 to 180 meters thick; and a core of several varieties of riebeckite granite porphyry. It has been dated by several methods at 151 Ma to 191 Ma (Lanphere and others, 1964; Saint-Andre and others, 1983; Armstrong, 1985; Gehrels, 1992; Thompson, 1997). The peralkaline granite mainly intrudes a regionally extensive body of Silurian or Ordovician quartz monzonite, granite, and quartz diorite that makes up much of the southeast tip of Prince of Wales Island. The south and west sides of the peralkaline granite are in contact with a band up to about 3,000 feet wide of shale and argillite of the Silurian or Ordovician Descon Formation. The Bokan Mountain complex and surrounding Paleozoic rocks are cut by numerous pegmatite, andesite, dacite, and aplite dikes. The dikes are genetically related to the complex and commonly are associated with the uranium, thorium, and REE deposits. The deposits are marked by intense albitization, pervasive or fracture-controlled chloritization, calcite-fluorite replacement of aegirine, and hematitization. Three types of U-Th-REE deposits occur in the Bokan Mountain complex: 1) irregular cylindrical pipes; 2) steep, shear-zone-related pods or lenses ('veins'); and 3) quartz veins.

MacKevett (1963) identified small pits and trenches at the Cheri prospects on several claims staked in 1956. The rocks in the vicinity consist of Ordovician, albitized quartz diorite and diorite, and a pendant of quartzite of the Descon Formation that cannot be delineated exactly in the heavily vegetated cover. The deposit at the Cheri prospects consists of system of radioactive andesite(?) dikes that strike about N 45 W and can be traced for at least 3,000 feet along strike (Warner and Barker, 1989). The zone of dikes is about 100 feet wide; it consists of several parallel dikes, 0.8 to 1.3 feet thick. The dikes are fine grained and siliceous. At one location, pyroxene-rich masses with minor pyrite, rare fluorite, and secondary uranium

minerals, occur in a dike. Chlorite, magnetite, pyrite, and epidote commonly occur at the margins of the dikes. Allanite is the principal radioactive mineral and the mineralogy is probably similar to that at the nearby Carol Ann/Dotson prospects (DE027), where similar dikes occur. The radioactive minerals are mainly concentrated in quartz veinlets or along mineralized fractures. At the Cheri No. 1 prospect, allanite in the interstices of quartzite is accompanied by abundant hematite and less-abundant albite, quartz, calcite, epidote, and chlorite.

In 2009, Ucore Uranium (2010) drilled two holes near the Cheri prospect for rare-earth elements. The analyses for the samples were reported as the light rare-earth-element oxides or LREO (lanthanum, cerium, praesodymium, neodymium, and samarium) and the heavy rare-earth-element oxides or HREO (europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, and yttrium); together they are termed the TREO, the total rare-earth-element oxides. The two most notable intercepts in one of the holes was 0.5 meter with 4.0 percent TREO, and 0.4 meter with 3.4 percent TREO. The ratio of the the HREO to the TREO in the two intercept was 39.4 and 46.1 percent; in other words nearly half of the rare-earth elements in the samples are the heavy rare-earth elements.

Warner and Barker (1989) estimate an indicated resource of 73,000 tons of rock in two portions of the Cheri dike system that contain 91,000 pounds of columbium, 32,000 pounds of thorium, 109,000 pounds of zirconium, 13,000 pounds of beryllium, 15,000 pounds of uranium, and 349,000 pounds of REE. There is an additional indicated resource of 458,000 short tons of rock in another portion of the dike system that contains 1,122,000 pounds of columbium, 338,000 pounds of thorium, 1,602,000 pounds of yttrium, 4,397,000 pounds of zirconium, 101,000 pounds of beryllium, 153,000 pounds of uranium, and 3,593,000 pounds of REE.

Alteration:

Age of mineralization:

Genetically related to the Jurassic, Bokan Mountain peralkaline granite.

Generic deposit model:

Deposit model:

U-Th-REE deposit in dikes associated with peralkaline granite stock.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

Only a few prospect pits to 2008. In 2009, Ucore Uranium drilled two holes for rare-earth elements.

Production notes:

None.

Reserves:

Warner and Barker (1989) estimate an indicated resource of 73,000 tons of rock in two portions of the Cheri dike system that contain 91,000 pounds of columbium, 32,000 pounds of thorium, 109,000 pounds of zirconium, 13,000 pounds of beryllium, 15,000 pounds of uranium, and 349,000 pounds of REE. There is an additional indicated resource of 458,000 short tons of rock in another portion of the dike system that contains 1,122,000 pounds of columbium, 338,000 pounds of thorium, 1,602,000 pounds of yttrium, 4,397,000 pounds of zirconium, 101,000 pounds of beryllium, 153,000 pounds of uranium, and 3,593,000 pounds of REE.

Additional comments:

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Warner, J. D., and Barker, J. C., 1989, Columbium- and rare-earth-element-bearing deposits at Bokan Mountain, southeast Alaska: U.S. Bureau of Mines Open-File Report 33-89, 196 p.

Primary Reference: Warner and Barker, 1989; Ucore Uranium, 2010

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Shore

Site type: Occurrence

ARDF no.: DE030

Latitude: 54.896 **Quadrangle:** DE D-1

Longitude: 132.0935

Location description and accuracy:

The Shore occurrence is in the intertidal zone in the vicinity of the point that juts out into the West Arm of Kendrick Bay near the northwest corner of section 36, T. 80 S., R. 88 E. The location of this occurrence relative to the other uranium and REE prospects in the vicinity of Bokan Mountain is best shown on Plate 1 of MacKevett (1963).

Commodities:

Main: Be, Cb, Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pm, Pr, Sm, Tb, Th, Tm, U, Y, Yb, Zr

Other: Pb, Sn, Sr, Ta

Ore minerals: Allanite?, pyrite, REE minerals?

Gangue minerals: Albite, quartz

Geologic description:

This and several other nearby uranium-thorium-REE deposits (DE015 to DE029 and DE031) are spatially and genetically related to a stock of Jurassic, peralkaline granite about 2 miles in outcrop diameter centered on Bokan Mountain. It commonly is referred to as the Bokan Mountain peralkaline granite or Bokan Mountain complex. The intrusion and its deposits have been mapped in detail several times using slightly different subdivisions of the granite (MacKevett, 1963; Thompson and others, 1980, 1982; Saint-Andre and others, 1983; Gehrels, 1992; Thompson, 1997). This description largely follows Gehrels' (1992) map units. The intrusion is a ring-dike complex with an outer border zone up to 14 meters thick of pegmatite and aplite; a nearly complete intermediate zone of aegirine granite porphyry, 15 to 180 meters thick; and a core of several varieties of riebeckite granite porphyry. It has been dated by several methods at 151 Ma to 191 Ma (Lanphere and others, 1964; Saint-Andre and others, 1983; Armstrong, 1985; Gehrels, 1992; Thompson, 1997). The peralkaline granite mainly intrudes a regionally extensive body of Silurian or Ordovician quartz monzonite, granite, and quartz diorite that makes up much of the southeast tip of Prince of Wales Island. The south and west sides of the peralkaline granite are in contact with a band up to about 3,000 feet wide of shale and argillite of the Silurian or Ordovician Descon Formation. The Bokan Mountain complex and surrounding Paleozoic rocks are cut by numerous pegmatite, andesite, dacite, and aplite dikes. The dikes are genetically related to the complex and commonly are associated with the uranium, thorium, and REE deposits. The deposits are marked by intense albitization, pervasive or fracture-controlled chloritization, calcite-fluorite replacement of aegirine, and hematitization. Three types of U-Th-REE deposits occur in the Bokan Mountain complex: 1) irregular cylindrical pipes; 2) steep, shear-zone-related pods or lenses ('veins'); and 3) quartz veins.

The Shore occurrence is in the intertidal zone on the south side of the West Arm of Kendrick Bay (Warner and Barker, 1989). Radioactive, granitic dike rubble and a few outcrops of dike occur along about 1,000 feet of shoreline. The dikes are in a 100-foot-wide zone near the contact of quartz monzonite and quartz diorite. The dikes strike N50W and dip steeply to vertical. They are generally 0.2 to 0.5 feet thick wide and there are intervals where thinner dikes closely parallel each other. The dikes vary from coarse grained to pegmatitic and commonly contain disseminated fluorite, pyrite, allanite(?), and REE(?) minerals. The quartz monzonite near the dikes locally is cut by pyritic, siliceous zones up to 30 feet wide. Samples

contained anomalously high columbium, uranium, thorium, REE, yttrium, zirconium, zinc, titanium, and beryllium. Some samples also contained elevated tin, tantalum, lead, and strontium. Three channel samples 1.1 feet long averaged 760 parts per million columbium. The dikes are unusually enriched in REE, especially cerium and neodymium; samples of dike material contained up to 2.5 percent REE.

In 2008, Ucore Uranium drilled one hole hear the Shore prospect for rare-earth elements along what they term the 'Geoduck trend' that is oriented northwest along the N50W granitic dike. In 2009, they drilled two more holes about 600 meters southeast along the trend at the Geoduck prospect (DE031).

Alteration:

Not specifically described; the dikes and their wallrocks are probably albitized and chloritized like those at the other REE deposits in the area.

Age of mineralization:

Genetically related to the Jurassic, Bokan Mountain peralkaline granite stock.

Generic deposit model:

Deposit model:

U-Th-REE deposit in dikes associated with peralkaline granite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Only surface sampling by government geologists to 2008. In 2008, Ucore Uranium drilled one hole for rare-earth elements.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Armstrong, R. L., 1985, Rb-Sr dating of the Bokan Mountain granite complex and its country rocks: Canadian Journal of Earth Sciences, v. 22, p. 1233-1236.

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Lanphere, M. A., MacKevett, E. M., and Stern, T. W., 1964, Potassium-argon and lead-alpha ages of plutonic rocks, Bokan Mountain area, Alaska: Science, v. 145, p. 705-707.

Maas, K.M., Bittenbender, P E., and Still, J.C., 1995, Mineral investigations in the Ketchikan mining district, southeastern Alaska: U.S. Bureau of Mines Open-File Report 11-95, 606 p.

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Saint-Andre, Bruno de, Lancelot, J. R., and Collot, Bernard, 1983, U-Pb geochronology of the Bokan Mountain peralkaline granite, southeastern Alaska: Canadian Journal of Earth Sciences, v. 20, p. 236-245.

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Thompson, T. B., 1988, Geology and uranium-thorium mineral deposits of the Bokan Mountain granite complex, southeastern Alaska: Fluid Inclusion Research, v. 21, p. 193-210.

Thompson, T.B., 1988, Geology and uranium-thorium mineral deposits of the Bokan Mountain granite complex, southeastern Alaska, in Gabelman, J. W., ed., Unconventional uranium deposits: Ore Geology Reviews, v. 3, p 193-210.

Thompson, T.B., 1997, Uranium, thorium, and rare metal deposits of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral deposits of Alaska: Economic Geology Monograph 9, p. 466-482.

Thompson, T. B., Lyttle, Thomas, and Pierson, J. R., 1980, Genesis of the Bokan Mountain, Alaska, uranium-thorium deposit: U.S. Department of Energy, Bendix Field Engineering Report GJBX-38(80), 232 p.

Thompson, T. B., Pierson, J. R., and Lyttle, T., 1982, Petrology and petrogenesis of the Bokan granite complex, southeastern Alaska: Geological Society of America Bulletin, v. 93, p. 898-908.

Ucore Uranium, 2010, Bokan Mountain, Alaska: http://www.ucoreuranium.com/bokan.asp (as of February 22, 2010.)

Warner, J. D., and Barker, J. C., 1989, Columbium- and rare-earth-element-bearing deposits at Bokan Mountain, southeast Alaska: U.S. Bureau of Mines Open-File Report 33-89, 196 p.

Primary Reference: Warner and Barker, 1989; Ucore Uranium, 2010

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Geoduck

Site type: Occurrences

ARDF no.: DE031

Latitude: 54.8887 **Quadrangle:** DE D-1

Longitude: 132.0853

Location description and accuracy:

The Geoduck occurrences are south of the West Arm of Kendrick Bay. They are related to a dike system that extends N40-50W for about 10,000 feet, nearly diagonally through the center of section 36, T. 80 S., R. 88 E. and into the NW1/4 of section 2, T. 81 S., R. 89 E. The site is approximately at the midpoint of the most continuous and thickest dike, where resource calculations have been made.

Commodities:

Main: Be, Cb, Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pm, Pr, Sm, Tb, Th, Tm, U, Y, Yb, Zr

Other:

Ore minerals: Allanite?, pyrite, REE minerals

Gangue minerals: Feldspar, quartz

Geologic description:

This and several other nearby uranium-thorium-REE deposits (DE015 to DE030) are spatially and genetically related to a stock of Jurassic, peralkaline granite about 2 miles in outcrop diameter centered on Bokan Mountain. It commonly is referred to as the Bokan Mountain peralkaline granite or Bokan Mountain complex. The intrusion and its deposits have been mapped in detail several times using slightly different subdivisions of the granite (MacKevett, 1963; Thompson and others, 1980, 1982; Saint-Andre and others, 1983; Gehrels, 1992; Thompson, 1997). This description largely follows Gehrels' (1992) map units. The intrusion is a ring-dike complex with an outer border zone up to 14 meters thick of pegmatite and aplite; a nearly complete intermediate zone of aegirine granite porphyry, 15 to 180 meters thick; and a core of several varieties of riebeckite granite porphyry. It has been dated by several methods at 151 Ma to 191 Ma (Lanphere and others, 1964; Saint-Andre and others, 1983; Armstrong, 1985; Gehrels, 1992; Thompson, 1997). The peralkaline granite mainly intrudes a regionally extensive body of Silurian or Ordovician quartz monzonite, granite, and quartz diorite that makes up much of the southeast tip of Prince of Wales Island. The south and west sides of the peralkaline granite are in contact with a band up to about 3,000 feet wide of shale and argillite of the Silurian or Ordovician Descon Formation. The Bokan Mountain complex and surrounding Paleozoic rocks are cut by numerous pegmatite, andesite, dacite, and aplite dikes. The dikes are genetically related to the complex and commonly are associated with the uranium, thorium, and REE deposits. The deposits are marked by intense albitization, pervasive or fracture-controlled chloritization, calcite-fluorite replacement of aegirine, and hematitization. Three types of U-Th-REE deposits occur in the Bokan Mountain complex: 1) irregular cylindrical pipes; 2) steep, shear-zone-related pods or lenses ('veins'); and 3) quartz veins.

The Geoduck occurrences are related to a system of equigranular, fine- to medium-grained, andesite dikes that strike N40-50W for about 10,000 feet, west of the head of Kendrick Bay (MacKevett, 1963; Warner and Barker, 1989). The dikes have steep to vertical dips, cut Silurian or Ordovician quartz monzonite, granite, and quartz diorite, and typically have wall rocks marked by chlorite and epidote alteration. The ore mineralogy has not been worked out in detail but it is probably similar to that in the mineralized dikes at the Carol Ann/Dotson prospects (DE027), which may be extensions of the Geoduck dikes. In the northwest part of the Geoduck dike system, individual dikes average about 1.4 feet thick; in the southeast part, they

average about 0.8 foot thick. Many samples contain elevated values of beryllium, thorium, yttrium, REE, columbium, uranium, and zirconium.

In 2009, Ucore Uranium (2010) drilled two holes near the Geoduck prospect for rare-earth elements. The holes are along what they term the 'Geoduck trend' that is oriented northwest along the andesite dike. The analyses for the samples were reported as the light rare-earth-element oxides or LREO (lanthanum, cerium, praesodymium, neodymium, and samarium) and the heavy rare-earth-element oxides or HREO (europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, and yttrium); together they are termed the TREO, the total rare-earth-element oxides. The most notable intercept in the two holes was 0.4 meter with 3.4 percent TREO. The ratio of the the HREO to the TREO in the three best intercepts varied between 41.9 and 46.6 percent; in other words nearly half of the rare-earth elements in the samples are the heavy rare-earth elements.

Warner and Barker (1989) estimate that a 3,000-foot section of the most continuous and thickest dike, which averages 1.5 feet thick, has an indicated resource of 1,378, 000 short tons of rock that contains 278,000 pounds of beryllium, 752,000 pounds of thorium, 8,116,000 pounds of yttrium, 8,786,000 pounds of REE, 2,844,000 pounds of columbium, 358,000 pounds of U, and 12,953,000 pounds of zirconium (Warner and Barker, 1989). There is a inferred reserve in 95,28,000 short tons of rock of 1,906,000 pounds of beryllium, 3,525,000 pounds of thorium, 29,975,000 pounds of yttrium, 14,864,000 pounds of columbium, 1,944,000 pounds of uranium, and 55,262,000 pounds of zirconium.

Alteration:

The dikes are probably albitized and chloritized; the wall rocks are marked by chlorite and epidote alteration.

Age of mineralization:

Associated with dikes that are genetically related to the Jurassic, Bokan Mountain peralkaline granite stock.

Generic deposit model:

Deposit model:

U-Th-REE deposit in dikes associated with peralkaline granite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Only surface sampling by government geologists to 2008. In 2009, Ucore Uranium drilled two holes.

Production notes:

None.

Reserves:

Warner and Barker (1989) estimate that a 3,000-foot section of the most continuous and thickest dike, which averages 1.5 feet thick, has an indicated resource of 1,378, 000 short tons of rock that contains 278,000 pounds of beryllium, 752,000 pounds of thorium, 8,116,000 pounds of yttrium, 8,786,000 pounds of REE, 2,844,000 pounds of columbium, 358,000 pounds of U, and 12,953,000 pounds of zirconium (Warner and Barker, 1989). There is a inferred reserve in 95,28,000 short tons of rock of 1,906,000 pounds of beryllium, 3,525,000 pounds of thorium, 29,975,000 pounds of yttrium, 14,864,000 pounds of columbium, 1,944,000 pounds of uranium, and 55,262,000 pounds of zirconium.

Additional comments:

References:

Armstrong, R. L., 1985, Rb-Sr dating of the Bokan Mountain granite complex and its country rocks: Canadian Journal of Earth Sciences, v. 22, p. 1233-1236.

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Ucore Uranium, 2010, Bokan Mountain, Alaska: http://www.ucoreuranium.com/bokan.asp (as of February 22, 2010).

Warner, J. D., and Barker, J. C., 1989, Columbium- and rare-earth-element-bearing deposits at Bokan Mountain, southeast Alaska: U.S. Bureau of Mines Open-File Report 33-89, 196 p.

Primary Reference: Warner and Barker, 1989; Ucore Uranium, 2010

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Red Top

Site type: Mine

ARDF no.: DI002

Latitude: 59.2751 **Quadrangle:** DI B-7

Longitude: 158.5342

Location description and accuracy:

The Red Top Mine is near the top of the southeastern peak of Marsh Mountain; the mine is plotted on the USGS B-7, 1:63,360-scale topographic map. It is at an elevation of about 1,100 feet, about 3.1 miles east of the village of Aleknagik, and about 0.6 mile south-southwest of the center of section 27, T. 10 S., R. 54 W. The location is accurate.

Commodities:

Main: Hg

Other:

Ore minerals: Cinnabar

Gangue minerals: Calcite, dickite, dolomite, hematite, limonite, quartz

Geologic description:

Placer cinnabar was discovered in 1941 in Arcana Creek, which drains east from the center of Marsh Mountain; follow-up exploration the next year discovered the lode deposits of the Red Top Mine (Sainsbury and MacKevett, 1965). The U.S. Defense Minerals Exploration Administration funded 10,000 feet of surface dozer trenching in 1952 and about 560 feet of underground workings in an adit and drifts in 1955. Subsequently, a lower adit and drifts totaling about 920 feet of underground workings were driven by mining companies. There was considerable drilling underground in the workings of the lower adit in 1958. C.L. Sainsbury mapped the surface and underground workings in 1959 (Sainsbury and MacKevett, 1965). Twenty-two flasks of mercury were produced from ore mined in the trenches and a total of 60 flasks of mercury were recovered by 1959. In 1959, the stockpiled ore was estimated to contain at least another 60 flasks of recoverable mercury (Sainsbury and MacKevett, 1965). Although Pennington (1959) reported that exploration had found ore that contained an estimated 1,400 flasks of mercury, production from the Red Top mine probably totaled about 100 flasks of mercury to the mid-1960s.

In 1969, Clayton Rasmusson leased the property and brought in a 20-ton mill (D.J. Grybeck, unpublished field notes, 1970). A 'raise', actually an irregular stope, was driven at the end of the lower adit from one of the better zones of mineralization. About 100 tons of ore was stockpiled that Rasmusson estimated to contain about one-half percent mercury. Some of the ore was concentrated at the mill and 3 flasks of mercury were retorted from it in Anchorage. Rasmussen estimated that the total production to 1970 was about 120 flasks of mercury. Apparently, there has been little work since 1971.

The host rocks for the Red Top cinnabar deposit are interbedded, very fine- to very coarse-grained graywacke, calcareous graywacke, and siltstone. Wilson and others (2006) include them in their 'Graywacke of Kululak Bay' unit of Middle and Upper Jurassic age. Individual beds vary from a few inches to several feet or more in thickness. The beds generally strike east to northeast and the rocks near the mine are broadly folded into a south-plunging syncline.

The principal controls on cinnabar mineralization are faults and breccia zones in massive graywacke. Faults in siltstone tend to be gouge-filled and tight; they commonly are not hosts for cinnabar deposits. The principal fault in the Red Top Mine strikes west to northwest and dips 45 to 80 degrees south. This arcuate reverse fault has had consistent right-lateral oblique slip, including some displacements that postdate

mineralization. It has been traced for a distance of about 1,250 feet at the surface and for 400 feet in the subsurface. Smaller subparallel faults and splays, generally striking west-northwest and dipping 40 to 50 degrees south, have been mapped in the subsurface, particularly in the hanging wall of the main fault (Sainsbury and MacKevett, 1965).

Cinnabar, the only sulfide mineral identified in the Red Top Mine, occurs in discrete small veins up to 4 inches thick that have been traced laterally up to 200 feet but are commonly only a few tens of feet long. Cinnabar also occurs as disseminations in fractured graywacke and in the carbonate gangue that cements graywacke breccia; as replacements of graywacke fragments and dolomite in breccia; and as breccia fragments in or along massive carbonate pods. Dolomite or ankeritic dolomite and later calcite are the most common gangue minerals. The carbonate minerals occur as discontinuous pods and lenses along the faults and as cement in breccia. Other gangue minerals include hematite, limonite, scarce quartz, and fairly common dickite (Sainsbury and MacKevett, 1965). The grade of mineralization varies greatly. Production has been from selected high-grade material. A sample of muck from a lower adit drift assayed 0.59 percent Hg, and a large grab sample from the lower adit dump assayed 1.09 percent Hg (Sainsbury and MacKevett, 1965). Two cinnabar-rich samples from the Red Top Mine contained less than 10 parts per billion gold Au and 150 and 7,000 parts per million antimony (Hawley and others, 1969).

Surface sampling of soils and nearby stream sediments suggests that the area surrounding the Red Top Mine on Marsh Mountain may contain other occurrences of mercury mineralization (Eakins, 1968). Cinnabar reported from Wood River gravels in the vicinity could have been derived from the Red Top deposit (Malone, 1962).

Alteration:

Hematite and limonite, closely associated with cinnabar and dickite, line the walls of some veins.

Age of mineralization:

Late Cretaceous or Tertiary. The Red Top deposit postdates regional deformation of the host Jurassic (?) sedimentary rocks and is probably similar in age to other mercury deposits of southwest Alaska that postdate regional deformation of Cretaceous sedimentary rocks.

Generic deposit model:

Deposit model:

Cinnabar vein and breccia deposits (Cox and Singer, 1986; model 27b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

27b

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

Placer cinnabar was discovered in 1941 in Arcana Creek, which drains eastward from the center of Marsh Mountain. Follow-up exploration the next year discovered the lode deposits that became the Red Top Mine (Sainsbury and MacKevett, 1965). The U.S. Defense Minerals Exploration Administration funded 10,000 feet of surface dozer trenching in 1952 and the driving of a upper adit and drifts totaling 560 feet of underground workings in 1955. Subsequently, a lower adit and drifts totaling about 920 feet of underground workings was driven by mining companies. Exploration drilling was completed from the lower adit workings in 1958. C. L. Sainsbury mapped the surface and underground workings in 1959 (Sainsbury and MacKevett, 1965).

In 1969, Clayton Rasmusson leased the property, revitalized the camp, and brought in a 20-ton mill (D.J. Grybeck, unpublished field notes, 1970). A 'raise', actually a irregular stope, was driven at the end of the lower adit from one of the better zones of mineralization. About 100 tons of ore was stockpiled that Rasmusson estimated to contain about 1/2-percent mercury. Some of the ore was concentrated at the mill

and 3 flasks of mercury were retorted from it in Anchorage.

Production notes:

Surface trenching exposed ore from which 22 flasks of mercury were recovered and a total of 60 flasks of mercury were recovered from surface and underground workings by 1959. In 1959, the stockpiled ore was estimated to contain at least another 60 flasks of mercury (Sainsbury and MacKevett, 1965). Although Pennington (1959) reported that exploration had found ore that contained an estimated 1,400 flasks of mercury. Clay Rasmussen (personal communication, 1970) estimated that the total production to 1970 was about 120 flasks of mercury. Apparently, there has been no production since 1971.

Reserves:

Pennington (1959) suggested that the Red Top Mine contained 1,4000 flasks of mercury. Three flasks were produced in the early 1970's but there has been no production since 1971.

Additional comments:

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Dillingham, Sleetmute, and Taylor Mountains quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-606, 92 p.

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Wilson, F.H., Mohadjer, Solmaz, Labay, K.A., and Shew, Nora, 2006, Digital data for the reconnaissance bedrock geologic map for the northern Alaska Peninsula area, Southwest Alaska: U.S. Geological Survey Open-File Report 2006-1303.

Primary Reference: Sainsbury and MacKevett, 1965; this record

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Humble; Kemuk

Site type: Prospect

ARDF no.: DI003

Latitude: 59.7203 **Quadrangle:** DI C-5

Longitude: 157.67

Location description and accuracy:

The Humble prospect is 12 miles east-northeast of the summit of Kemuk Mountain. The prospect is centered near the southwest corner of section 20, T. 5 S., R. 49 W. It is in an area of extensive surficial deposits with few conspicuous topographic features and little outcrop. The location is accurate to within 1 mile.

Commodities:

Main: Cu, Fe

Other: Ti, platinum-group metals?

Ore minerals: Titaniferous magnetite

Gangue minerals:

Geologic description:

The Humble prospect is above a pronounced 4-mile-square magnetic anomaly identified in an aeromagnetic survey flown for Humble Oil and Refining Company in 1959 (Berg and Cobb, 1967). The anomaly reflects a large composite mafic and ultramafic body beneath 90 to 140 feet of unconsolidated Quaternary deposits. The pluton was explored by 16 diamond drill holes as the Kemuk prospect, some holes down to a depth of almost 2,000 feet. It is a composite, tabular, southeast-dipping body of clinopyroxenite with some olivine-bearing and hornblende-bearing rocks ((Nokleberg and others, 1987; T. Hinderman, personal communication, 2000). The country rocks cut by the drilling are hornfels and quartzite. The body contains much titaniferous magnetite that probably occurs as segregations and disseminations in the clinopyroxenite. The body was estimated to have a resource of 2.4 billion long tons that average 15 to 17 percent total iron (Nokleberg and others, 1987). A beneficiation test indicates the feasibility of producing a concentrate containing 65 percent Fe, 2 to 3 percent SiO2, 0.005 to 0.016 percent P2O5, and 2 to 3 percent TiO2.

In 2010, Millrock Resources staked a large block of claims over the body, calling it the Humble prospect. Millrock with funding provided by Kinross Gold Corp., began drilling in August of 2011 (Millrock, 2012). The drilling was begun to test the idea that the body was similar to the gabbro body (IL005) peripheral to the large Pebble copper-gold porphyry deposit (IL007) which features similar geochemistry and geophysical characteristics. In September, 2011, Millrock reported that the drilling was not going well (Millrock Resources Inc., 2011).

Alteration:

Age of mineralization:

The age of the body is not known. The age of the country rocks is uncertain; from regional trends, they could be clastic sedimentary rocks of either Jurassic or Cretaceous age (Decker and others, 1994).

Generic deposit model:

Deposit model:

Titaniferous magnetite in clinopyroxenite; Alaska PGE? (Cox and Singer, 1986; model 9?); Porphyry Cu-Au-(Mo) (Cox and Singer, 1986; model 20c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

9?, 20c

Production Status: None

Site Status: Active

Workings/exploration:

The Humble prospect is above a pronounced 4-mile-square magnetic anomaly identified in an aeromagnetic survey flown for Humble Oil and Refining Company in 1959 (Berg and Cobb, 1967). The anomaly reflects a large composite mafic and ultramafic body beneath 90 to 140 feet of unconsolidated Quaternary deposits. The pluton was explored by 16 diamond drill holes as the Kemuk prospect, some drilled to a depth of almost 2,000 feet. In 2010, Millrock Resources staked a large block of claims over the body, calling it the Humble prospect. Millrock with funding provided by Kinross Gold Corp., began drilling in August of 2011(Millrock, 2012). In September, 2011, Millrock reported that the drilling was not going well (Millrock Resources Inc., 2011).

Production notes:

None.

Reserves:

The prospect was estimated to have a resource of 2.4 billion long tons that average 15 to 17 percent total iron in titaniferous magnetite (Nokleberg and others, 1987). A beneficiation test indicates the feasibility of producing a concentrate containing 65 percent Fe, 2 to 3 percent SiO2, 0.005 to 0.016 percent P2O5, and 2 to 3 percent TiO2.

Additional comments:

References:

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

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Survey Bulletin 1786, 104 p., 2 plates, scale 1:5,000,000.

Primary Reference: Nokleberg and others, 1987; Millrock, 2012

Reporter(s): Travis L. Hudson; D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): D Block

Site type: Prospect

ARDF no.: DI011

Latitude: 59.6929 **Quadrangle:** DI C-3

Longitude: 156.8455

Location description and accuracy:

This prospect is within a block of 88 State of Alaska mining claims on the east side of the lower Mulchatna River about 10 miles northeast of its mouth. The center of the block is near the northeast corner of section 1, T. 9 S., R. 44 W., of the Seward Meridian.

Commodities:

Main: Cu?

Other: Au?

Ore minerals:

Gangue minerals:

Geologic description:

The D Block claims were originally staked by Rio Algom in 2000 on overlapping aeromagnetic and IP anomalies. The prospect is in an area of extensive alluvial deposits and bedrock is not exposed. Two drill holes were attempted in 2003 by the TNR Gold Corporation (Chapman, 2004). IL-D-01 reached a total depth of 129.3 meters (424 feet) in unconsolidated deposits and did not reach bedrock. Il-D-02 was inclined 80 degrees southeast from a location 1.5 km northwest of IL-D-01. This hole also did not reach bedrock after passing through 104.9 meters (344 feet) of unconsolidated deposits. The unconsolidated deposits in these two holes were mostly silt, and fine sand, with minor fine gravel. This prospect essentially remains a geophysical anomaly. Drilling equipment has been moved to the prospect as of April 27, 2006 and the plan is to drill at least 250-meter holes to test the geophysical anomaly (TNR Gold Corporation, 2006).

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Porphyry Cu-Au? (Cox and Singer, 1986, model 20c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c?

Production Status: None

Site Status: Active

Workings/exploration:

The D Block prospect was discovered as a result of regional geophysical surveys in a search for Pebble-like (ARDF DI007) porphyry copper-gold deposits. Rio Algom contracted a 7,468-kilometer-long (4,640 mile) aeromagnetic survey; the flight line spacing was 1,600 meters and the survey was flown at an altitude of 300 meters. This survey was followed up by IP surveys over 7 anomalies identified by the aeromagnetic survey. Two of these anomalies, D Block and H Block (DI012) were subsequently staked. BHP-Billiton Minerals International controlled these prospects when they were optioned to TNR Gold Corp. in 2002. TNR Gold Corp. in turn optioned the D Block to Geocom Resources Inc. in 2003. Geocom completed two diamond drill holes (Il-D-01 and IL-D-02) on the D Block prospect in August and September 2003. Drilling equipment has been moved to the prospect as of April 27, 2006 and the plan is to drill at least 250-meter holes to test the geophysical anomaly (TNR Gold Corporation, 2006).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Chapman, J., 2004, Geological summary report on the Iliamna project, Iliamna Lake region, southwest Alaska: Private report for TNR Gold Corp., 12 p. 2 appendices (available online at www.tnrgoldcorp.com as of 10/2005).

Primary Reference: Chapman, 2004

Reporter(s): Travis L. Hudson (Applied Geology, Inc.)

Last report date: 2005-10-10

Site name(s): H Block

Site type: Prospect

ARDF no.: DI012

Latitude: 59.3898 **Quadrangle:** DI B-2

Longitude: 156.6868

Location description and accuracy:

The H Block prospect consists of 149 State of Alaska mining claims approximately centered at the northeast corner of section 22, T. 9 S., R. 44 W., of the Seward Meridian, i.e., at about the center of the township. The center of these claims is about 5.3 miles west of triangulation station Yellow Hill 2, which is about 22 miles north-northeast of the village of Lovelock.

Commodities:

Main: Cu

Other: Au

Ore minerals: Chalcopyrite, pyrite, pyrrhotite

Gangue minerals: Biotite, carbonate, chlorite, potassium feldspar, quartz, sericite

Geologic description:

The H Block prospect is in an area of extensive glacial outwash about 8 km west of a terminal moraine complex associated with the west end of Iliamna Lake. Because bedrock is not exposed, the geology of the prospect is only known from two diamond drill holes by TNR Gold Corporation (Chapman, 2004).

Il-H-01 is a vertical drill hole drilled in the center of a positive magnetic anomaly. It went through 67.1 meters (220 feet) of sand, silt, and fine gravel deposits to bedrock. Bedrock is a metasedimentary and metavolcanic (?) sequence that extended to the bottom of the hole at a depth of 208.8 meters (685 feet). The entire bedrock sequence was variably altered and mineralized. Petrographic descriptions (Chapman, 2004, Appendix B) indicate that at least some of these rocks are hornfels and calc-silicate rocks containing biotite-amphibole-plagioclase, plagioclase-clinopyroxene-quartz-sphene, and plagioclase-biotite-orthopyroxene assemblages. These rocks may be altered volcanic rocks and/or skarn. Granitic dikes were also encountered. The alteration varies from weak sericite, carbonate, and chlorite alteration to strong biotite veining and replacement. Secondary potassium feldspar was identified in and adjacent to some veins and fractures. Chalcopyrite, pyrite, and pyrrhotite occur both as disseminations and in veins and fractures but the veining is generally weakly developed. The sulfide-bearing veins commonly include quartz +/- carbonate. Some fractures contain sulfide linings and lack gangue minerals.

Drill hole Il-H-02 was located about 1 km west of Il-H-01 and inclined -70 degrees east. It targeted an IP anomaly on the flank of a positive magnetic anomaly. It intersected 85.4 meters (280 feet) of sand, silt, and fine gravel overlying medium- to coarse-grained granodiorite. This hole terminated in a fine- to medium-grained granitic intrusive (dike?) at a depth of 254.6 m (835 feet). The granodiorite varies from unaltered to extensively altered with chlorite, carbonate, and sericite replacement, local silicification, and secondary potassium feldspar and biotite adjacent to fractures. Sulfides in IL-H-02 are disseminated and fracture-controlled chalcopyrite, pyrite, and pyrrhotite similar in occurrence to that in IL-H-01.

Assay results are fairly consistent over long intervals in these holes (Chapman, 2004). In Il-H-01, 141.8 meters (465 feet) contained 0.0195 gram of gold per ton and 231 parts per million (ppm) copper. The bottom 73 m (240 feet) contained 0.02 gram of gold per ton and 244 ppm copper. The best assays were 0.068 gram of gold per ton and 601 ppm copper over 1.5 meter (5 feet) and 0.044 gram of gold per ton and 709 ppm copper over 3 meters (10 feet). In Il-H-02, the entire 168.6 meters (553 feet) of bedrock averaged

0.0484 gram of gold per ton and 212 ppm copper. The high values included 3 meters (10 feet) of 0.0535 gram of gold per ton and 235 ppm copper and 1.5 meter (5 feet) of 0.037 gram of gold per ton and 1,125 ppm copper.

The initial exploration shows that a porphyry copper-gold system is present at the H Block prospect. This system is buried by 200 feet or more of glacial outwash deposits where it has been drilled.

Alteration:

The granodiorite varies from unaltered to extensively altered, with chlorite, carbonate, and sericite replacement, local silicification, and secondary K-feldspar and biotite adjacent to fractures.

Age of mineralization:

The age of this mineralization is assumed to be Late Cretaceous or early Tertiary based on the general age of intermediate intrusive rocks north of the prospect (Wilson and others, 2003). The similar (?) Pebble porphyry copper-gold deposit (ARDF IL007) nearby has been dated at 89.7 Ma.

Generic deposit model:

Deposit model:

Porphyry Cu-Au (Cox and Singer, 1986, model 20c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c

Production Status: None

Site Status: Active

Workings/exploration:

The H Block prospect was discovered as a result of regional geophysical surveys meant to locate Pebble-like (ARDF IL007) porphyry copper-gold deposits. In 2000, Rio Algom contracted a 7,468-kilometer-long (4,640 miles) aeromagnetic survey; the flight line spacing was 1,600 meters and it was flown at an altitude of 300 meters. This survey was followed up by ground IP surveys over 7 anomalies identified by the aeromagnetic survey. Two of these anomalies, H Block and D Block (DI011) were subsequently staked. BHP-Billiton Minerals International controlled these prospects when they were optioned to TNR Gold Corp. in 2002. TNR Gold Corp. in turn optioned the H Block to Geocom Resources Inc. in 2003. Geocom completed two diamond drill holes (Il-H-01 and IL-H-02) on the H Block prospect in August and September 2003. In late summer 2004, Geocom completed a 47 kilometer (28 miles) three-dimensional induced polarization-resistivity survey in the area of IL-H-01 and IL-H-02 in the H Block prospect. This survey identified several anomalies, some of which were tested in the fall of 2004 by five more drill holes (http://www.tnrgoldcorp.com/news/tnr_050605.asp; May 6, 2005). One of these holes, IL-H-06 encountered drilling problems and did not reach bedrock.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Chapman, J., 2004, Geological summary report on the Iliamna project, Iliamna Lake region, southwest Alaska: Private report for TNR Gold Corp. 12 p. 2 appendices (available online at www.tnrgoldcorp.com as

of 10/2006).

Wilson, F. H., and 7 others, 2003, Preliminary geologic map of the northeast Dillingham quadrangle (D-1, D-2, C-1, and C-2 quadrangles), Alaska: U. S. Geological Survey Open-File Report 03-105, 13 p. scale 1:63,360.

Primary Reference: Chapman, 2004

Reporter(s): Travis L. Hudson (Applied Geology, Inc.)

Last report date: 2005-10-11

Site name(s): Unnamed (near tributary to Arcana Creek)

Site type: Mine

ARDF no.: DI013

Latitude: 59.28 **Quadrangle:** DI B-7

Longitude: 158.535

Location description and accuracy:

This placer mine is near the mouth of an unnamed tributary to Arcana Creek in the central part of Marsh Mountain. This is the small creek that drains north from the Red Top Mine (DI002) for about 0.4 mile. The placer mine is about about 0.3 mile west of the center of section 27, T. 10 S., R. 55 W., of the Seward Meridian.

Commodities:

Main: Hg

Other:

Ore minerals: Cinnabar

Gangue minerals:

Geologic description:

Placer cinnabar has been known on Arcana Creek since 1941, when the cinnabar was traced upstream to discover the Red Top Mine (DI002) ((Sainsbury and MacKevett, 1965). Apparently, however, no placer mining took place on Arcana Creek or its tributaries until 1969, when Clarence Wren of Dillingham operated a small placer mine about 0.4 mile north of the Red Top Mine on the creek that extends north from the mine (Clarence Wren, personal communication, 1970; D.J. Grybeck, unpublished field notes, 1970). Panned samples from the lower part of the creek were often exceptionally rich in cinnabar with nuggets up to 1/2 inch in size; pans in the upper part of the creek where it flowed on bedrock had only small amounts of cinnabar. In 1969, Wren mined with with indifferent results using a front-end loader, D6 tractor, and a sluice box. He attributed the results to inexperience and inappropriate recovery methods. About 5 gallons of cinnabar concentrate was produced. Apparently, there has been no mining since. The source of the cinnabar is almost certainly the Red Top deposit at the head of this creek.

The rocks in the area consist of interbedded, very fine- to very coarse-grained graywacke, calcareous graywacke, and siltstone. Wilson and others (2006) include them in their 'Graywacke of Kululak Bay' unit of Middle and Upper Jurassic age.

Alteration:

Age of mineralization:

Placer in Quaternary gravel.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer cinnabar.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

Some placer mining in 1969 with a front-end loader, D6 tractor, and a sluice box.

Production notes:

About 5 gallons of cinnabar concentrates was produced in 1969.

Reserves:

None.

Additional comments:

References:

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Wilson, F.H., Blodgett, R.B., Blome, C.D., Mohadjer, Solmaz, Preller, C.C., Klimasauskas, E.P., Gamble, B.M., and Coonrad, W.L., 2006, Reconnaissance bedrock geologic map for the northern Alaska Peninsula area, southwest Alaska: U.S. Geological Survey Open-File Report 2006-1303, 72 p., 2 sheets, scale 1:350,000.

Primary Reference: This record

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Monk's Hood

Site type: Mine

ARDF no.: DI014

Latitude: 59.2814 **Quadrangle:** DI B-7

Longitude: 158.5427

Location description and accuracy:

The Monk's Hood Mine is about in the middle of the Marsh Mountain area, about 0.3 mile east of the center of section 28, T. 10 S., R. 55 W., of the Seward Meridian and about 0.6 mile northwest of the Red Top Mine (DI002). The location is accurate.

Commodities:

Main: Hg

Other:

Ore minerals:

Gangue minerals: Calcite, dolomite

Geologic description:

In 1969, William Carlson and Edward Gentzwill as the Arcana Creek Mining Company, began prospecting in the headwaters of Arcana Creek, northwest of the Red Top Mine (DI002). They employed the classical methods of digging pits to bedrock along the creek and panning the samples (D.J. Grybeck, unpublished field notes, 1970, after discussions with Carlson and Gentzwill). They followed encouraging pans that contained cinnabar up the headwater tributary of Arcana Creek which flows eastward in the center of section 28, and then dug pits up to 8 feet deep up the hillside to the south, about 0.3 mile east of the center of the section. (They also prospected up the tributary that extends northwest in the NE 1/4 of section 28; there was little cinnabar in the pans for a short distance and then none at all.)

The rocks in the area are interbedded, very fine- to very coarse-grained graywacke, calcareous graywacke, and siltstone. Wilson and others (2006) include them in their 'Graywacke of Kululak Bay' unit of Middle and Upper Jurassic age.

The pits and hand trenching on the hillside uncovered two good shows of mineralization. The best is a 1/2- to 3-inch vein of carbonates with disseminated and massive cinnabar that extends for at least 100 feet; it strikes N 80 E and dips 70S. The other is along a gouge zone several inches thick that strikes N 70 E and dips 18S; at one place along it there was a disseminated-cinnabar-bearing carbonate lens about 8 feet long, 4 feet deep, and about 18 inches thick. In 1969, about 700 pounds of ore was hand mined from these showings and a flask of mercury was retorted from it. Some trenching with a tractor was attempted in 1969 but the hillside has discontinuous permafrost and the trenching generally did not reach bedrock. It is unclear whether there was work after 1970 but Carlson and Gentzwill found considerable mineralized float above and below the pits that exposed the mineralization. The mineralization is similar to that at the nearby Red Top Mine (DI002).

Alteration:

Not specifically noted but probably similar to that at the better-known, nearby Red Top Mine (DI002).

Age of mineralization:

Jurassic or younger based on the age of the host rocks; probably Cretaceous or Tertiary by analogy with other mercury deposits in southwestern Alaska.

Generic deposit model:

Deposit model:

Cinnabar veins (Cox and Singer, 1986; model 27b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

27b

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

In 1969, William Carlson and Edward Gentzwill as the Arcana Creek Mining Company, began prospecting in the headwaters of Arcana Creek, northwest of the Red Top Mine (DI002). They employed the classical methods of digging pits to bedrock along the creek and panning the samples (D.J. Grybeck, unpublished field notes, 1970, after discussions with Carlson and Gentzwill). They followed encouraging pans that contained cinnabar up the headwater tributary of Arcana Creek which flows eastward in the center of section 28, and then dug pits up to 8 feet deep up the hillside to the south, about 0.3 mile east of the center of the section. (They also prospected up the tributary that extends northwest in the NE 1/4 of section 28; there was little cinnabar in the pans for a short distance and then none at all.) Some trenching with a tractor was attempted in 1969 but the hillside has discontinuous permafrost and the trenching generally did not reach bedrock. It is unclear whether there was work after 1970.

Production notes:

One flask of mercury was retorted from 700 pounds of ore mined by hand from surface pits.

Reserves:

Probably none.

Additional comments:

References:

Wilson, F.H., Blodgett, R.B., Blome, C.D., Mohadjer, Solmaz, Preller, C.C., Klimasauskas, E.P., Gamble, B.M., and Coonrad, W.L., 2006, Reconnaissance bedrock geologic map for the northern Alaska Peninsula area, southwest Alaska: U.S. Geological Survey Open-File Report 2006-1303, 72 p., 2 sheets, scale 1:350,000.

Primary Reference: This record

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Red Dog; Qanaiyaq; Hilltop; Aqqaluk; Paalaaq

Site type: Mine

ARDF no.: DL001

Latitude: 68.0704 **Quadrangle:** DL A-2

Longitude: 162.8379

Location description and accuracy:

This record describes the main Red Dog deposit mined since 1989, and the nearby Qanaiyak (Hilltop), Aqqaluk, and Paalaaq deposits that are part of the Red Dog mine. The map site is at the open pit of the main deposit, 2 miles northwest of Deadlock Mountain in section 20, T. 31 N., R. 18 W., of the Kateel Meridian. The Qanaiyak (Hilltop) deposit is one mile south of the main deposit; Aqqaluk is 1,500 feet north of the Main deposit, across Red Dog Creek, and Paalaaq is just east-northeast of Aqqaluk. The location is accurate to within 500 feet.

Commodities:

Main: Ag, Pb, Zn

Other: As, Ba, Cu, Sb

Ore minerals: Barite, bornite, boulangerite, chalcopyrite, covellite, galena, marcasite, polybasite, pyrite, pyrrhotite, sphalerite, tetrahedrite

Gangue minerals: Quartz

Geologic description:

The DeLong Mountains are characterized by stacked and folded, thrust allochthons (Ellersieck and others, 1990; Kelley and Jennings, 2004; [Supplemental map]). The structurally lower allochthons are composed of Devonian through Cretaceous clastic and chemical sedimentary rocks. The two uppermost allochthons contain Jurassic or older mafic and ultramafic igneous sequences. Minor igneous rocks of basic composition are exposed 0.6 mile northeast of Red Dog (Kulas, 1992).

The Red Dog deposit is a shale-hosted, sedimentary exhalite deposit (SEDEX) deposit (Kelley and Jennings, 2004). The deposit is in multiple, superimposed thrust fault slices of stratabound, massive sulfides and barren mudstones. The host rock is black, siliceous shale and chert of the Ikalukrok unit of the Mississippian to Pennsylvanian Kuna Formation (Dumoulin and others, 2004). The Kivalina unit, an interbedded calcarenite and calcareous shale, is the footwall of the deposit. Mineralization is syngenetic with respect to sediment deposition. Silicification occurs within and peripheral to the main mass of sulfides. A barite facies is concentrated toward the top and periphery of the deposit. Major sulfides in decreasing order of abundance are sphalerite, pyrite, marcasite, and galena. Rare disseminated chalcopyrite and pyrrhotite occur in the sphalerite. The ore textures are massive, fragmental, chaotic, and veined; they rarely show typical sedimentary layering (Kelley, Leach, and others, 2004). The upper portion of the ore body is oxidized. The deposit is weakly enriched upward in lead relative to zinc.

The Main deposit consists of two major mineralized thrust fault slices and one lesser mineralized fault slice. It extends 1,600 meters in a northwest direction and varies in width from 150 to 975 meters. High-grade portions of the deposit are up to 135 meters thick. The base of the Main deposit is a tectonic melange zone which separates it from the Cretaceous Okpikruak Formation.

The Qanaiyaq (the old Hilltop) ore body is a horizontal klippe of the same ore body as the Main deposit (Moore and others, 1986). The mineralized zone is 490 meters long by 245 meters wide and the exhalite package is less than 100 meters thick. The mineral assemblage is similar to that at the Main deposit except that it locally contains significant amounts of chalcopyrite, covellite, and bornite. The deposit contains 0.3

percent copper with gold values of about 1 gram per tonne. The presence of copper and gold may indicate that this deposit formed near a vent (Kulas, 1992).

The Aqqaluk ore body was discovered north of the main deposit across Red Dog Creek during a drilling program in 1995. The ore is similar to that at the Main deposit. Sphalerite and galena occur in silica rock, barite and shale. Sulfides are disseminated, semi-massive to massive, and rarely laminated. Late crosscutting sulfide veins and stringers occur in the host shale and occasionally in the exhalites.

The Paalaaq ore body is the newest and deepest exploration target in the Red Dog complex.

Kelley, Leach and others (2004) suggest that the mineralization took place by: 1) deposition of early brown sphalerite with abundant barite, minor pyrite, and trace galena immediately beneath the sea floor in unconsolidated mud; 2) deposition of yellow-brown sphalerite during subsea-floor hydrothermal recrystallization and coarsening of preexisting barite; 3) open-space deposition of barite, red-brown sphalerite and other sulfides in veins, and coeval replacement of barite; and 4) post-ore sulfide deposition, including the formation of late tan sphalerite breccias. Sedimentological, faunal, and geochemical data indicate that the Kuna Formation formed in slope and basin settings characterized by anoxic or dyosoxic bottom water (Dumoulin and others, 2004). The mineralization has been dated at 338 Ma by Re-Os methods but has been subject to later thermal overprinting during episodes of the Brooks Range orogeny (Romback and Layer, 2004).

Mineralization at Red Dog was first reported in 1968 by the U.S. Geological Survey (Tailleur, 1970). In 1975, the U.S. Bureau of Mines conducted a mineral examination of the Red Dog site. Active exploration of the site and adjacent area began in 1975 and the first claims were staked in 1978. In 1980, Cominco Alaska drilled 9 holes that totaled 915 meters; extensive surface mapping, sampling, and geochemical and geophysical surveys followed through the the 1980s. Mining began in 1989 from an open pit that is still in operation in early 2011. However, the main ore body of the Red Dog mine will be exhausted within a few years and mining has shifted to the Aqqaluk ore body where mining began in 2011 (Nana Regional Corp, 2011). The mine was developed under an innovative operating agreement between the NANA Regional Corporation, owned by the Inupiat people of Northwest Alaska, and Teck Alaska Incorporated, a U.S. subsidiary of Teck Resources Limited (Nana Regional Corp., 2011).

The mine has been in operation continually since 1989 and from 1999 to 2009 it has produced from about 3.2 to 3.7 tons of ore a year. The production in 2009 was 3.729 million tons of ore that recovered 642,096 tons of zinc, 144,954 tons of lead, and 8.12 million ounces of silver (Szumigala and others, 2010).

As of December, 2009, the Red Dog mine has: 1) 10.14 million tons of proven reserves with a grade of 20.0 percent zinc and 5.4 percent lead; 2) 57.52 tons of probable reserves with a grade of 16.6 percent zinc and 4.4 percent lead; 3) 6.50 million tons of indicated resources with a grade of 20.0 percent zinc and 6.6 per lead; and 4) 34.16 million tons of inferred resources with a grade of 11.0 percent zinc and 4.0 percent lead (Szumigala and others, 2010). The 2009 probable reserves are almost entirely in the Aqqaluk ore body whose 2011 reserves are 51.6 million tons with a grade of 16.7 percent zinc, and 4.4 percent lead (Nana Regional Corp., 2011). This Aqqaluk ore is thought to prolong the life of the mine to 2031. Red Dog indicated mineral resources as of December 31, 2006 for the Aqqaluk deposit are 3.0 million tonnes at 11.2 percent zinc, 4.0 percent lead, and 85 grams of silver per tonne and for the Qanaiyaq deposit indicated resources are 4.7 million tonnes at 23.7 percent zinc, 6.2 percent lead, and 127 grams of silver per tonne (Cinits and others, 2007).

Mining began in 1989 from an open pit called Red Dog Main pit; this was in operation until the first quarter of 2012, when it was exhausted. All future ore will come from the Aqqaluk deposit (Teck, 2014a). The mine life of the Aqqaluk deposit is expected to go through 2031. The Qanaiyaq deposit is higher grade than Aqqaluk and will supplement declining grades in later years from Aqqaluk with an expected mine life from 2016 to 2025 (Cinits and others, 2007).

In 2016, Teck Alaska Inc. mined the Aqqaluk deposit portion of their Red Dog deposit; zinc production increased to 583,000 tonnes compared with 567,000 tonnes in 2015, primarily due to increased mill throughput as softer ores were processed. The zinc grade was 17.1 percent, with an 82.8 percent recovery rate. Lead production in 2016 rose to 122,300 tonnes, compared to 117,600 tonnes in 2015, primarily due to higher mill throughput. The lead grade was 4.9 percent, with a 56.0 percent recovery rate. In 2016, Teck Alaska Inc. mined 13,704,000 tonnes of material and milled 4,250,000 tonnes of ore. In 2016, Teck began development of its Qanaiyaq deposit, a near-surface deposit located immediately south of the mined-out Red Dog Main pit. This high-grade deposit hosts 7.4 million tonnes of reserves averaging 24.7 percent Zn and 6.9 percent Pb; production at Qanaiyaq is scheduled to begin in early 2017 (Athey and Werdon, 2017).

Alteration:

Silicification of host mudstone (Kelley, Leach, and others, 2004).

Age of mineralization:

Mineralization is syngenetic to sediment deposition which has been dated to 338 Ma by Re-Os methods (Kelley, Leach, and others, 2004).

Generic deposit model:

Deposit model:

Sedimentary exhalative Zn-Pb (Cox and Singer, 1986; model 31a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

31a

Production Status: Yes; large

Site Status: Active

Workings/exploration:

Mineralization at Red Dog was first reported in 1968 by the U.S. Geological Survey (Tailleur,1970). In 1975, the U.S. Bureau of Mines conducted a mineral examination of the Red Dog site. Active exploration of the site and adjacent area began in 1975 and the first claims were staked in 1978. In 1980, Cominco Alaska drilled 9 holes that totaled 915 meters; extensive surface mapping, sampling, geochemical and geophysical surveys, and much additional drilling followed through the 1980s. Teck has been conducting ongoing exploration work, including geological mapping, geochemistry, geophysical surveys, and drilling, around the Red Dog Property except for a hiatus between 1990 and 1994. Various geophysical survey methods have been used including airborne electromagnetics (EM), induced polarization (IP), controlled source, audio-frequency magneto-tellurics (CSAMT), time-domain electromagnetics (TEM), University of Toronto electromagnetometer (UTEM), and gravity. The discovery of the Anarraaq deposit was attributed to the use of gravity (Cinits and others, 2007).

Mining began in 1989 from an open pit called Red Dog Main pit; this was in operation until the first quarter of 2012, when it was exhausted. All future ore will come from the Aqqaluk deposit (Teck, 2014a). The mine life of the Aqqaluk deposit is expected to go through 2031. The Qanaiyaq deposit is higher grade than Aqqaluk and will supplement declining grades in later years from Aqqaluk with an expected mine life from 2016 to 2025. Red Dog indicated mineral resources as of December 31, 2006 for the Aqqaluk deposit are 3.0 million tonnes at 11.2 percent zinc, 4.0 percent lead, and 85 grams of silver per tonne and for the Qanaiyaq deposit indicated resources are 4.7 million tonnes at 23.7 percent zinc, 6.2 percent lead, and 127 grams of silver per tonne (Cinits and others, 2007).

Teck Alaska Inc. continued to explore on their Noatak project near its' existing Red Dog mine in northwest Alaska in 2016. The project area includes the Anarraaq-Aktigiruq deposits, where Teck Alaska Inc. drilled a total of 29,800 feet (9,083m) (Athey and Werdon, 2017).

Production notes:

The mine was developed under an innovative operating agreement between the NANA Regional Corporation, owned by the Inupiat people of Northwest Alaska, and Teck Alaska Incorporated, a U.S. subsidiary of Teck Resources Limited (Nana Regional Corp., 2011). The mine has been in operation continually since 1989 and from 1999 to 2009, it has produced from about 3.2 to 3.7 million tons of ore a year. However, the main ore body of the Red Dog mine will be exhausted in a few years and mining has shifted to the Aqqaluk ore body, where mining began in 2011 (Nana Regional Corp., 2011). The production in 2009 was 3.729 million tons of ore that recovered 642,096 tons of zinc, 144,954 tons of lead, and 8.12 million ounces of silver (Szumigala and others, 2010).

The production in 2011 was 572,000 tonnes zinc concentrate (Teck, 2013). The production in 2012 was 529,000 tonnes zinc concentrate at 18.2 percent zinc and 96,700 tonnes lead concentrate at 3.9 percent lead.

The production in 2013 was 551,000 tonnes of zinc concentrate at 17.0 percent zinc and 95,400 tonnes lead concentrate at 4.6 percent lead (Teck, 2014b).

In 2016, Teck Alaska Inc. mined the Aqqaluk deposit portion of their Red Dog deposit; zinc production increased to 583,000 tonnes compared with 567,000 tonnes in 2015, primarily due to increased mill throughput as softer ores were processed. The zinc grade was 17.1 percent, with an 82.8 percent recovery rate. Lead production in 2016 rose to 122,300 tonnes, compared to 117,600 tonnes in 2015, primarily due to higher mill throughput. The lead grade was 4.9 percent, with a 56.0 percent recovery rate. In 2016, Teck Alaska Inc. mined 13,704,000 tonnes of material and milled 4,250,000 tonnes of ore. In 2016, Teck began development of its Qanaiyaq deposit, a near-surface deposit located immediately south of the mined-out Red Dog Main pit. This high-grade deposit hosts 7.4 million tonnes of reserves averaging 24.7 percent Zn and 6.9 percent Pb; production at Qanaiyaq is scheduled to begin in early 2017 (Athey and Werdon, 2017).

Reserves:

As of December, 2009, the Red Dog mine has 1) 10.14 million tons of proven reserves with a grade of 20.0 percent zinc and 5.4 percent lead; 2) 57.52 tons of probable reserves with a grade of 16.6 percent zinc and 4.4 percent lead; 3) 6.50 million tons of indicated resources with a grade of 20.0 percent zinc and 6.6 per lead; and 4) 34.16 million ton of inferred resources with a grade of 11.0 percent zinc and 4.0 percent lead (Szumigala and others, 2010). The 2009 probable reserves are almost entirely in the Aqqaluk ore body, whose 2011 reserves are 51.6 million tons with a grade of 16.7 percent zinc, and 4.4 percent lead (Nana Regional Corp., 2011). This Aqqaluk ore is thought to prolong the life of the mine to 2031.

In 2016, Teck Alaska Inc. began development of its Qanaiyaq deposit, a near-surface deposit located immediately south of the mined-out Red Dog Main pit. This high-grade deposit hosts 7.4 million tonnes of reserves averaging 24.7 percent Zn and 6.9 percent Pb; production at Qanaiyaq is scheduled to begin in early 2017. As of March 2016, total Red Dog proven and probable reserves are 56.6 million tonnes at 14.6 percent zinc and 4.1 percent Pb. Indicated resources include 200,000 tonnes at 11.5 percent zinc and 3.8 percent lead (Teck Alaska Inc., 2016).

Additional comments:

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Primary Reference: Kelley and Jennings, 2004

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Last report date: 2017-08-26

Site name(s): Lik; Sue

Site type: Prospect

ARDF no.: DL005

Latitude: 68.1664 **Quadrangle:** DL A-2

Longitude: 163.202

Location description and accuracy:

The Lik prospect is at an elevation of about 1,000 feet in the headwaters of east-flowing tributaries to Wulik River. The coordinates are at about the center of the prospect, near the southeast corner of section 15, T. 32 N., R. 20 W., of the Kateel River Meridian. The Sue deposit is the southern extension of the Lik deposit beyond the claims of the Zazu Metals Corporation, which was exploring the Lik deposit in early 2010. The accuracy is unknown.

Commodities:

Main: Ag, Pb, Zn

Other: Ba, Cd

Ore minerals: Boulangerite, bournonite, galena, marcasite, pyrite, sphalerite

Gangue minerals: Barite, calcite, dolomite, quartz

Geologic description:

In early 2010, the Lik deposit was on 296 unpatented federal mining claims, and the deposit was aggressively being explored by Zazu Metals Corporation (Zazu Metals Corporation, 2010; Gow and others, 2009; Britton, 2009; Scott and others, 2010). The Lik deposit was first staked in 1976 as a result of stream geochemical sampling by GCO and New Jersey Zinc Company. The deposit was drilled in 1977 by a joint venture of GCO, New Jersey Zinc, and WGM. HOMEX soon replaced New Jersey Zinc and by 1979, 103 holes had been drilled, many intersected lead-zinc mineralization. Noranda optioned the property in 1984, and in 1990 Moneta Porcupine Mines Inc. took control. By the end of 1992, 135 holes had been drilled that aggregated 26,237 meters. Zazu purchased their interest in the property in 2006 and drilled 69 holes in 2007 and 2008 that aggregated 8,223 meters (Gow and others, 2009; Scott and others, 2010).

The Lik deposit is in Kuna Formation of the Red Dog plate of the Endicott Mountain allochthon (Gow and others, 2009; Scott and others, 2010). Regionally, the Mississippian to Pennsylvanian Kuna Formation consists of at least 122 meters of thinly interbedded calcareous shale, calcareous spiculite, and bioclastic support stone, overlain by 30 to 240 meters of siliceous shale, mudstone, calcareous radiolarite, and calcareous turbidite. The Kuna Formation has two units, the Kivilina and the Ikalukrok which hosts the massive sulfide deposits in the area, including the Lik. At the Lik deposit, the Ikalukrok unit consists of carbonaceous and siliceous black shale with subordinate black chert and fine-grained limestone. These strata and their mineralized horizons generally strike north and dip 25 to 40 degrees west. The Lik mineralized horizon is overlain conformably by the Permian Siksikpuk Formation. The Lik mineralization is cut by numerous faults, notably the Main Break Fault that drops the northern end of the deposit down about 150 meters and separates the Lik South deposit from the Lik North deposit. The Lik South deposit is about 1,100 meters long and about 600 meters wide; the Lik North deposit is about 700 meters long and about 350 wide. The Lik deposit is open to the north and extends south beyond the Zazu claims to the Sue prospect, which is held by the Teck company that operates the nearby Red Dog mine (DL001).

The mineralization consists of irregular stratiform lenses of pyrite, marcasite, sphalerite, and galena with rare tetrahedrite, bournonite, and boulangerite. The mineralization was deposited in four distinct cycles that are better developed close to the hydrothermal sources of the mineralizing fluids. The thickest cycle is about

13.7 meters thick. Typically, the base of a cycle begins with the deposition of sphalerite, galena, and pyrite; the highest grades usually occur a few meters above the base of a cycle and the grade decreases upward. Locally, the mineralization is brecciated. The gangue consists of chert, clay minerals, carbonates, and barite.

Numerous high-grade intercepts of zinc-lead-silver mineralization were cut in many of the drill holes. As estimated by Gow and others (2009), Roscoe, and by Scott and others (2010), the mineral resources in Lik South consist of 18.74 million tonnes of 'Indicated Mineral Resources' with a grade of 8.08 percent zinc, 2.62 percent lead, and 52.8 grams of silver per tonne. There is an 'Inferred Mineral Resources' in Lik North of 1.23 million tonnes with a grade of 6.08 percent zinc, 2.12 percent lead, and 35 grams of silver per tonne; and' 'Inferred Mineral Resources' of 5.18 million tonnes with a grade of 9.65 percent zinc, 3.25 percent lead, and 51 grams of silver per tonne. An earlier 'reserve' estimate by Sterne and others (1984) was similar but did not meet modern standards of ore calculations, nor did it have the benefit of the more recent drilling.

Zazu completed a summer field program in 2011 including exploration, infill, and geotechnical drilling; metallurgy and associated environmental baseline, acid rock drainage, and infrastructure studies (Zazu Metals Corporation, 2011). The 2012 program focused on environmental baseline, acid rock drainage, and infrastructure studies, in addition to refined resource estimate, pit models, and metallurgical studies (Zazu Metals Corporation, 2012). In 2013, Zazu initiated the field portion of the acid rock drainage program, in addition to mine design, infrastructure, and metallurgical studies. The work completed by Zazu over these three years was compiled for a preliminary economic analysis (PEA), which was reported on April 23, 2014. Drilling completed in 2011 contributed to a new indicated mineral resource for Lik South of 16.85 million tonnes at 8.04 percent zinc, 2.70 percent lead, and 50.1 grams of silver per tonne. The PEA found that acid rock drainage and metal leaching related to waste rock and storage facilities are manageable and have no large environmental or permitting issues (Matter and others, 2014).

Alteration:

Host rocks are intensely silicified close to the sulfides (Gow and others, 2009).

Age of mineralization:

The mineralization is coeval with the deposition of the Mississippian host rocks (Gow and others, 2009; Scott and others, 2010).

Generic deposit model:

Deposit model:

Sedimentary exhalative Zn-Pb (Cox and Singer, 1986; model 31a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

31a

Production Status: None

Site Status: Active

Workings/exploration:

In early 2010, the Lik deposit was on 296 unpatented federal mining claims, and the deposit was being explored by Zazu Metals Corporation (Gow and others, 2009; Britton, 2009; Scott and others, 2010; Zazu Metals Corporation, 2010). The LIk deposit was first staked in 1976 as a result of stream geochemical sampling by GCO and New Jersey Zinc Company. The deposit was drilled in 1977 by a joint venture of GCO, New Jersey Zinc, and WGM. HOMEX soon replaced New Jersey Zinc and by 1979, 103 holes had been drilled on the deposit; many intersected lead-zinc mineralization. Noranda optioned the property in 1984, and in 1990 Moneta Porcupine Mines Inc. took control. By the end of 1992, 135 holes had been drilled that aggregated 26,236.6 meters. Zazu purchased their interest in the property in 2006 and drilled 69 holes in 2007 and 2008 that aggregated 8,223 meters (Gow and others, 2009; Scott and others, 2010).

Zazu completed a summer field program in 2011 including exploration, infill, and geotechnical drilling; metallurgy and associated environmental baseline, acid rock drainage, and infrastructure studies (Zazu

Metals Corporation, 2011). The 2012 program focused on environmental baseline, acid rock drainage, and infrastructure studies, in addition to refined resource estimate, pit models, and metallurgical studies (Zazu Metals Corporation, 2012). In 2013, Zazu initiated the field portion of the acid rock drainage program, in addition to mine design, infrastructure, and metallurgical studies. The work completed by Zazu over these three years was compiled for a preliminary economic analysis (PEA), which was reported on April 23, 2014. Drilling completed in 2011 contributed to a new indicated mineral resource for Lik South of 16.85 million tonnes at 8.04 percent zinc, 2.70 percent lead, and 50.1 grams of silver per tonne. The PEA found that acid rock drainage and metal leaching related to waste rock and storage facilities are manageable and have no large environmental or permitting issues (Matter and others, 2014).

Production notes:

None.

Reserves:

As estimated by Gow and others (2009), Roscoe, and by Scott and others (2010), the mineral resources in Lik South consist of 18.74 million tonnes of 'Indicated Mineral Resources' with a grade of 8.08 percent zinc, 2.62 percent lead, and 52.8 grams of silver per tonne. There is an 'Inferred Mineral Resources' in Lik North of 1.23 million tonnes with a grade of 6.08 percent zinc, 2.12 percent lead, and 35 grams of silver per tonne; and' 'Inferred Mineral Resources' of 5.18 million tonnes with a grade of 9.65 percent zinc, 3.25 percent lead, and 51 grams of silver per tonne. An earlier 'reserve' estimate by Sterne and others (1984) was similar but did not meet modern standards of ore calculations, nor did it have the benefit of the more recent drilling.

Drilling completed in 2011 by Zazu Metals Corporation contributed to a new indicated mineral resource published in a prelimary economic assessment report in 2014 for Lik South of 16.85 million tonnes at 8.04 percent zinc, 2.70 percent lead, and 50.1 grams of silver per tonne of potential open pit ore. The inferred mineral resource for open pit ore at Lik South is 0.74 million tonnes at 7.73 percent zinc, 1.94 percent lead, and 13.4 grams of silver per tonne. Indicated resources at Lik North are 0.44 million tonnes at 10.03 percent zinc, 2.77 percent lead, and 59.0 grams of silver per tonne and inferred resources are 2.87 million tonnes at 8.59 percent zinc, 2.68 percent lead, and 37.5 grams of silver per tonne (Matter and others, 2014).

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Primary Reference: Scott and others, 2010

Reporter(s): Anita Williams (Anchorage, AK); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-10

Site name(s): Anarraaq

Site type: Prospect

ARDF no.: DL016

Latitude: 68.155 **Quadrangle:** DL A-2

Longitude: 163.033

Location description and accuracy:

The Anarraaq prospect is about 9.6 miles northwest of Deadlock Mountain on a small tributary to the Wulik River. It is near the center of section 21, T. 32 N., R. 19 W., of the Kateel River Meridian. The location is accurate.

Commodities:

Main: Ag, barite, Pb, Zn

Other:

Ore minerals: Barite, galena, pyrite, pyrrhotite, sphalerite

Gangue minerals: Quartz

Geologic description:

The Anarraaq prospect was found in 1999 by Teck Cominco by drilling a gravity anomaly (Kelley, Dumoulin, and Jennings, 2004). In plan view the deposit is about 300 by 400 meters in area and consists of a flat-lying lens of massive and banded sulfides up to about 100 meters thick, that is overlain stratigraphically by a thick, continuous layer of barite.

The Anarraag deposit is in shale, mudstone, and carbonate of the Mississippian Ikalukrok unit of the Kuna Formation, which is overlain by the Pennsylvanian to Permian Siksikpuk Formation (Kelley and Jennings, 2004, supplemental map; Kelley, Dumoulin, and Jennings, 2004). The Ikalukrok unit varies greatly in thickness from about 135 to 350 meters.

The sulfide zone at Anarraaq varies in thickness from a few meters to more than 100 meters. There are three types of mineralization: 1) low grade zones (less than 8 percent zinc) with sphalerite, galena, and up to 60 percent pyrite and marcasite; 2) banded sulfides with laminated sphalerite, galena, pyrite, marcasite, and quartz; and 3) massive sphalerite, galena, pyrite, and marcasite in breccias, contorted bands, and veins. The barite layer above the massive and banded sulfides is 65 to 140 meters thick under the entire drilled area and from the top down consists of modular barite, massive banded barite, and calcareous barite. Carbonate replacement by sulfides and barite played a critical role in localizing them.

The Anarraaq deposit is estimated to have a resource of as much as 1 billion tonnes of barite and 18 million tonnes of sulfide ore with a grade of 18 percent zinc, 5.4 percent lead, and 85 grams of silver per tonne (Kelley, Dumoulin, and Jennings, 2004).

Alteration:

Carbonate replacement by sulfides and barite played a critical role in localizing them.

Age of mineralization:

Mississippian based on the age of the host rock.

Generic deposit model:

Deposit model:

Sedimentary exhalative Zn-Pb (Cox and Singer, 1986; model 31a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

31a

Production Status: None

Site Status: Active

Workings/exploration:

The Anarraaq prospect was found in 1999 by Teck Cominco by drilling a gravity anomaly (Kelley, Dumoulin, and Jennings, 2004). There are 14 holes in the ore body and numerous holes peripheral to it.

Production notes:

None.

Reserves:

The Anarraaq deposit is estimated to have a resource of as much as 1 billion tonnes of barite and 18 million tonnes of sulfide ore with a grade of 18 percent zinc, 5.4 percent lead, and 85 grams of silver per tonne.

Additional comments:

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Kelley, K.D., and Jennings, Scott, 2004, A special issue devoted to barite and Zn-Pb-Ag deposits in the Red Dog district, western Brooks Range, northern Alaska: Economic Geology, v. 99, p. 1267-1280.

Kelley, K.D., Dumoulin, J.A., and Jennings, Scott, 2004, The Anarraaq Zn-Pb-Ag and Barite Deposit, Northern Alaska: Evidence for Replacement of Carbonate by Barite and Sulfides: Economic Geology, v. 99, p. 1577-1591.

Primary Reference: Kelley, Dumoulin, and Jennings, 2004

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Lead Creek

Site type: Prospect

ARDF no.: EA057

Latitude: 58.96 **Quadrangle:** EA C-1

Longitude: 161.652

Location description and accuracy:

The Lead Creek prospect is located in the headwaters of Lead Creek, about 8 miles west-northwest of Liberty on the Taylor Highway. Lead Creek is not labeled on the U.S. Geological Survey topographic map of the Eagle C-1 quadrangle (1956). The coordinates are the approximate center of the 4-square-mile prospect area, located in the southwest corner of section 36, T. 4 S., R. 31 E., of the Fairbanks Meridian. The location is accurate. The hills around the head of Lead Creek (none named on the Eagle C-1 map) are, clockwise from west to east: Wizard Hill, Paradox Hill, Nodular Knob, Pebble Dike Hill, and Macarena Hill. Argent Creek is a small, west-flowing creek in the draw near the middle of section 5, T. 5 S., R. 32 E. between Pebble Dike Hill and Macarena Hill. The Lead Creek prospect is on Doyon, Ltd. selected or conveyed land.

Commodities:

Main: Ag, Pb, Zn

Other: As, Au, Bi, Cd, Cu, Hg, Sb

Ore minerals: Arsenopyrite?, chalcopyrite, galena, iron-oxide, manganese oxide, pyrite, sphalerite

Gangue minerals: Ankerite, dolomite, garnet, pyroxene, quartz, scorodite, siderite, wollastonite

Geologic description:

Rocks in the vicinity of the Lead Creek prospect include carbonaceous quartz-mica schist and phyllite; weakly metamorphosed silicified volcanic rocks, quartzite, marble, and metachert; unmetamorphosed limestone, sandstone, argillite, and tuff; slightly metamorphosed greenstone, basalt, and pillow basalt; and serpentinite (WGM Inc., 1998 [DLR 98-12]). The protolith ages for these rocks may be Triassic, Permian, or Mississippian and Devonian (Dusel-Bacon and others, 1998); they are tentatively correlated with Paleozoic rocks that host stratiform lead-zinc-silver deposits in the Yukon Territory. Granodiorite, diorite, and dacite intrusions of Tertiary to Mesozoic age also occur in the Lead Creek area.

The models proposed for the Lead Creek prospect include: lead-zinc stratiform massive sulfide (Schmidt, 1997); manto replacement silver-lead-zinc; breccia-hosted silver-lead-zinc; skarn-hosted lead-zinc-silver; pluton-hosted lead-zinc-copper-silver; or another type of deposit indicated by precious and base metals in siliceous nodules (WGM Inc., 1998 [DLR 98-12]). The prospect is defined by anomalous lead in soils over a 3-mile by 1.5-mile area. The mineralized system may be more extensive than indicated by soil sampling since favorable ore intervals pass under overlying units on the ridges (WGM Inc., 2000 [Champion property summary]).

Graphitic quartz-mica schist and phyllite crop out on top of Paradox Hill and Nodular Knob (WGM Inc., 1998 [DLR 98-12]). A strongly graphitic schist east of Nodular Knob contains siliceous nodules and iron(?) oxide-cemented concretions that are anomalous in precious and base metals. The graphitic schist and phyllite grade into, or are in fault contact with, underlying silicified volcanic rocks.

A steeply dipping, east-southeast-trending fault separates the silicified metavolcanic rocks on Nodular Knob from limestone on Pebble Dike Hill (WGM Inc., 1998 [DLR 98-12]). Sections of impure massive limestone were intersected in drill holes on the west side of Pebble Dike Hill. The limestone has been bleached, silicified, brecciated, and mineralized; it has a trace to greater than 20 percent combined pyrite,

galena, and sphalerite. A carbonaceous sequence of interlayered limestone, shale, argillite, siltstone, and sandstone underlies the massive limestones. Massive sulfides (50 percent or more galena, pyrite, and sphalerite) are present in strata-bound layers within the carbonaceous sedimentary rocks. Pillow basalts form prominent outcrops on the west side of Macarena Hill and are present northwest of Paradox Hill and in drill core.

Small granodiorite and quartz diorite bodies and numerous andesite, dacite, and feldspar porphyry dikes are scattered throughout the upper basin of Lead Creek (WGM Inc., 1998 [DLR 98-12]). Many of these intrusions are argillically altered, fractured, and sheared; the feldspar is altered to clays, and chlorite occurs along cleavage planes. Galena and sphalerite are sparsely disseminated in granodiorite in a drill hole on Wizard Hill. Fine-grained hornfels and skarn zones in limestone units contain garnet, wollastonite, and pyroxene. Skarns are generally small and spatially related to dikes and (or) sills. A 120-foot-thick intercept of hydrofracture breccia with greater than 25 percent disseminated pyrite that occurs in a drill hole on Pebble Dike Hill is possibly intrusion-related. A pebble dike cuts across limestone on Pebble Dike Hill.

Structural features at the Lead Creek prospect include Triassic to Jurassic thrust faults, folds, and later, north-south-trending and east-southeast-trending high-angle faults (WGM Inc., 1998 [DLR 98-12]). Airborne geophysical data indicate that Lead Creek is on the periphery of a semicircular magnetic zone that contains the Champion II (EA049), North Champion (EA046), East Champion (EA047), and Little Champion Creek (EA051) prospects. An arcuate trend of high conductivity follows topographic contours around the Lead Creek basin, possibly indicating a graphitic unit with the potential for stratiform sulfide mineralization (WGM Inc., 1998 [DLR 98-12]).

Sulfides at Lead Creek predominantly are galena, sphalerite, and pyrite, with trace chalcopyrite (WGM Inc., 1998 [DLR 98-12]). Sphalerite is typically reddish and coarse grained. Silver is closely associated with galena. Pyrite is the most widespread and abundant sulfide, and is present in all rock types. Silicification accompanies much of the sulfide mineralization and is especially strong in mineralized limestone. Carbonate alteration is marked by dolomite-ankerite and possibly siderite; the carbonates are primarily found in veins and breccia matrix.

There are four main target areas at the Lead Creek prospect: Nodular Knob, Argent Creek, Wizard Hill, and Paradox Hill (WGM Inc., 1998 [DLR 98-12]). Siliceous nodules and scorodite-cemented nodules in graphitic schist and phyllite immediately east of Nodular Knob are anomalous in gold, silver, lead, zinc, arsenic, antimony, cadmium, mercury, and bismuth. One nodule contains 2,000 parts per billion (ppb) gold, 31.4 parts per million silver, greater than 10,000 ppm arsenic, 6 ppm bismuth, 374 ppm antimony, 1,330 ppm copper, 2.82 percent lead, and 744 ppm zinc.

In the Argent Creek area, drilling intersected a stratiform massive sulfide horizon; a 47-foot interval averages 1.4 percent lead, 1.3 percent zinc, and 1.53 ounces of silver per ton (WGM Inc., 1998 [DLR 98-12]). Base metals and abundant pyrite occur in brecciated and sheared carbonaceous shale, argillite, and gray limestone, and are also found as semi-massive replacements of graywacke. Another drill hole (LC-14) in the Argent Creek area has a 31.5 foot intercept with 23.3 ounces of silver per ton and 6.4 percent lead. The Argent Creek fault has been identified as a possible ore control (Ventures Resource Corp., 2001). Quartz-vein float with iron and manganese oxides and sparse galena was found in sandstone and limestone north of Argent Creek; the float contains 2,500 ppm lead, 4,800 ppm zinc, and 1.8 ppm silver. A weakly developed skarn is exposed on Pebble Dike Hill. Step-out hole LC-15, drilled 430 feet to the southeast of 2000 hole LC-14, has a 50.6 foot intersect with 11.9 ounces of silver per ton, 5.1 percent lead, and 0.2 percent zinc in the same zone as hole LC-14. Mineralization is open west of hole LC-14; other 2001 holes tentatively indicate that it is to the east (Swainbank and others, 2002; Ventures Resource Corp., 2002).

Paradox Hill contains complex, siliceous, metavolcanic breccias with clasts of quartzite, limestone, siltstone, claystone, basalt, and tuffaceous material (WGM Inc., 1998 [DLR 98-12]). Galena and sphalerite are disseminated in the quartzite clasts and occur as replacements and open-space fillings in silicified breccia matrix and in quartz-carbonate veins. The veins contain as much as 2.82 percent lead, 2.84 percent zinc, and 0.79 ounce of silver per ton. A small amount of sulfide-bearing skarn is also present in core.

At Wizard Hill, sparse pyrite, galena, sphalerite, and chalcopyrite are associated with quartz-carbonate veins in quartzite and graphitic schist. Altered granodiorite contains minor disseminated pyrite, chalcopyrite, galena, and sphalerite (WGM Inc., 1998 [DLR 98-12]).

The Lead Creek prospect was originally identified by stream-sediment sampling conducted by the Alaska Division of Mines and Minerals in 1968 (Smith, 1968). Argentiferous galena float was found on the ridge south of Champion Creek (the west end of Wizard Hill) in 1968 (Foster and Clark, 1970). In 1976, WGM

Inc. conducted stream-sediment and soil sampling in the Lead Creek area (WGM Inc., 1998 [DLR 98-12]). In 1977 and 1978, WGM Inc. conducted soil sampling and gridded geophysical surveys, and drilled about 600 feet of core in three holes. Three EM conductors were identified during a 13.3-mile vertical-loop survey. Analyses of soil, stream-sediment, pan-concentrate, and rock samples from the Lead Creek area are reported in Burleigh and Lear (1994). In 1996, WGM Inc. carried out a mapping and sampling program at Lead Creek and identified new drilling targets. In 1997, WGM Inc. followed up an airborne EM-magnetics survey, carried out geologic mapping and sampling, and drilled a total of 3,853 feet in seven core holes. WGM Inc. drilled an additional 2,033 feet at Lead Creek in 2000 and 5,464 feet in 2001 and reported high-grade silver-lead mineralization (Ventures Resource Corp., 2001; Ventures Resource Corp., 2002). As of May 2006, the Lead Creek prospect was being examined by Full Metal Minerals under an agreement with Doyon Limited (Full Metal Minerals, 2008, 40 mile). Full Metals web site shows the location of the 22 drill holes on the property and the footages of the mineralized intercepts in them (Full Metal Minerals, 2008, Lead Creek).

Alteration:

Some limestones are bleached, silicified, brecciated, and (or) contain weak skarn alteration (WGM Inc., 1998 [DLR 98-12]). Metavolcanic rocks are locally silicified and altered to clay, but the relationship of alteration to mineralization is unclear. Granodiorite porphyry is argillically altered and contains green chlorite along fractures. Many intrusions are argillically altered, fractured, and sheared, with feldspars altered to clays; chlorite occurs along cleavages.

Age of mineralization:

Probably Mesozoic, as inferred from the presence of skarns adjacent to Mesozoic intrusions and a Cretaceous common lead age from galena (Dusel-Bacon and others, in press [in 2003]).

Generic deposit model:

Deposit model:

Possibly Zn-Pb skarn, polymetallic replacement, or sedimentary exhalative (Cox and Singer, 1986; models 18c, 19a, or 31a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18c, 19a, or 31a

Production Status: None

Site Status: Active

Workings/exploration:

The Lead Creek prospect was originally identified by stream-sediment sampling conducted by the Alaska Division of Mines and Minerals in 1968 (Smith, 1968). Argentiferous galena float was found on the ridge south of Champion Creek (the west end of Wizard Hill) in 1968 (Foster and Clark, 1970). In 1976, WGM Inc. conducted stream-sediment and soil sampling in the Lead Creek area (WGM Inc., 1998 [DLR 98-12]). In 1977 and 1978, WGM Inc. conducted soil sampling and gridded geophysics surveys and drilled about 600 feet of core in three holes at the prospect. Three EM conductors were identified during a 13.3-mile vertical-loop survey. Analyses of soil, stream -sediment, pan-concentrate, and rock samples from the Lead Creek area are reported in Burleigh and Lear (1994). In 1996, WGM Inc. carried out a mapping and sampling program at Lead Creek and identified new drilling targets. In 1997, WGM Inc. followed up an airborne EM-magnetics survey, carried out geologic mapping and sampling, and drilled a total of 3,853 feet in seven core holes. WGM Inc. drilled an additional 2,033 feet at Lead Creek in 2000 and 5,464 feet in 2001 (Ventures Resource Corp., 2001; Swainbank and others, 2002. As of May 2006, the Lead Creek prospect was being examined by Full Metal Minerals under an agreement with Doyon Limited (Full Metal Minerals, 2008, 40 mile). The Full Metals web site shows the location of the 22 drill holes on the property and the footages of the mineralized intercepts in them (Full Metal Minerals, 2008, Lead Creek).

Production notes:

None.

Reserves:

None.

Additional comments:

The Lead Creek prospect is located within Doyon, Ltd. selected or conveyed land. For more information contact Doyon, Ltd., Fairbanks, Alaska.

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Reporter(s): M.B. Werdon; D.J. Szumigala (Alaska Division of Geological and Geophysical Surveys); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Fish

Site type: Prospect

ARDF no.: EA062

Latitude: 64.2546 **Quadrangle:** EA B-4

Longitude: 142.7058

Location description and accuracy:

The Fish prospect is about 0.6 mile northwest of hill 4280 near the center of the southern boundary of the Eagle B-4 quadrangle. The coordinates are the location of a quartz-carbonate vein and gossan zone at the headwaters of Texas Creek in the northeast quarter of section 1, T. 8 S., R. 25 E.. Texas Creek, a small tributary of Fish Creek, is not labeled on the U.S. Geological Survey topographic map of the Eagle B-4 quadrangle (1956); its mouth is in the northeast quarter of section 24, T. 7 S., R. 25 E. The location is accurate.

Commodities:

Main: Ag, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, smithsonite, sphalerite

Gangue minerals: Carbonate, quartz

Geologic description:

In upper Fish Creek, Paleozoic metasedimentary and metavolcanic rocks are intruded by Mesozoic to early Tertiary(?) biotite-hornblende quartz monzonite and granodiorite stocks (Dashevsky and others, 1986). Hornfelsed metamorphic rocks are common near the contact of a quartz monzonite pluton. The Fish prospect consists of quartz-carbonate veins and a gossan zone in the headwaters of Texas Creek (see EA061). Mineralization in one drainage appears to be associated with a 5- to 10-foot-wide gossan zone along a north-trending fault zone at a contact of granodiorite and metasedimentary rock. Gossan samples from the fault zone contain 8 to 24 percent zinc, as much as 2,000 parts per million (ppm) lead, and as much as 200 ppm copper. Samples of gossan and silicified zones contained more than 3 percent zinc, and up to 6,424 ppm lead and 12 ppm silver (U.S. Bureau of Mines, 1995). Five VLF lines run at right angles to the trend of the fault zone showed 'crossovers' probably related to the fault. The geology in the prospect area is considered permissive for skarn, structurally controlled, or stratabound deposits (Dashevsky and others, 1986). There has been placer gold prospecting on Fish Creek (EA059) and Texas Creek (EA061) to the north and west of this prospect.

Sulfides in the area were first noted by Foster (1976). Reconnaissance stream-sediment sampling was done in the upper Fish Creek drainage in 1976 by WGM Inc. (Dashevsky and others, 1986). Initial reconnaissance sampling detected elevated zinc and lead in stream sediments in several tributaries to Fish Creek. In 1977, WGM Inc. conducted reconnaissance mapping, sampled soils and rocks, and filled in the stream-sediment sampling grid. traverses and soil and rock sampling, and fill-in stream sediment sampling. In 1981, Arctic Resources Inc. conducted ridge line traverses and ran a soil-sampling line across the north-south-trending fault zone. Soils with elevated lead and zinc were found west of the fault in hornfels and quartzite, but no mineralization was observed. In 1991, Central Alaska Gold Co. conducted rock sampling in the area; no gold was detected in any samples (WGM Inc., 1998 [DLR 98-10]). The U.S. Bureau of Mines briefly examined the Fish Creek area in 1994. Soil sampling and mapping by WGM Inc. in 2001 resulted in defining a steeply dipping metal-enriched shear zone that persistently extends for 4,800 feet across a high ridge crest to the edge of the soil grid. The zone is defined by anomalous zinc, lead, silver,

copper, bismuth, arsenic, antimony, cadmium, and manganese. All the zinc values exceed 1,000 ppm for the entire 4,800 feet; zinc values exceed 5,000 ppm in 1,200 segments to each side of the ridge. Twenty-eight grab samples of rocks averaged 11.6 percent zinc, 0.13 percent lead, and 18.7 ppm silver. The mineralized zone is estimated to be 50 to 75 feet thick (Swainbank and others, 2002; Ventures Resource Corp., 2002).

Under an agreement with Doyon Ltd., Full Metal Minerals began work on the prospect in 2006 (Full Metal Minerals, 2006 [40 mile]). They described the mineralization as strongly oxidized massive sulfides up to 44 meters thick. They drilled a gossan 15 to 23 meters thick derived from intensely weathered massive to semi-massive sulfides. The zinc in the gossan occurs mainly as smithsonite. The gossan has been traced 1,500 meters along strike and 250 meters down dip. Through 2010, Full Metal has drilled 10 holes at Fish that total 1,629 meters (2007 Stevens, 2010). The mineralization remains open in depth and in both directions along strike. Some notable intercepts are: 1) 11 meters that averaged 205.2 grams of silver per tonne, 0.1 percent copper, 0.2 percent lead, and 4.2 percent zinc; 2) 12.9 meters that averaged 181.3 grams of silver per tonne, 0.1 percent copper, 0.4 percent lead, and 4.0 percent zinc; 3) 7.8 meters that averaged 114.8 grams of silver per tonne, 0.2 percent copper, 0.1 percent lead, and 2.7 percent zinc; 4) 8.2 meters that averaged 118.8 grams of silver per tonne, 0.1 percent copper, and 0.1 percent zinc; 5) 20.6 meters that averaged 52 grams of silver per tonne, 0.1 percent copper, 0.08 percent lead and 1.7 percent zinc; 6) 4.6 meters that averaged 46.7 grams of silver per tonne and 2.2 percent zinc; and 7) 2.1 meters that averaged 205 grams of silver per tonne and 0.3 percent zinc.

Alteration:

Age of mineralization:

Mineralization probably related to nearby Mesozoic to early Tertiary(?) biotite-hornblende quartz monzonite and granodiorite stocks in the upper Fish Creek drainage (Dashevsky and others, 1986).

Generic deposit model:

Deposit model:

Silver-zinc-lead skarn (Cox and Singer, 1986; model 18c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18c

Production Status: None

Site Status: Active

Workings/exploration:

Sulfides in the area were first noted by Foster (1976). Reconnaissance stream-sediment sampling was done in the upper Fish Creek drainage in 1976 by WGM Inc. (Dashevsky and others, 1986). In 1981, Arctic Resources Inc. conducted ridge line traverses and ran a soil sampling line across the north-south-trending fault zone that crosses the prospect. In 1991, Central Alaska Gold Co. conducted rock sampling in the area; no gold was detected in any samples (WGM Inc., 1998 [DLR 98-10]). The U.S. Bureau of Mines briefly examined the Fish Creek area in 1994. WGM carried out soil sampling and mapping. Under an agreement with Doyon Ltd., Full Metal Minerals began work on the prospect in 2006. They drilled 7 holes in 2006 and 3 holes in 2008 (Stevens, 2010).

Production notes:

None.

Reserves:

None.

Additional comments:

This prospect is located on Doyon, Ltd. selected or conveyed land. For more information contact Doyon, Ltd., Fairbanks, Alaska.

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Primary Reference: Stevens, 2010

Reporter(s): M.B. Werdon; R.L. Flynn; and D.J. Szumigala (ADGGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Oscar

Site type: Prospect

ARDF no.: EA096

Latitude: 64.2279 **Quadrangle:** EA A-5

Longitude: 143.1174

Location description and accuracy:

The Oscar prospect covers about 5 square miles on the ridge west of Gold Bottom Creek. The coordinates are the approximate center of the prospect about 4 miles northwest of Mount Veta in the northeast quarter of section 14, T. 8 S., R. 23 E. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, magnetite, pyrrhotite, sphalerite

Gangue minerals: Calc-silicate minerals

Geologic description:

The Oscar prospect is at the contact between the Jurassic Mount Veta syenite and Paleozoic marble, calcareous schist, and quartzite (WGM Inc., 1998 [DLR 98-10]). Hypabyssal Tertiary felsic intrusions and volcanic rocks and Tertiary or Mesozoic quartz-monzonite plutons are also present. The relation of these younger intrusions to the Oscar prospect is not known. Ten outcrops of skarn occur at the prospect, but vegetation cover is extensive (WGM Inc., 2000 [Veta property summary]; WGM Inc., 1998 [DLR 98-10]). Ground magnetometer surveys indicate that several skarns are connected in the shallow subsurface and blind extensions continue beneath tundra cover.

Magnetite, pyrrhotite, galena, sphalerite, and chalcopyrite occur in calc-silicate rocks and hornfels (Dashevsky and others, 1986). Average grades are generally less than 11 percent combined lead and zinc, and as much as 3 ounces of silver per ton. A massive chalcopyrite-pyrrhotite boulder in rubble contained 18.8 percent copper and 18 ounces of silver per ton. A trench over a ground-magnetic anomaly revealed iron-stained and geochemically anomalous soils that contain as much as 3.8 percent lead, 10 ounces of silver per ton, 0.4 percent copper, 0.9 percent zinc, and 860 ppb gold. Rock samples collected in 1990 contain as much as 2,040 parts per billion (ppb) gold, 192 parts per million (ppm) silver, 9,134 ppm lead, greater than 1 percent copper, and greater than 1 percent zinc (WGM Inc., 1998 [DLR 98-10]). Four northeast-trending soil anomalies are as much as 2,000 feet long; they contain from 30 to greater than 7,000 ppb gold, 1 to 30 ppm silver, 100 to greater than 10,000 ppm copper, and 10,000 ppm or more zinc (WGM Inc., 2000 [Veta property summary]). Molybdenum- and silver-bearing calc-silicate inclusions in quartz monzonite occur across Gold Bottom Creek, east of the Oscar prospect skarns.

Bear Creek Mining Co. discovered the Oscar prospect in 1971; they conducted soil and rock sampling and a ground magnetic survey (Dashevsky and others, 1986). In 1975, WGM Inc. did stream sediment reconnaissance in the area; 1976 work by WGM Inc. included stream sediment sampling, reconnaissance geologic mapping, rock sampling, trenching, and soil sampling on a grid. In 1981, Arctic Resources Inc. extended the soil grid, and in 1982, Doyon, Ltd. traversed outlying ridges and slopes, sampled soils on a grid over a blind skarn, and conducted a ground magnetometer survey. In 1990, Central Alaska Gold Co. did geologic mapping and rock, soil, and stream-sediment sampling (WGM Inc., 1998 [DLR 98-10]). Work by WGM Inc. in 2001 was restricted to stream-sediment sampling near the peripheries of the prospect.

As of early 2012, the Oscar prospect was being explored by Heavy Metal Zinc under a lease agreement

with Doyon, Ltd. (Heavy Metal Zinc, 2012). They consider the deposit to be in skarn bodies in marble adjacent to a syenite stock. The deposit is roughly zoned with magnetite-chalcopyrite bodies near the syenite and galena-sphalerite bodies further away. There are only two outcrops. Thirty-eight samples from the lower outcrop contained from a trace to 3.8 percent copper and a trace to 356 grams of silver per tonne. Sixty-two samples from the upper outcrop contained from a trace to 1.0 percent copper, a trace to 34.1 grams of silver per ton, and up to 1.2 percent zinc. Samples from prospect pits contained up to 17 percent copper, 5.2 percent zinc, 4.4 percent lead, and 444 grams of silver per tonne. Full Metal drilled one hole in 2010 but it did not intersect any significant mineralization (Stevens, 2010).

Alteration:

Mineralization is associated with skarn bodies.

Age of mineralization:

Skarn mineralization is at the contact of the Jurassic, Mount Veta syenite.

Generic deposit model:

Deposit model:

Cu skarn or Zn-Pb skarn (Cox and Singer, 1986; models 18b or 18c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b or 18c

Production Status: None

Site Status: Active?

Workings/exploration:

Bear Creek Mining Co. discovered the Oscar prospect in 1971; they conducted soil and rock sampling and a ground magnetic survey (Dashevsky and others, 1986). In 1975, WGM Inc. did stream-sediment reconnaissance in the area; 1976 work by WGM Inc. included stream-sediment sampling, reconnaissance geologic mapping, rock sampling, trenching, and soil sampling on a grid. In 1981, Arctic Resources Inc. extended the soil grid, and in 1982, Doyon, Ltd. traversed outlying ridges and slopes, sampled soils on a grid over a blind skarn, and conducted a ground magnetometer survey. In 1990, Central Alaska Gold Co. did geologic mapping and rock, soil, and stream-sediment sampling (WGM Inc., 1998 [DLR 98-10]). Work by WGM Inc. in 2001 was restricted to stream-sediment sampling near the peripheries of the prospect (Ventures Resources, 2002). Beginning in 2006, the Oscar deposit was being explored by Full Metal Minerals and its successor Full Metal Zinc under a lease agreement with Doyon Ltd. Their work to early 2010 consisted mainly of sampling outcrops and hand-dug pits. They drilled one hole in 2010 that did not intersect any significant mineralization.

Production notes:

None.

Reserves:

None.

Additional comments:

The Oscar prospect is within Doyon, Ltd. selected or conveyed land. For more information contact Doyon, Ltd., Fairbanks, Alaska.

References:

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Stevens, D.L., 2010, 40-Mile project, Fortymile Mining District, East-Central Alaska: Unpublished NI 43-101 report for Full Metal Zinc Ltd. and Full Metal Minerals Ltd., 177 p. (posted on www.sedar.com, April 21, 2011).

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Primary Reference: Stevens, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Eva; Eva Creek; Ruby Silver

Site type: Prospect

ARDF no.: EA099

Latitude: 64.1057 **Quadrangle:** EA A-5

Longitude: 143.198

Location description and accuracy:

The center of the Eva prospect is at an elevation of about 3,900 feet on the ridge north of Eva Creek. The claims of the prospect extend several miles to the north and south into the Norvell Creek and Iron Creek drainages. The coordinates are the location of trenches in the central part of the Eva Creek prospect in section 23, T. 27 N., R. 11 E. The location is accurate.

Commodities:

Main: Ag, Cu, Pb, Zn

Other: Au, Sb

Ore minerals: Argentiferous galena, azurite, cerussite, hematite, magnetite, malachite, pyrite, pyrrhotite, sphalerite

Gangue minerals: Calcite, epidote, quartz

Geologic description:

The Eva prospect is in Paleozoic gneiss, schist, quartzite, and marble, that have been intruded by the Mount Veta syenite of Jurassic age (Foster, 1976). Other Tertiary to Mesozoic monzonite and granite intrusions are about 1 mile east of the prospect, and there are felsic and mafic dikes in the area (Dashevsky and others, 1986). The syenite to the east is epidotized and contains local altered zones near the contact (Foster and Clark, 1970). Several other prospects are spatially associated with the Mount Veta intrusive complex, including East Eva (EA098), Drumstick (EA166), Oscar (EA096), Oscar West (EA097), Little Enchilada (EA103), unnamed (north of Fish Creek) (EA062), Molly Creek (EA100), Little Whiteman Creek (EA060), and Mitchell (EA101).

At the Eva prospect, pyrite and pyrrhotite are disseminated grains in gneiss and schist. There are also scattered highly mineralized marble units that contained argentiferous galena, cerussite, sphalerite, azurite, and malachite filling vugs, boxworks, and quartz veinlets (Carter, 1981). Wedow and others (1954) reported quartz veins as much as several feet thick, most of which are highly fractured and stained with hematite. These veins contain pods of galena, partly altered to cerussite, and calcite. Rock samples from the Eva Creek prospect with galena, sphalerite, and malachite contained as much as 9.24 ounces of silver per ton, 29.13 percent lead, and 0.61 percent copper (Saunders, 1962). Mineralized rock samples from trenches contained 0.4 to 2 percent copper, 7 to 52 percent lead, 0.6 to 21 percent zinc, and 31 to 99 ounces of silver per ton. Other samples of vein material and gossan in trenches contain as much as 32.4 ounces of silver per ton, 0.18 percent copper, 896 parts per million antimony, 9.5 percent zinc, and 6.6 percent lead (U.S. Bureau of Mines, 1995). Samples from a vein that can be traced on the surface for at least 1,800 feet contains as much as 28.7 percent lead, 9.4 percent zinc, 0.28 percent copper, 0.003 ounce of gold per ton, and 19.4 ounces of silver per ton (Swainbank and others, 1998).

Metal anomalies in soils at the Eva prospect are elongated northeast (Dashevsky and others, 1986). CEM and VLF-EM geophysical surveys both detected narrow conductors up to 400 feet long striking north to northwest. Seven hundred feet northwest of the trenches at the Eva Creek prospect, soils have elevated copper in an area of strong response to IP and ground magnetic surveys. A drill hole penetrated pyrite- and magnetite-bearing, biotite schist, and calcite-filled breccia zones as much as 58 feet thick. At the head of

Iron Creek, two core holes totaling 404 feet were drilled in an area with anomalous magnetite and zinc; these holes intersected disseminated pyrite and chalcopyrite, iron oxides, and rare galena in banded marble and dolomite (Dashevsky and others, 1986).

About 18 miles of traverses were conducted for radioactive minerals in the area in 1949 but no significant radioactivity was detected in panned heavy-mineral concentrates (Wedow and others, 1954). Saunders (1962) examined prospects in the My Creek and Eva Creek area in 1960. Rock and stream-sediment samples were collected from the Molly Creek drainage in 1968 (Foster and Clark, 1970). Apex Exploration Ltd. conducted exploration in the Eva Creek area in the early 1970s (Dashevsky and others, 1986). Placid Oil Company explored in the area from 1975 to 1978; their work included float mapping, soil sampling on a grid, and ground magnetic, CEM, and VLF-EM geophysical surveys. They drilled three core holes in trenches at Eva Creek in 1977, and two core holes on Iron Creek in 1978. In 1981, Arctic Resources Inc., sampled rocks and soils at the Eva Creek prospect, and in 1982, Doyon Ltd. in 1982 ran two lines of IP-resistivity and magnetometer surveys.

Full Metal Minerals resumed exploration at the Eva prospect in 2007 and at an extension about 2,200 meters north called the Drumstick prospect (EA166) (Full Metal Minerals, 2008 [40 Mile district]; 2008 [LWM prospect]; 2008 [LWC drill sites]. They interpret the deposit as a carbonate replacement that consists of partially oxidized, massive, coarsely-crystalline sphalerite, with galena, and chalcopyrite. They collected 14 samples from outcrop and prospect pits. The samples contained 6.5 to 43.6 percent zinc, 4.1 to more than 25 percent lead, and 0.18 to 4.9 percent copper. The lowest silver value was 207 grams of silver per tonne; the highest three samples contained 3,730, 1,960, and 1,280 grams of silver per tonne.

Stevens (2010) shows several trenches spread along about 100 meters of marble, quartz-mica schist, amphibole schist, and gossan. Five holes were drilled in 2010 that totaled 632 meters. The best intercept was 1.1 meter that contained 70 grams of silver per tonne, 0.03 percent copper, 2.35 percent lead, and 1.43 percent zinc; four of the holes did not cut significant mineralization.

Alteration:

Not noted.

Age of mineralization:

Jurassic or younger if related to the nearby Mt. Veta syenite.

Generic deposit model:

Deposit model:

Silver-copper-lead-zinc replacement deposits in carbonate rocks (Cox and Singer, 1986; model 19a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

19a

Production Status: None

Site Status: Active

Workings/exploration:

About 18 miles of traverses were conducted for radioactive minerals in 1949 but no significant radioactivity was detected in panned heavy-mineral concentrates (Wedow and others, 1954). Saunders (1962) examined prospects in the My Creek and Eva Creek area in 1960. Rock and stream-sediment samples were collected from the Molly Creek drainage in 1968 (Foster and Clark, 1970). Apex Exploration, Ltd. conducted exploration in the Eva Creek area in the early 1970s (Dashevsky and others, 1986). Placid Oil Company explored in the area from 1975 to 1978; their work included float mapping, soil sampling on a grid, and ground magnetic, CEM, and VLF-EM geophysical surveys. They drilled three core holes in trenches at Eva Creek in 1977 and two core holes on Iron Creek in 1978. In 1981, Arctic Resources Inc. sampled rocks and soils and in 1982 Doyon Ltd. ran two lines of IP-resistivity and magnetometer surveys. Full Metal Minerals resumed exploration at the Eva prospect in 2007 and at an extension about 2,200 meters

north called the Drumstick prospect (EA166) (Full Metal Minerals, 2008 [40 Mile district]; 2008 [LWM prospect]; 2008 [LWC drill sites]). Full Metal drilled 4 holes in 2010.

Production notes:

None.

Reserves:

None.

Additional comments:

The Eva prospect is on Doyon, Ltd. selected or conveyed land. For more information contact Doyon, Ltd., Fairbanks, Alaska.

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Primary Reference: Full Metal Minerals, 2008 [40 Mile]; Stevens, 2010

Reporter(s): R.L. Flynn and M.B. Werdon (ADGGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): LWM; Little Whiteman; West LWM

Site type: Prospect

ARDF no.: EA102

Latitude: 64.2308 **Quadrangle:** EA A-4

Longitude: 142.8274

Location description and accuracy:

The LWM prospect covers 9 square miles in upper Little Whiteman Creek. The coordinates are at about the center of an area that has been drilled in section 8, T. 8 S., R. 25 E. The location is accurate within 1 mile.

Commodities:

Main: Ag, Pb, Zn

Other: Au, Hg, In, W

Ore minerals: Cerrusite, chalcopyrite, galena, hemimorphite, smithsonite, sphalerite

Gangue minerals: Calcite

Geologic description:

The rocks in upper Little Whiteman Creek consist of Paleozoic quartzite, schist, marble, and greenstone that have been intruded by the Mount Veta intrusive complex of Mesozoic granodiorite and quartz monzonite stocks and by Jurassic syenite dikes (Foster, 1976; WGM Inc., 1998). A northeast-trending greenstone belt underlies the ridge at the south end of the LWM prospect. Reconnaissance stream-sediment samples from Little Whiteman Creek are anomalous in lead, zinc, and silver, and panned heavy-mineral concentrates contain anomalous tungsten, silver, and mercury. The geochemical anomalies are spatially separated and perhaps reflect input from two different deposit types. Sulfides noted by Foster (1976) on the ridge east of Little Whiteman Creek and on the ridge line at the head of the creek are probable sources for the geochemical anomalies.

WGM Inc. conducted a regional stream-sediment reconnaissance in the upper Little Whiteman Creek area in 1975 (Dashevsky and others, 1986). In 1977, WGM Inc. carried out reconnaissance soil sampling, and did a reconnaissance magnetic survey; in 1978 they did a follow-up panned heavy-mineral-concentrate survey. In 1981, Arctic Resources Inc. mapped the ridges and collected soil samples in the area. Doyon, Ltd. conducted a placer reconnaissance in 1982. In 1990, Central Alaska Gold Co. mapped the geology and collected soil, rock, and stream-sediment samples (WGM Inc., 1998). In 2001, WGM Inc. sampled and hypothesized that the mineralization is hosted in gently dipping siliceous and carbonaceous phyllite. This target, which was open to the north, was well defined by a 6,000-foot by 1,200-foot soil anomaly in zinc, lead, and silver. The only mineralized rock that was found in the heart of the target area was rare gossan exposed in pits during soil sampling. Gossan samples contained up to 34 percent lead, 16 percent zinc, and 13.75 ounces of silver per ton (Swainbank and others, 2002; Ventures Resource Corp., 2002).

Under an agreement with Doyon Ltd., Full Metal Minerals began work on this prospect in 2006. Full Metal Minerals subsequently established a separate company, Full Metal Zinc, to explore their properties in the 40 Mile District.

As of March, 2012, Full Metal Zinc had drilled 72 holes on 50-meter centers at the LWM prospect and outlined a zone of mineralization that extends 970 meters along strike and 300 meters down dip (Full Metal Zinc, 2012 [40 Mile]; 2012 [LWM]). Twelve of these holes totaling 3,229 meters were drilled in 2011. Some notable intercepts were: 1) 44.6 meters that averaged 15.7 percent zinc, 5.3 percent lead, and 76 grams of silver per tonne; 2) 11.1 meters that averaged 26.3 percent zinc, 11.7 percent lead, and 169.8 grams

of silver per tonne; 5.6 meters that averaged 31.8 percent zinc, 19.9 percent lead, and 346.8 grams of silver per tonne; and 4) 17.7 meters that averaged 14.5 percent zinc, 11.1 percent lead, and 217.5 grams of silver per tonne.

Full Metal Zinc also drilled two holes totaling 260 meters on a geochemical anomaly at the West LWM prospect about 3,500 meters southwest of the LWM prospect. No significant mineralization was cut.

The mineralization at the LWM prospect consists of massive to semi-massive sphalerite, galena, and chalcopyrite in dolomitized marble and marble breccia. The primary mineralization is capped by a thick oxide zone with smithsonite, hemimorphite, and cerussite. The mineralization also includes notable indium; 9 samples that were analyzed for indium contained from a trace to 39.8 grams of indium per tonne, with an average of 16.1 grams of indium per tonne.

There are two mineralized zones. The lower zone extends the full length of the deposit; it is 970 meters long, 25-50 meters thick, and dips to the southeast. Near the center of the drilling, the upper zone is about 200 meters long and 0-30 meters thick. Stevens (2011), citing a company report from Full Metal Zinc classifies the deposit a carbonate replacement, a subset of the Mississippi Valley type of deposit. Full Metal Zinc considers the LWM a high-temperature carbonate-replacement deposit.

Alteration:

The deposit is partly oxidized near the surface.

Age of mineralization:

This carbonate replacement deposit may be related to nearby Mesozoic granodiorite or quartz monzonite intrusive plutons.

Generic deposit model:

Deposit model:

Ag-Pb-Zn replacement deposit in carbonates (Cox and Singer, 1986; model 19a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

19a

Production Status: None

Site Status: Active

Workings/exploration:

WGM Inc. conducted a regional stream-sediment reconnaissance in the upper Little Whiteman Creek area in 1975 (Dashevsky and others, 1986). In 1977, WGM Inc. carried out reconnaissance soil sampling, and did a reconnaissance magnetic survey; in 1978 they did a follow-up panned heavy-mineral-concentrate survey. In 1981, Arctic Resources Inc. mapped the ridges and collected soil samples in the area. Doyon, Ltd. conducted a placer reconnaissance in 1982. In 1990, Central Alaska Gold Co. mapped the geology and collected soil, rock, and stream-sediment samples (WGM Inc., 1998). In 2001, WGM Inc. sampled. Under an agreement with Doyon Ltd., Full Metal Minerals began work on this prospect in 2006. Full Metal Minerals subsequently established a separate company, Full Metal Zinc, to explore their properties in the 40 Mile District. As of March, 2012, Full Metal Zinc had drilled 72 holes on 50-meter centers at the LWM prospect and outlined a zone of mineralization that extends 970 meters along strike and 300 meters down dip (Full Metal Zinc, 2012 [40 Mile]; 2012 [LWM]).

Production notes:

None.

Reserves:

None.

Additional comments:

The LWM prospect is within Doyon, Ltd. selected or conveyed land. For more information contact Doyon, Ltd., Fairbanks, Alaska.

References:

Burleigh, R.E., and Lear, K.G., 1994, Compilation of data for Phase I of the mineral resource evaluation of the Bureau of Land Management Black River and Fortymile subunits: U.S. Bureau of Mines Open-File Report 48-94, 116 p.

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Primary Reference: Full Metal Zinc, 2012 [40 Mile]

Reporter(s): M.B. Werdon, R.L. Flynn, and D.J. Szumigala (ADGGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Main Zone; Saddle Zone; Trench 24; Napoleon

Site type: Prospect

ARDF no.: EA115

Latitude: 64.1643 **Quadrangle:** EA A-2

Longitude: 141.6352

Location description and accuracy:

This site consists of 3 discrete but adjacent mineralized zones, the Main Zone, the Saddle Zone, and the Trench 24 zone. These are often combined with the nearby Twin Peaks (EA167) and with the Burnt Ridge (EA168) prospects under the name Napoleon or Napoleon Block/claims. The three zones are near peak 3750 northwest of the head of Napoleon Creek and occupy much of the west half of section 35, T. 28 N., R. 19 E. The location is accurate.

Commodities:

Main: Ag, Au, Pd, Pt

Other:

Ore minerals: Gold, hematite, pyrite

Gangue minerals: Carbonate, chlorite, epidote, K-feldspar, quartz, sericite

Geologic description:

As described by Eden (2010), this site consists of three discrete but adjacent mineralized zones: the Main Zone, the Saddle Zone, and the Trench 24 zone. All are in the Napoleon pluton which is roughly equidimensional and about 4 miles wide. The pluton is mainly weakly to strongly foliated hornblende, quartz monzonite. Hornblende from this pluton gives a Jurassic 40Ar/39Ar plateau age of 186.5 +/- 1.3 Ma (Layer and others, 2002). The pluton contains small bodies of biotite clinopyroxenite and coarse-grained hornblende gabbro, which form inclusions, dikes, and/or marginal phases (Werdon and others, 2001). Clinopyroxenite bodies in the Napoleon pluton contain as much as 25 parts per billions (ppb) platinum and 6 ppb palladium (Werdon and others, 2000). Biotite clinopyroxenite dikes, which are compositionally and texturally similar to those in the northeastern Eagle quadrangle, give K-Ar ages of 184-185 Ma (Newberry and others, 1996). The Napoleon pluton and the inclusions/dikes of clinopyroxenite and hornblende gabbro are cut by minor, granite and aplite dikes of unknown age. The pluton intrudes amphibolite-facies amphibolite, quartzite, paragneiss, marble, orthogneiss, and minor schist (Werdon and others, 2001). The Napoleon pluton and surrounding country rocks are cut and offset by high-angle faults.

Airborne magnetic and resistivity surveys were flown in the Fortymile Mining district in 1998 (Alaska Division of Geological and Geophysical Surveys and others, 1999). The Alaska Division of Geological and Geophysical Surveys conducted 1:63,360-scale bedrock and surficial geologic mapping in the area from 1999 to 2001. The mineralization was discovered by Kennecott Exploration in 1998 and 1999 by detailed soil and rock sampling and airborne and ground geophysical surveys (Jones and Olson, 1999; Eden, 2010). In 1999, Kennecott drilled 9 holes on the Main Zone, 3 holes on the Saddle Zone, and 2 holes on the Trench 24 zone, and dug 24 trenches that totaled 464 meters. In 2000 and 2001, Tech Resources explored the property with ground and magnetic geophysical surveys and drilled 4 holes on the Main Zone and 3 holes on the Saddle Zone. A large block of claims was staked over the property in 2007 by Millrock Resources Inc., the current owners of the property (Millrock, 2011), and they have done considerable rock and soil sampling.

The mineralization is controlled by a major east-west trending shear zone that has been traced along strike for at least 4 miles (Eden, 2010). As best exposed in the Main Zone, this shear zone is at least 150 feet thick.

Along this shear zone, the Napoleon pluton is cut by several discrete concentrations of narrow quartz veins including the three that make up this site. These veins typically strike northwest or north-northeast and dip steeply south. The veins are up to 12 inches thick, and consist of mainly of quartz +/- pyrite +/- hematite +/- epidote +/- carbonate +/- rare visible gold. Samples from the quartz veins assayed as much as 15 ounces of gold per ton and rarely contained less than 0.2 ounces of gold per ton. Vein selvages commonly contain K-feldspar, some of which is partly replaced by sericite. Sericite-altered K-feldspar from the selvage of a gold-quartz vein gives a Cretaceous 40Ar/39Ar isochron age of 127.8 +/- 1.6 Ma (Layer and others, 2002); this is approximately 60 Ma younger than the Napoleon pluton and is tentatively interpreted to reflect the time of mineralization.

The best exposed mineralization and the focus of most of the exploration has been the Main Zone. The most notable drill intercepts on the Main Zone were two feet that contained 34.71 grams of gold per tonne and 2 feet that contained 17.74 grams of gold per tonne. The drilling at the Saddle Zone and Trench 24 zone tested a strong gold anomalies in soil. The best drill intercepts on the Saddle Zone were 3 meters with 8.49 grams of gold per tonne and 0.5 meters with 14.21 grams of gold per tonne. The best drill intercepts on the Trench 24 zone were 5 feet with 3.90 grams of gold per tonne, and 0.61 meters with 5.566 grams of gold per tonne.

Jones and Olson (1999) classified the prospect as a porphyry gold deposit. More recently, Eden (2010) classified it as a plutonic related gold-quartz vein deposit as defined by Lefebure and Hart (2005).

Alteration:

K-feldspar adjacent to quartz veins is partly altered to sericite.

Age of mineralization:

Sericite-altered K-feldspar from the selvage of a gold- quartz vein gave a Cretaceous 40Ar/39Ar isochron age of 127.8 +/- 1.6 Ma (Layer and others, 2002); this is tentatively interpreted to reflect the time of mineralization.

Generic deposit model:

Deposit model:

Plutonic related gold-quartz vein deposit (Lefebure and Hart, 2005).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The mineralization was discovered by Kennecott Exploration in 1998 and 1999 by detailed soil and rock sampling and airborne and ground geophysical surveys (Jones and Olson, 1999; Eden, 2010). In 1999, Kennecott drilled 9 holes on the Main Zone, 3 holes on the Saddle Zone, and 2 holes on the Trench 24 zone, and dug 24 trenches that totaled 464 meters. In 2000 and 2001, Tech Resources explored the property with ground and magnetic geophysical surveys and drilled 4 holes on the Main Zone and 3 holes on the Saddle Zone. A large block of claims was staked over the property in 2007 by Millrock Resources Inc., the current owners of the property (Millrock, 2011), and they have done considerable rock and soil sampling.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Primary Reference: Eden, 2010

Reporter(s): M.B. Werdon (ADGGS; 2000); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Boundary

Site type: Prospect

ARDF no.: EA152

Latitude: 64.0985 **Quadrangle:** EA A-1

Longitude: 141.028

Location description and accuracy:

The Boundary prospect covers about 2 square miles; it is bounded to the east by the Canadian border, to the south by the Top of the World Highway, to the west by Arkansas Creek, and to the north by the ridge north of Brophy Creek. The coordinates are the approximate center of the drillholes, in the northeast 1/4 section 26, T. 27 N., R. 22 E., of the Copper River Meridian; the location is accurate.

Commodities:

Main: Pb, Zn

Other: Ag, Cu

Ore minerals: Chalcocite?, chalcopyrite, covellite, galena, pyrite, sphalerite

Gangue minerals: Chlorite, quartz

Geologic description:

The Boundary prospect is interpreted to be a lead-zinc-copper-silver, volcanogenic massive-sulfide deposit. The prospect is in greenschist-facies metamorphic rocks, including quartz-white mica schist, and underlying quartz-chlorite-white mica schist and minor quartz-chlorite schist. Foliation and compositional layering generally dip 20 to 30 degrees to the north and northwest (Resource Associates of Alaska, 1977). These rocks are part of the Klondike Schist (the Klondike series of McConnell, 1905). The Klondike Schist has mid-Permian protolith ages determined by uranium-lead zircon dating (Mortensen, 1999). Because the Klondike Schist hosts mineralization that is probably syngenetic with its host rocks, the stratabound sulfide mineralization is probably mid-Permian. A galena sample taken from drill core from the Boundary prospect was analyzed for common lead values in two separate dissolutions. Both analyses fall within the middle of the field for galenas from other Permian Klondike Schist-hosted syngenetic occurrences in the area (J.K. Mortensen, written communication, 2002).

Klondike Schist near the Boundary prospect overlies carbonaceous schist and quartzite to the south that are part of the Nasina Series, which has a Mississippian protolith age (McConnell, 1905; Resource Associates of Alaska, 1977; Mortensen, 1999). Along the north side of the Boundary prospect, serpentinized ultramafic rocks (including an ultramafic body more than 1 square mile in area along Hall Creek) crop out along a thrust contact with the overlying Nasina Series rocks and extend across the border into Yukon Territory (Mortensen, 1988; R.L. Flynn, unpub. data, 2000). Two base-metal sulfide prospects in Klondike Schist are located across the border in the Yukon Territory: the Baldy prospect is 2 miles to the east, and the Pub prospect is 5 miles to the east of the Boundary prospect (Mortensen, 1988).

At the Boundary prospect, the Klondike Schist contains abundant quartz lenses; locally abundant iron oxides replace pods of pyrite and occur along the foliation (R.L. Flynn, unpub. data, 2000). Surface oxidation is extensive to depths of more than 300 feet in drillcore, and there are local gossan zones. Where sulfides are present in outcrop, they are generally found as thin laminations and include pyrite and minor galena, sphalerite, and covellite and possibly chalcocite (Resource Associates of Alaska, 1977). The sulfides most commonly occur in felsic schist. Sulfides in drillcore are found to below 300 feet and consist primarily of pyrite, with rare galena, sphalerite, and chalcopyrite (Resource Associates of Alaska, 1977). Whole-rock analyses of some felsic schists indicate that they have high magnesium and iron contents,

suggesting chlorite alteration; chlorite alteration is visible in some drillcore samples (Smit, 2000).
A lead-zinc-copper-silver geochemical anomaly occurs along the contact between felsic schists and mafic schists at the Boundary prospect (Smit, 2000). Rock samples from gossan zones commonly contain 3,000 to 5,000 parts per million (ppm) lead, 300 to 500 ppm zinc, 300 to 800 ppm copper, and 7 to 14 ppm silver; gold is below detection limits. Zinc is more dispersed than lead; a soil geochemistry anomaly approximately 6,000 by 2,000 feet in extent typically has 100 to 300 ppm lead, 300 to 700 ppm zinc, and 75 to 100 ppm copper, with less than 2 ppm silver. Stream sediments generally contain less than 50 ppm lead and copper, but they typically contain 400 to 900 ppm zinc (Resource Associates of Alaska, 1977). Several geochemically anomalous intervals were found in drillcore; a 48-foot section of pyritic chlorite schist has 241 ppm copper, 709 ppm lead, 1,933 ppm zinc, and 6.4 ppm silver (Smit, 2000).

Alteration:

Oxidation is extensive to depths of more than 300 feet, and there are local gossan zones (Resource Associates of Alaska, 1977). Whole-rock analyses of some felsic schists indicate that they have high magnesium and iron contents, suggesting chlorite alteration; chlorite alteration is visible in some drillcore samples (Smit, 2000).

Age of mineralization:

Because the Klondike Schist hosts mineralization that is probably syngenetic with its host rocks, the stratabound sulfide mineralization is probably mid-Permian. A galena sample taken from drillcore from the Boundary prospect was analyzed for common lead values in two separate dissolutions. Both analyses fall within the middle of the field for galenas from other Permian, Klondike Schist-hosted syngenetic occurrences in the area (J.K. Mortensen, written commun., 2002).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Inactive

Workings/exploration:

The area between Arkansas Creek (see EA150) and Brophy Creek was first identified as a potential lead-zinc deposit by R.R. Asher of the Alaska Division of Mines and Geology (Asher, 1970). Asher observed a gossan zone with limonite replacing pyrite, and several samples contain anomalous lead, zinc, and copper. In 1977, Resource Associates of Alaska conducted regional and detailed geologic mapping, sampled soil on a grid over about 2 square miles, and drilled four diamond drill holes totaling 1,560 feet near Brophy Creek. Recoveries were poor; only two of the drill holes reached target depth, and massive sulfides were not intersected. Most of this drillcore is now stored at the University of Alaska Museum, Fairbanks, Alaska. Resource Associates of Alaska (1977) suggested that the drillholes may have been collared in the footwall of a potential massive-sulfide deposit and the deposit may be to the north of Brophy Creek, down-dip and up-section. However, recent mapping (R.L. Flynn, unpub. data, 2000) suggests that near Brophy Creek, Nasina Series rocks have been thrust over the Klondike Schist that hosts the Boundary prospect. A horizontal-loop-EM (electromagnetic) survey with a penetration depth of about 140 feet was run on six grid lines by Resource Associates of Alaska in 1977, but no conductors were found.
Regional exploration was conducted by Anaconda in the Boundary area in 1978; about 70 square miles was mapped at a reconnaissance scale (Wiltse, 1978). In 1979, two holes totaling 1,004 feet were drilled by American Copper and Nickel Company in the same area, but they also failed to intersect massive-sulfide mineralization (Smit, 2000); most of this drillcore is still at the drill hole collars, but information about the

orientation of the holes has been lost. Limited work on the Boundary prospect in 1999 by Grayd Resource Corporation did not produce new exploration targets (Smit, 2000).

In 2010 Full Metal Minerals (FMM) staked the Boundary prospect and in 2011 completed soil sampling along the ridge north of the Top of the World Highway near Davis Dome. The following year FMM collected 107 more soil samples along the spurs around the Boundary prospect area. Results showed a copper and zinc anomaly in the chlorite-sericite schist. Rock samples collected in gossan zones near areas of historic drilling contained up to 1,025 parts per million (ppm) lead, 669 ppm copper, 392 ppm zinc, and 4.9 ppm silver (King, 2012).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Wiltse, M.A., 1978, Central Alaska stratiform Ag-Pb-Zn project 522: Anaconda Company report [unpublished], 174 p. (Report held by Alaska Division of Geological and Geophysical Surveys, Fairbanks, Alaska).

Primary Reference: Resource Associates of Alaska, 1977

Reporter(s): R.L. Flynn; M.B. Werdon; N.V. King (Alaska Earth Sciences)

Last report date: 2016-02-25

Site name(s): Drumstick

Site type: Prospect

ARDF no.: EA166

Latitude: 64.1316 **Quadrangle:** EA A-5

Longitude: 143.2114

Location description and accuracy:

The Drumstick prospect is on the ridge about a half mile north of the mouth of Silas Pup, a short headwater tributary of My Creek. It is in about the middle of the west half of section 11, T. 27 N., R. 11 E. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, sphalerite

Gangue minerals: Calcite

Geologic description:

Although mineralization at the Drumstick prospect was probably recognized earlier in several pits dug in conjunction with work at the nearby Eva prospect (EA099), it first cited as a separate prospect by Full Metal Minerals (2008 [40 mile]) in 2007.

The Drumstick prospect is in Paleozoic gneiss, schist, quartzite, and marble, that have been intruded by the Mount Veta syenite of Jurassic age (Foster, 1976). Other Tertiary to Mesozoic monzonite and granite plutons are about 1 mile east of the prospect, and there are felsic and mafic dikes in the area (Dashevsky and others, 1986). The granitic pluton to the east is epidotized and contains scattered altered zones near the contact (Foster and Clark, 1970).

Full Metal interprets the Drumstick prospect as an extension of the Eva prospect and like it a carbonate replacement deposit that consists of partially oxidized, coarsely crystalline sphalerite, with galena, and chalcopyrite. Three samples of the mineralization were collected from old prospect pits by Full Metal Minerals, (2008 [high grade]; 2008 [map]). Two of the samples contained 21.6 and 11.6 percent zinc, 19.1 and 8.1 percent lead, 222 and 863 grams of silver per tonne, and anomalous gold and copper. The Drumstick prospect is within a 1,100-meter-long by approximately 120-meter-wide soil anomaly marked by lead values of 100 to 7,980 parts per million. The anomaly coincides with subtle vegetation 'kill zones', similar to the one at the LWM prospect (EA 102), 22 kilometers to the northeast.

Stevens (2010) reports that 8 holes were drilled at the Drumstick prospect in 2008. Some notable intercepts are: 1) 1.4 meters that averaged 44.5 grams of silver per tonne, 2.27 percent lead, and 11.75 percent zinc; 2) 6.03 meters that averaged 3 grams of silver per tonne and 0.16 percent zinc; and 3) 1 meter that averaged 14 grams of silver per tonne, 0.39 percent lead, and 1.67 percent zinc.

Alteration:

Not specifically noted.

Age of mineralization:

Probably Jurassic or younger based on nearby Jurassic plutons.

Generic deposit model:

Deposit model:

Silver-lead-zinc carbonate replacement deposit (Cox and Singer, 1986; model 19a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

19a

Production Status: None

Site Status: Active

Workings/exploration:

Probably undocumented prospecting and sampling as far back as the 1980s. In 2008 being explored by Full Metal Minerals and they drilled 8 holes that year.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Dashevsky, S.S., Nicol, D.L., and Bond, J., 1986, Mines, prospects, and geochemical anomalies on Doyon Limited regional overselection lands, Alaska, Blocks 1-8: Doyon, Ltd. Report 86-01a, 300 p. (Report held by Doyon, Ltd., Fairbanks, Alaska).

Foster, H.L., Albert, N.R.D., Barnes, D.F., Curtin, G.C., Griscom, Andrew, Singer, D.A., and Smith, J.G., 1976, The Alaskan Mineral Resources Assessment Program; Background information to accompany folio of geologic and mineral resource maps of the Tanacross quadrangle, Alaska: U.S. Geological Survey Circular 734, 23 p.

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Full Metals Minerals, 2008, Full Metal reports high grade assay results from LWM prospect: /www.fullmetalminerals.com/s/NewsReleases.asp?ReportID=283603&_Type=News&_Title=Full-Metal-Reports-High-Grade-Assay-Results-from-LWM-Prospect-40-Mile-Prope... (News Release, Jan 29, 2008)

Full Metal Minerals, 2008, (Map showing LWC drill sites): http://www.fullmetalminerals.com/in/misc/LWM-drill.gif (as of March 4, 2008).

Stevens, D.L., 2010, 40-Mile project, Fortymile Mining District, East-Central Alaska: Unpublished NI 43-101 report for Full Metal Zinc Ltd. and Full Metal Minerals Ltd., 177 p. (posted on www.sedar.com, April 21, 2011).

Primary Reference: Stevens, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Twin Peaks; Napoleon

Site type: Prospect

ARDF no.: EA167

Latitude: 64.1698 **Quadrangle:** EA A-2

Longitude: 141.5601

Location description and accuracy:

This prospect is about 2.2 miles east of peak 3750, just northeast of the head of Napoleon Creek. It is about 0.5 mile north of the center of section 31,T. 28 N., R. 20 E. This prospect is often combined with the nearby Main Zone, Saddle Zone, and Trench 24 sites (EA115) and with the Burnt Ridge (EA168) prospects under the name Napoleon or Napoleon Block/claims.

Commodities:

Main: Ag, Au, Pd, Pt

Other:

Ore minerals: Gold, hematite, pyrite

Gangue minerals: Carbonate, chlorite, epidote, K-feldspar, quartz, sericite

Geologic description:

The Twin Peaks prospect is about 2 miles east of ARDF site EA115. Although it is a discrete mineralized area, it is along the same regional structure and shares the same characteristics and origin. The Twin Peaks prospect, like those to the west, is in the Napoleon pluton which is roughly equidimensional and about 4 miles wide. The pluton is mainly weakly to strongly foliated hornblende quartz monzonite. Hornblende from this pluton gives a Jurassic 40Ar/39Ar plateau age of 186.5 +/- 1.3 Ma (Layer and others, 2002). The pluton contains small bodies of biotite clinopyroxenite and coarse-grained hornblende gabbro, which form inclusions, dikes, and/or marginal phases (Werdon and others, 2001). Clinopyroxenite bodies within the Napoleon pluton contain as much as 25 parts per billion (ppb) platinum and 6 ppb palladium (Werdon and others, 2000). Biotite clinopyroxenite dikes, which are compositionally and texturally similar to those in the northeastern Eagle quadrangle, give K-Ar ages of 184-185 Ma (Newberry and others, 1996). The Napoleon pluton and the inclusions/dikes of clinopyroxenite and hornblende gabbro are cut by minor, granite aplite-pegmatite dikes of unknown age. The Napoleon pluton intrudes amphibolite-facies amphibolite, quartzite, paragneiss, marble, orthogneiss, and minor schist (Werdon and others, 2001). The Napoleon pluton and surrounding country rocks are cut and offset by high-angle faults.

Airborne magnetic and resistivity surveys were flown in the Fortymile Mining district in 1998 (Alaska Division of Geological and Geophysical Surveys and others, 1999). In 1998 and 1999, Kennecott Exploration did detailed soil- and rock sampling, and airborne and ground geophysical surveys which led to the discovery of the Twin Peaks mineralization (Jones and Olson, 1999; Eden, 2010). In 1999, Kennecott drilled 16 holes on similar mineralization to the west (EA115 and EA New G1002) but dug only one trench at Twin Peaks. Encouraged by strong geochemical anomalies, Teck Resources drilled one hole at Twin Peaks in 2001. A large block of claims was staked over the property in 2007 by Millrock Resources Inc., the current owners of the property (Millrock, 2011) and they have done considerable rock and soil sampling in the area.

While not as well known as the mineralization at site EA115 about two miles to the west, the Twin Peaks mineralization is almost certainly controlled by a major east-west trending shear zone that has been traced along strike for at least 4 miles (Eden, 2010). As best exposed in the Main Zone propsect (EA115), this shear zone is at least 150 feet wide. Along this shear zone, the Napoleon pluton is cut by several discrete

swarms of narrow quartz veins, including at this prospect. These veins typically strike northwest or north-northeast and dip steeply south. These veins are up to 12 inches thick, and consist of mainly of quartz +/- pyrite +/- hematite +/- epidote +/- carbonate +/- rare visible gold. Vein selvages commonly contain K-feldspar, some of which is partly replaced by sericite. Sericite-altered K-feldspar from the selvage of a gold + pyrite + quartz vein gave a Cretaceous 40Ar/39Ar isochron age of 127.8 +/- 1.6 Ma (Layer and others, 2002); this is approximately 60 Ma younger than the Napoleon pluton and is tentatively interpreted to reflect the time of mineralization. Quartz vein samples contained up to 15 ounces of gold per ton and rarely less than 0.2 ounce of gold per ton. The best intercept in the 2001 Teck drilling at Twin Peaks was 7.6 meters that contained 2.69 grams of gold per tonne.

Jones and Olson (1999) classified the prospect as a porphyry gold deposit. More recently, Eden (2010) classified it as a plutonic related gold-quartz vein deposit as defined by Lefebure and Hart (2005).

Alteration:

K-feldspar adjacent to quartz veins is partly altered to sericite.

Age of mineralization:

Sericite-altered K-feldspar from the selvage of a gold- quartz vein gave a Cretaceous 40Ar/39Ar isochron age of 127.8 +/- 1.6 Ma (Layer and others, 2002); this is tentatively interpreted to reflect the time of mineralization.

Generic deposit model:

Deposit model:

Plutonic related gold-quartz vein deposit (Lefebure and Hart, 2005).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

In 1998 and 1999, Kennecott carried out detailed soil- and rock sampling, and airborne and ground geophysical surveys which led to the discovery of the Twin Peaks prospect (Jones and Olson, 1999; Eden, 2010). In 1999, Kennecott drilled 16 holes on similar mineralization to the west (EA115 and EA168) but dug only one trench at Twin Peaks. Encouraged by strong geochemical anomalies, Teck Resources drilled one hole in 2001 at Twin Peaks. A large block of claims was staked over the property in 2007 by Millrock Resources Inc., the current owners of the property (Millrock, 2011) and they did considerable rock and soil sampling in the area.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Alaska Division of Geological and Geophysical Surveys, Geoterrex-Dighem, and Stevens Exploration Management Corporation, 1999, CD-ROM containing profile and gridded data and section lines of 1997 geophysical survey data for part of the Fortymile mining district, Alaska, southern Eagle and northern

Tanacross quadrangles: Alaska Division of Geological and Geophysical Surveys Public-Data File 99-9, 2 CD-ROMs.

Eden, Karsten, 2010, Napoleon claim block, Forty Mile mining district, east-central Alaska, April 8, 2010: Unpublished NI43-101 report, 96 p. (posted on www.sedar.com, April 14, 2010).

Jones, S. and Olson, D., 1999, Napoleon Project Report: Kennecott Exploration Company unpublished report, 13 p.

Layer, P.W., Drake, J., and Szumigala, D.J., 2002, 40Ar/39Ar dates for mineralization and igneous and metamorphic rocks in a portion of the Fortymile mining district, Eagle quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Preliminary Interpretive Report.

Lefebure, D.V., and Hart, C., 2005, Plutonic-related Au quartz veins and veinlets, model L02, in Fonseca, A.,and Bradshaw, G., eds., Yukon mineral deposit profiles: Yukon Geological Survey Open File Report 2005-5, p.121-128.

Millrock Resources Inc., 2011, Fortymile: http://www.millrockresources.com/projects/fortymile/ (as of February 6, 2011).

Newberry, R.J., Layer, P.W., Burleigh, R.E., and Solie, D.N., 1996, New 40Ar/39Ar dates for intrusions and mineral prospects in the eastern Yukon-Tanana terrane, Alaska - Regional patterns and significance, in Gray, J.E., and Riehle, J.R., eds., Geological Studies in Alaska by the U.S. Geological Survey, 1996: U.S. Geological Survey Professional Paper 1595, p. 131-159.

Werdon, M.B., Newberry, R.J., and Szumigala, D.J., 2001, Bedrock geologic map of the Eagle A-2 quadrangle, Fortymile mining district, Alaska: Alaska Division of Geological and Geophysical Surveys Preliminary Interpretive Report 2001-3b, 1 sheet, scale 1:63,360.

Werdon, M.B., Szumigala, D.J., Newberry, R.J., Grady, J.C., and Munly, W.C., 2000, Major oxide, minor oxide, trace element, rare-earth element, and geochemical data from rocks collected in Eagle and Tanacross quadrangles, Alaska in 2000: Alaska Division of Geological and Geophysical Surveys Raw-Data File 2000-4, 27 p., 3 sheets, scale 1:63,360.

Primary Reference: Eden, 2010

Reporter(s): M.B. Werdon (ADGGS, 2000); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Burnt Ridge; Napoleon

Site type: Prospect

ARDF no.: EA168

Latitude: 64.1554 **Quadrangle:** EA A-2

Longitude: 141.6189

Location description and accuracy:

This prospect is about 1 mile southeast of peak 3750, about 0.6 mile west of the fork at the head of Napoleon Creek. It is about 0.6 mile north-northeast of the center of section 2, T. 27 N., R.19 E. This prospect is sometimes combined with the nearby Main Zone, Saddle Zone, and Trench 24 prospects (EA115) and with the Twin Peaks (EA167) prospects under the name Napoleon or Napoleon Block/claims.

Commodities:

Main: Ag, Au, Pd, Pt

Other:

Ore minerals:

Gangue minerals: Carbonate, chlorite, epidote, K-feldspar, quartz, sericite

Geologic description:

The Burnt Ridge prospect like those at the nearby prospects EA115 and EA167 to the north is within the Napoleon pluton, a roughly roughly equidimensional stock about 4 miles wide. The pluton is mainly weakly to strongly foliated hornblende, quartz monzonite. Hornblende from this pluton gives a Jurassic 40Ar/39Ar plateau age of 186.5 +/- 1.3 Ma (Layer and others, 2002). The pluton contains small bodies of biotite clinopyroxenite and coarse-grained hornblende gabbro, which form inclusions, dikes, and/or marginal phases (Werdon and others, 2001). Clinopyroxenite bodies within the Napoleon pluton contain as much as 25 parts per billion (ppb) platinum and 6 ppb palladium (Werdon and others, 2000). Biotite clinopyroxenite dikes, which are compositionally and texturally similar to those in the northeastern Eagle quadrangle, give K-Ar ages of 184-185 Ma (Newberry and others, 1996). The Napoleon pluton and the inclusions/dikes of clinopyroxenite and hornblende gabbro are cut by minor, granite aplite-pegmatite dikes of unknown age. The Napoleon pluton intrudes amphibolite-facies amphibolite, quartzite, paragneiss, marble, orthogneiss, and minor schist (Werdon and others, 2001). The Napoleon pluton and surrounding country rocks are cut and offset by high-angle faults.

Airborne magnetic and resistivity surveys were flown in the Fortymile Mining district in 1998 (Alaska Division of Geological and Geophysical Surveys and others, 1999). In 1998 and 1999, Kennecott Exploration did detailed soil- and rock sampling, and airborne and ground geophysical surveys which led to the discovery of the Burnt Ridge mineralization (Jones and Olson, 1999; Eden, 2010). In 1999, they drilled 13 holes on similar mineralization to the north (EA115) and 3 holes on Burnt Ridge. A large block of claims was staked over the property in 2007 by Millrock Resources Inc., the current owners of the property (Millrock, 2011) and they have done considerable rock and soil sampling in the area.

While not as well known as the similar mineralization to the north at ARDF site EA115, the Burnt Ridge mineralization is probably related to a major east-west striking shear zone exposed to the north or a similar parallel structure. This shear zone is at least 150 feet thick and contains several swarms of narrow sulfide-bearing quartz veins. The veins typically strike northwest or north-northeast and dip steeply south. The veins are up to 12 inches thick, and consist of mainly of quartz +/- pyrite +/- hematite +/- epidote +/- carbonate +/- rare visible gold. Vein selvages commonly contain K-feldspar, some of which is partly replaced by sericite. Sericite-altered K-feldspar from the selvage of a gold + pyrite + quartz vein gave a

Cretaceous 40Ar/39Ar isochron age of 127.8 +/- 1.6 Ma (Layer and others, 2002); this is approximately 60 Ma younger than the Napoleon pluton and is tentatively interpreted to reflect the time of mineralization. Samples of the quartz veins contain up to 15 ounces of gold per ton and rarely contain less than 0.2 ounces of gold per ton. The best intercept in the 1999 Burnt Ridge drilling was 35 feet that averaged 1.413 grams of gold per tonne; it included 5 feet that contained 6.56 grams of gold per tonne.

Jones and Olson (1999) classified the prospect as a porphyry gold deposit. More recently, Eden (2010) classified it as a plutonic related gold-quartz vein deposit as defined by Lefebure and Hart (2005).

Alteration:

Age of mineralization:

Sericite-altered K-feldspar from the selvage of a gold- quartz vein gave a Cretaceous 40Ar/39Ar isochron age of 127.8 +/- 1.6 Ma (Layer and others, 2002); this is tentatively interpreted to reflect the time of mineralization.

Generic deposit model:

Deposit model:

Plutonic related gold-quartz vein deposit (Lefebure and Hart, 2005).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

In 1998 and 1999, Kennecott did detailed soil- and rock sampling in the area as well as airborne and ground geophysical surveys which led to the discovery of the Burnt Ridge mineralization (Jones and Olson, 1999; Eden, 2010). In 1999, they drilled 13 holes on similar mineralization to the north (EA115) and 3 hole on Burnt Ridge. The best intercept was 35 feet that averaged 1.413 grams of gold per tonne; it included 5 feet that contained 6.56 grams of gold per ton Teck Resources drilled one hole at the Burnt Ridge prospect in 2001. A large block of claims was staked over the property in 2007 by Millrock Resources Inc., the current owners of the property (Millrock, 2011) and they have done considerable rock and soil sampling in the area.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Alaska Division of Geological and Geophysical Surveys, Geoterrex-Dighem, and Stevens Exploration Management Corporation, 1999, CD-ROM containing profile and gridded data and section lines of 1997 geophysical survey data for part of the Fortymile mining district, Alaska, southern Eagle and northern Tanacross quadrangles: Alaska Division of Geological and Geophysical Surveys Public-Data File 99-9, 2 CD-ROMs.

Eden, Karsten, 2010, Napoleon claim block, Forty Mile mining district, east-central Alaska, April 8, 2010: Unpublished NI43-101 report, 96 p. (posted on www.sedar.com, April 14, 2010).

Jones, S. and Olson, D., 1999, Napoleon Project Report: Kennecott Exploration Company unpublished report, 13 p.

Layer, P.W., Drake, J., and Szumigala, D.J., 2002, 40Ar/39Ar dates for mineralization and igneous and metamorphic rocks in a portion of the Fortymile mining district, Eagle quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Preliminary Interpretive Report. [In preparation in 2002]

Lefebure, D.V., and Hart, C., 2005, Plutonic-related Au quartz veins and veinlets, model L02, in Fonseca, A.,and Bradshaw, G., eds., Yukon mineral deposit profiles: Yukon Geological Survey Open File Report 2005-5, p.121-128.

Millrock Resources Inc., 2011, Fortymile: http://www.millrockresources.com/projects/fortymile/ (as of February 6, 2011).

Newberry, R.J., Layer, P.W., Burleigh, R.E., and Solie, D.N., 1996, New 40Ar/39Ar dates for intrusions and mineral prospects in the eastern Yukon-Tanana terrane, Alaska - Regional patterns and significance, in Gray, J.E., and Riehle, J.R., eds., Geological Studies in Alaska by the U.S. Geological Survey, 1996: U.S. Geological Survey Professional Paper 1595, p. 131-159.

Werdon, M.B., Newberry, R.J., and Szumigala, D.J., 2001, Bedrock geologic map of the Eagle A-2 quadrangle, Fortymile mining district, Alaska: Alaska Division of Geological and Geophysical Surveys Preliminary Interpretive Report 2001-3b, 1 sheet, scale 1:63,360.

Werdon, M.B., Szumigala, D.J., Newberry, R.J., Grady, J.C., and Munly, W.C., 2000, Major oxide, minor oxide, trace element, rare-earth element, and geochemical data from rocks collected in Eagle and Tanacross quadrangles, Alaska in 2000: Alaska Division of Geological and Geophysical Surveys Raw-Data File 2000-4, 27 p., 3 sheets, scale 1:63,360.

Primary Reference: Eden, 2010

Reporter(s): M.B. Werdon (ADGGS; 2000); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): West Eva

Site type: Prospect

ARDF no.: EA169

Latitude: 61.134 **Quadrangle:** EA A-5

Longitude: 143.3377

Location description and accuracy:

The West Eva prospect is near hill 3812, about 2 miles northeast of the junction of My Creek and Molly Creek. Two holes were drilled about 0.5 mile apart and the coordinates are between them, about 0.3 mile west of the center of section 7, T. 27 N., R. 11 E. The location is accurate.

Commodities:

Main: Ag, Cu, Pb, Zn

Other:

Ore minerals: Galena?, sphalerite?

Gangue minerals:

Geologic description:

There was little information about the West Eva prospect until Full Metal Minerals Inc. began to work in the area in 2006. The country rocks in the area are amphibolite-facies Paleozoic metamorphic rocks of the 40-Mile assemblage (Stevens, 2010). The West Eva prospect is marked by geochemical soil anomalies in lead, silver, zinc. Full Metal explored the anomalies with two holes that were drilled in 2010, one 192 meters deep and the other 298 meters deep. The best intercepts were three, 6-meter intervals with 15-30 grams of silver per tonne, 0.0 to 0.04 percent copper, 0.36 to 0.96 percent lead, and 0.04 to 0.6 percent zinc; and a 1.4 meter intercept with 23 grams of silver per tonne, 0.01 percent copper, 0.5 percent lead, and 0.33 percent zinc.

Alteration:

Not specified.

Age of mineralization:

Younger than the Paleozoic host rocks.

Generic deposit model:

Deposit model:

Insufficient information to assign.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Gridded geochemical sampling, surface mapping, and 2 holes drilled in 2010 by Full Metal Minerals Inc.

Production notes:

None.

Reserves:

None.

Additional comments:

The West Eva prospect is on Doyon, Ltd. selected or conveyed land. For more information contact Doyon, Ltd., Fairbanks, Alaska.

References:

Stevens, D.L., 2010, 40-Mile project, Fortymile Mining District, East-Central Alaska: Unpublished NI 43-101 report for Full Metal Zinc Ltd. and Full Metal Minerals Ltd., 177 p. (posted on www.sedar.com, April 21, 2011).

Primary Reference: Stevens, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Maple Leaf

Site type: Prospect

ARDF no.: EA170

Latitude: 64.4013 **Quadrangle:** EA B-6

Longitude: 143.9333

Location description and accuracy:

The Maple Leaf prospect is located 2 miles north of Eisenmenger Fork, Goodpaster River; 0.6 mile from the center of section 11, T. 6 S., R. 19 E., of the Fairbanks Meridian. This location is accurate to within 500 feet.

Commodities:

Main: Au

Other: As, Bi, Mo, Te

Ore minerals: Arsenopyrite, bismuthinite, gold, molybdenite

Gangue minerals: Quartz, sericite

Geologic description:

The Maple Leaf prospect is located in the eastern edge of the Goodpaster Mining District, and it was discovered during regional pan concentrate and stream sediment sampling conducted by Avalon Development Corp. for Evanachan Ltd. in the fall of 2006 (Freeman, 2015).

The primary host rocks at the Maple Leaf prospect are Cretaceous(?) age unfoliated biotite granite and biotite quartz monzonite. These rocks are fine- to medium-grained, equigranular and contain abundant quartz and biotite. There are numerous dikes of the biotite granite-quartz monzonite cutting the gneissic country rocks. Sulfide-bearing auriferous quartz veins are hosted in dikes of this unit. Maple Leaf is structurally bounded by numerous northeast-trending, near-vertical faults, which may control gold mineralization (Freeman, 2015).

Mineralization is characterized by sugary textured quartz veins and locally by vein stockworks of variable orientation associated with intrusive and country rock (gneisses) containing trace to 2 percent sulfides characterized by arsenopyrite +/- bismuthinite +/- molybdenite and, locally, visible gold. Outcrop in the area is limited and solifluction has clearly transported float boulders down slope. Vein widths range from less than 1.0 meter to vein stockworks over 1-3 meters. Large (0.5 by 0.25 meter) boulders containing bismuthinite-bearing veins noted from the prospective area have not yet been traced to their source although, given the topography, the source is likely local (Freeman, 2014).

Samples from work in 2006 of a quartz vein boulder float/train and from stream sediment and pan concentrate samples in surrounding drainages identified a 10 kilometer by 7.0 kilometer area with greater than 100 parts per million (ppm) arsenic stream silt and pan concentrate anomaly. Within this area quartz vein samples interpreted as bedrock or sub-crop returned anomalous gold (from trace up to 12 grams per tonne). Evanachan Ltd. was acquired by Rubicon Minerals in early 2007 and follow up work, including limited diamond drilling (1,105 meters in 4 holes), was conducted in 2007.

Assays of grab rock samples collected in 2007 returned gold values from trace to 19.1 grams per tonne with 19 samples (total 114 rock samples) containing gold in excess of 1.0 gram of gold per tonne with an average of 5.2 grams of gold per tonne. Gold is associated with elevated bismuth (up to 7,700 ppm), tellurium (up to 280 ppm) and variable arsenic (Freeman, 2014).

Alteration:

Moderate to weak sericite alteration in biotite quartz monzonite adjacent to sugary textured quartz veins, which host the gold mineralization (Freeman, 2015).

Age of mineralization:

Cretaceous or younger based on age of host rock (Freeman, 2015).

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Inactive

Workings/exploration:

The Maple Leaf prospect was discovered during regional pan concentrate and stream sediment sampling conducted by Avalon Development Corp. for Evanachan Ltd. in the fall of 2006. Follow up rock and grab samples were collected that year (Freeman, 2014).

In 2007, Avalon Development managed a diamond core drilling program for Rubicon on the Maple Leaf prospect. The program included 1,105 meters of drilling in four holes. Drilling beneath surface gold-quartz vein showings intersected weakly anomalous (up to 0.25 gram of gold per tonne over 0.8 meter) but did not intersect vein style mineralization similar to that observed on the surface (Freeman, 2014). Values up to 19 grams of gold per tonne were assayed (Freeman, 2014).

The land was open to mineral entry until staked by Anglo Alaska Gold Corp. in 2011 and assessment-level work has been conducted by Anglo Alaska since 2011 (Freeman, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

According to Freeman (2015), after the 2007 drilling, no other work was conducted on the Maple Leaf prospect and in the fall of 2008, Rubicon dropped the claims covering these prospects. No significant mineral exploration has been conducted on the prospect since that time.

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Freeman, C.J., 2014, Avalon Development Corp., Prospect Submittal Summary: Maple Leaf: http://www.avalonalaska.com/ML-2014-Summary-1.pdf (as of Sept. 20, 2014).

Freeman, C.J., 2015, Maple Leaf Gold Prospect, Avalon Development Corporation Summary Report 2015 : http://www.avalonalaska.com/ML-2015-Summary-1.pdf (as of July 17, 2015).

Primary Reference: Freeman, 2015

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.), F.H. Wilson (USGS)

Last report date: 2016-03-15

Site name(s): Ninja Jim

Site type: Occurrence

ARDF no.: EA171

Latitude: 64.0714 **Quadrangle:** EA A-2

Longitude: 141.8729

Location description and accuracy:

The Ninja Jim prospect is located 0.8 mile southeast from the center of section 33, T. 27 N., R. 18 E., of the Copper River Meridian. Ninja Jim is located 1.9 miles east from the town of Chicken. This location is accurate to within 30 feet of the center of the prospect.

Commodities:

Main: Au

Other: Cu, Pb, Sb, Zn

Ore minerals: Arsenopyrite, chalcopyrite, cinnabar, gold, stibnite

Gangue minerals: Calcite, quartz

Geologic description:

Ninja Jim is a prospect within the Chicken (EA9901) claim block, composed of a claim block of 12 claims held by Millrock Resources Inc. in the Fortymile mining district. The Ninja Jim prospect is named after Alaskan prospector Jim McLaughlin, who discovered the Golden Eagle lode prospect on McKinley Creek (Still and others, 1991). This area is underlain by older metamorphic rocks and younger igneous rocks. The metamorphic rocks have been dated from upper Paleozoic to Devonian with several undated units considered to be Pre-Mississippian. Metamorphic protoliths include both sedimentary and igneous rocks. The metamorphic rocks are intruded by Cretaceous, equigranular to porphyritic, felsic to intermediate igneous bodies (Foster, 1970). Gold mineralization is most commonly found in quartz and calcite veins associated with arsenopyrite, chalcopyrite, cinnabar, stibnite and other sulfide minerals (Millrock Resources Inc., 2014).

Millrock has been working the Fortymile area since 2007 conducting geochemical sampling programs at the Chicken claim block (Millrock Resources Inc., 2014). In 2008, 25 rock samples collected over 400 meters along the stream reach at Ninja Jim averaged 0.6 part per million (ppm) gold. Two rock samples collected at the head of the stream measure 3.54 ppm gold and 3.39 ppm gold (Negri, K., Database/IT/GIS Manager, Millrock Resources Inc., written communication, 2014).

Alteration:

Age of mineralization:

Age of gold mineralization in the area is known to be prolific around 135 million years ago related to felsic to intermediate intrusions (Millrock Resources Inc., 2014).

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

Millrock has been working the Fortymile area since 2007 conducting geochemical sampling programs at the Chicken claim block (Millrock Resources Inc., 2014). In 2008, 25 rock samples collected over 400 meters along the stream reach at Ninja Jim averaged 0.6 part per million (ppm) gold. Two rock samples collected at the head of the stream measure 3.54 ppm gold and 3.39 ppm gold (Negri, K., Database/IT/GIS Manager, Millrock Resources Inc., written communication, 2014).

Ninja Jim is near the adit of the Highway Copper lode deposit (EA130), which was explored for copper and gold in the 1960s and 1970s (Eberlein and others, 1977).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Eberlein, G.D., Chapman, R.M., Foster, H.L., and Gassaway, J.S., 1977, Map and table describing known metalliferous and selected nonmetalliferous mineral deposits in central Alaska: U.S. Geological Survey Open-File Report 77-168-D, 132 p., 1 map sheet, scale 1:1,000,000.

Foster, H.L., and Clark, S.H.B., 1970, Geochemical and geologic reconnaissance of a part of the Fortymile area, Alaska: U.S. Geological Survey Bulletin 1312-M, p. M1-M29.

Still, J.C., Hoekzema, R.B., Bundtzen, T.K., Gilbert, W.G., Wier, K.R., Burns, L.E., and Fechner, S.A., 1991, Economic geology of Haines-Klukwan-Porcupine area, southeastern Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 91-4, 156 p., 5 sheets, scale 1:63,360.

Millrock Resources Inc., 2014, Fortymile Project Overview: http://www.millrockresources.com/projects/fortymile (as of December 18, 2014).

Primary Reference: Millrock Resources Inc., 2014

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-18

Site name(s): Maple Leaf

Site type:

ARDF no.: EA172

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:
This records was a duplicate of EA170 Maple Leaf prospect.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Primary Reference:

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.), F.H. Wilson (USGS)

Last report date: 2016-03-15

Site name(s): Tourmaline Ridge

Site type: Occurrence

ARDF no.: EA173

Latitude: 64.402 **Quadrangle:** EA B-6

Longitude: 143.987

Location description and accuracy:

The Tourmaline Ridge occurrence is located 1 mile northeast of the Eisenmenger Fork, Goodpaster River; about 0.5 mile north from the center of section 16, T. 6 S., R. 19 E., of the Fairbanks Meridian (Freeman, 2014). This location is approximate, although probably, accurate to within one mile.

Commodities:

Main: Au

Other: As, Bi

Ore minerals: Gold

Gangue minerals: Quartz, sericite, tourmaline

Geologic description:

The Tourmaline Ridge prospect is located in the eastern edge of the Goodpaster Mining District, and it was discovered in 2007 by Avalon Development Corporation. The upper 150 meters on this ridge, extending for about 800 meters along the ridge crest, is composed of tourmaline-bearing paragneiss containing massive tourmalinite (50 percent tourmaline) with lesser quartz veins and tourmaline-vein breccias. Numerous dikes of granite, ranging from less than 1 to 3 meters wide intrude the tourmaline-rich gneissic rocks and often contain tourmaline along the dike margins (Freeman, 2014).

Sampling of the tourmaline-rich rocks has returned weakly elevated gold (maximum 164 parts per billion (ppb)), up to 804 parts per million (ppm) bismuth and up to 2,620 ppm arsenic. The intensity and extent of tourmaline indicates that a fluid-rich intrusive-related mineralizing system is present on a large scale in the general Maple Leaf (EA9901) area (Freeman, 2014).

Alteration:

Age of mineralization:

Cretaceous or younger based on age of host rock (Freeman, 2014).

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

The Tourmaline Ridge prospect was discovered in 2007 by Avalon Development Corporation. The prospect was rock sampled in 2007 and assays returned weakly elevated gold numbers (maximum 164 parts per billion (ppb)), up to 804 parts per million (ppm) bismuth and up to 2,620 ppm arsenic (Freeman, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Freeman, C.J., 2014, Avalon Development Corp., Prospect Submittal Summary: Maple Leaf, 7 p.: http://www.avalonalaska.com/ML-2014-Summary-1.pdf (as of Sept. 20, 2014).

Primary Reference: Freeman, 2014

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): American Eagle

Site type: Occurrence

ARDF no.: EA174

Latitude: 64.4366 **Quadrangle:** EA B-6

Longitude: 143.8524

Location description and accuracy:

The American Eagle prospect is located 5 miles northeast from the of Eisenmenger Fork, Goodpaster River; about 0.1 mile southeast from the center of section 21, T. 5 S., R. 20 E., of the Fairbanks Meridian. This location is approximate although probably accurate to within one mile.

Commodities:

Main: Au

Other: As, Bi, Mo, Te

Ore minerals:

Gangue minerals: Quartz, sericite

Geologic description:

The American Eagle occurrence is located in the eastern edge of the Goodpaster Mining District, and it was discovered in 2007 during exploration work for Rubicon Minerals by Avalon Development Corp by a sampling program including steam sediment, pan concentrate samples, and rock sampling in the area.

The primary host rocks at the American Eagle prospect is Cretaceous(?) age unfoliated biotite granite and biotite quartz monzonite. These rocks are fine- to medium-grained, equigranular and contain abundant quartz and biotite. There are numerous dikes of this biotite granite-quartz monzonite cutting the gneissic country rocks. Sulfide-bearing auriferous sheeted white quartz veins ranging from 0.1 to 1.0 cm thick are hosted in dikes of this unit. Vein material makes up 5 percent-10 percent of the country rock over an area of 400 by 50 meters. Quartz veins at American Eagle host extremely course grained bismuthinite in flat,sometimes deformed tabular plates ranging up to 1.0 cm in maximum dimensions. The bismuth-bearing veins have not been seen in outcrop and occur on a coarse boulder-strewn talus slope just below a flat ridge line. Limited grab sampling along this ridge has returned gold values ranging from trace to 3.03 gpt gold, up to 3,880 ppm bismuth, up to 5,610 ppm arsenic and up to 494 ppm molybdenum. The full extent of this mineralization is unknown due to extensive talus cover (Freeman, 2014).

Samples from a quartz boulder train and from steam sediment and pan concentrate samples in surrounding drainages in 2006 identified a 10 kilometer by 7.0 kilometer, greater than 100 ppm arsenic stream silt and pan concentrate anomaly within which samples of quartz veins interpreted as bedrock or sub-crop returned anomalous gold (from trace up to 12 gpt) (Freeman, 2014).

Assays of grab rock samples collected in 2007 returned gold values from trace to 19.1 gpt with 17 percent of samples (total 114 rock samples) containing gold in excess of 1.0 gpt gold with an average of 5.2 gpt gold (Freeman, 2014).

Alteration:

Moderate to weak sericite alteration adjacent to sugary textured quartz veins which host the gold mineralization (Freeman, 2014).

Age of mineralization:

Cretaceous or younger based on age of host rock (Freeman, 2014).

Generic deposit model:

Deposit model:

Gold-quartz veins that contain bismuth and tellurium? (Cox and Singer, 1986; model 22c?)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Probably inactive

Workings/exploration:

The American Eagle occurrence was discovered during regional pan concentrate and stream sediment sampling conducted by Avalon Development Corp. for Evanachan Ltd. in the fall of 2006. Follow up rock and grab samples were collected that year (Freeman, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Freeman, C.J., 2014, Avalon Development Corp., Prospect Submittal Summary: Maple Leaf, 7 p.: http://www.avalonalaska.com/ML-2014-Summary-1.pdf (as of Sept. 20, 2014).

Thomas, B.I., 1970, Reconnaissance of the gold-bearing quartz veins in the Tibbs Creek area, Goodpaster River, Big Delta quadrangle, central Alaska: U.S. Bureau of Mines Open-File Report 14-70, 12 p., 3 sheets.

Primary Reference: Freeman (2014)

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-09

Site name(s): Unnamed (near Crescent Creek)

Site type: Occurrence

ARDF no.: EA175

Latitude: 64.9654 **Quadrangle:** EA D-6

Longitude: 143.6824

Location description and accuracy:

An unnamed tungsten occurrence is located on the north bank of Crescent Creek at the confluence of an unnamed northerly tributary stream. The site lies about 2 miles west of Beverly Creek, which is another tributary to Crescent Creek. All local drainages are to the Charley River, located east of the site. The occurrence is in the SE1/4 sec. 28, T. 2 N., R. 20 E., of the Fairbanks Meridian, and the location given is the approximate midpoint of an area of hornfels boulders. Accuracy of the location is about 1,000 feet.

Commodities:

Main: W

Other: Li, Sn

Ore minerals: Cassiterite, scheelite

Gangue minerals: Amphibole, chlorite, epidote, garnet, muscovite, quartz, sericite, tourmaline

Geologic description:

Local igneous rocks, mostly biotite-quartz monzonite and its more felsic segregations, are part of a much larger Mesozoic to Tertiary age intrusive complex in east-central Alaska (Foster and others, 1973; Foster, 1976; Brabb and Churkin, 1969). North of Crescent Creek the granitic rocks intrude biotite gneiss, amphibolite and subordinate quartz-biotite gneiss, schist, and marble (Foley and Barker, 1981). Near this site leucocratic aplite dikes are also common. Contact margins between these rocks are locally retrograded to plagioclase- and pyroxene-hornfels and banded calc-silicate.

Near the confluence of an unnamed creek with Crescent Creek green siliceous carbonate rock with scheelite occurring as layered and dissemination of aggregate grains is reported, as well as minor disseminated scheelite in some granitic boulders (Foley and Barker, 1981). Locally minor scheelite also occurs as isolated interstitial grains in aplite and within quartz veinlets cutting these dike rocks. Minor constituent minerals in the aplite groundmass include garnet, tourmaline, muscovite and epidote. Dravite-filled fractures in granitic rock and disseminated scheelite are noted in the vicinity. Lithium in the granitic rocks was also found substantially anomalous. Local areas of sericite greisen occur in the quartz monzonite along joints and faults. Placer scheelite occurs in the stream bed about two miles upstream (Foley and Barker, 1981).

Alteration:

Silicification and greisen formation with scheelite and minor cassiterite (Foley and Barker, 1981).

Age of mineralization:

Granitic rocks that host primary scheelite occurrences are believed to be Cretaceous with some subordinate granitic rocks of early Tertiary age (Brabb and Churkin, 1969; Foster, 1976). Mineralization appears concordant with the younger (Tertiary) intrusive phase.

Generic deposit model:

Deposit model:

Tungsten greisen (Cox and Singer, 1986; model 15c); Skarn tungsten (Cox and Singer, 1986; model 14a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

15c, 14a

Production Status: None

Site Status: Inactive

Workings/exploration:

This unnamed tungsten occurrence was selected for study by the U.S. Bureau of Mines in 1977 because reconnaissance sampling had defined a broad southeasterly trend of mostly poorly known or unreported tungsten occurrences beginning near Pinnell Mountain in the Circle mining district and extending eastward across the headwaters of the Charley and Seventy Mile Rivers (Barker, 1978; Foley and Barker, 1981). Stream sediment and heavy mineral surveys of the upper Charley River basin were part of the Bureau's land assessment surveys for the proposed Alaska Lands legislation. The occurrences of tungsten mineralization first reported in 1978, were later studied and reported in greater detail in 1981 (Foley and Barker, 1981) and included ultraviolet scanning of the occurrence near Crescent Creek. Twelve samples of granitic rocks from this site, located about 2 miles west of Beverly Creek, were analyzed for lithium and tungsten, yielding lithium values ranging from less than 20 to more than 1,000 parts per million (ppm). Tungsten values were generally less than 20 ppm, though one quartz monzonite sample yielded 1357 ppm tungsten and a hornfels sample 96 ppm tungsten.

Production notes:

None.

Reserves:

None.

Additional comments:

The assessment of the Crescent Creek tungsten occurrence was done in 1977-1978; the occurrence is now within the Yukon-Charley Rivers National Preserve and mineral development is prohibited.

References:

Barker, J.C., 1978, Tanana - Yukon Uplands, A summary report: U.S. Bureau of Mines Open File Report 88-78, 32 p., 2 plates.

Brabb, E.E., and Churkin, M.J., Jr., 1969, Geologic map of the Charley River quadrangle, East-central Alaska: U.S. Geological Survey Miscellaneous Investigation, Map I-573, 1 sheet, scale 1:250,000.

Foley, J., and Barker, J.C., 1981, Tungsten investigations near VABM Bend, eastern Alaska: U.S. Bureau of Mines Open File Report 29-81, 24 p.

Foster, H.L., 1976, Geologic map of the Eagle quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigation, Map I-922, 1 sheet, scale 1:250,000.

Foster, H.L., Weber, F.R., Forbes, R.B., and Brabb, E.E., 1973, Regional Geology of the Yukon-Tanana Upland, Alaska, in Pitcher, M.G., ed., Arctic Geology: American Association of Petroleum Geologists, Memoir 19, p. 388-395.

Primary Reference: Foley and Barker (1981)

Reporter(s): J.C. Barker

Last report date: 2017-04-06

Site name(s): Ryan Lode

Site type: Mine

ARDF no.: FB065

Latitude: 64.863 **Quadrangle:** FB D-2

Longitude: 147.99

Location description and accuracy:

The Ryan mine is on the ridge between Eva Creek and Saint Patrick Creek, on the southeast side of Ester Dome. The mine workings are marked on the Fairbanks D-2 topographic map in the NW1/4NE1/4 section 5, T. 1 S., R. 2 W., of the Fairbanks Meridian. The property can be reached from the Parks Highway by turning east on Gold Hill Road for about a quarter of a mile, then north and then west on Saint Patrick Road for about 2 miles. The extensive workings can be seen on both sides of the road. The mine is included in locality 18 of Cobb (1972 [MF 410]). This location is accurate to within 500 feet.

Commodities:

Main: Ag, Au

Other: Sb

Ore minerals: Arsenopyrite, gold, jamesonite, stibnite

Gangue minerals:

Geologic description:

The following is a summary of the Ryan Lode property prepared by Ryan Lode Mines, Inc. (Ryan Lode Mines, Inc., unpublished report, 1996). The Ryan lode is underlain by the Fairbanks Schist that consists of quartz-mica schist, mica schist, and calcareous schist. A small quartz monzonite intrusion is located in the southeast portion of the property. Prior to the intrusion, the rocks underwent several episodes of regional deformation. Post-intrusive brittle deformation resulted in pervasive near-vertical faulting. The dominant structural trend on the property parallels the regional trend of about N 45 E.

The ore reserves occur in two shear zones: the Ryan shear and the Curlew shear, which is just south of the Ryan shear. Both deposits are schist-hosted and structurally controlled. However, the Curlew shear is partially in a small quartz monzonite intrusion. A surface oxidation zone is present at both sites and varies in depth from 150 feet to more than 300 feet. Quartz veins in the shear zones contain gold, arsenopyrite, and minor pyrite and stibnite. The Ryan shear is of varied thickness and has an average strike of N 30 E. Where the shear zone trends N 35 E to N 55 E, secondary splays diverge from the main trunk at regular intervals along the shear. The dip of the Ryan shear varies between 50 and 80 degrees east. High-grade ore is found in pods which form at deflection points in the shear zone. As in the Ryan shear, the gold and sulfides in the Curlew shear are associated with quartz-filled voids in highly fractured rock. The intrusion (90 to 93 million years old) that hosts part of the Curlew shear appears to be sill-like, and in some places it is in fault contact with the surrounding schist. It has a core of quartz monzonite surrounded by a border of granodiorite to quartz diorite. There has been extensive sericitic alteration along shears and fractures within the intrusion. At least three alteration assemblages have been identified: quartz-muscovite-siderite, quartz-muscovite-chlorite, and silicification. White mica in the hydrothermal stockwork has been dated at 89.1 +/- 0.3 Ma (McCoy and others, 1997).

Gold ore was discovered at the Ryan lode in the early 1900s; the first production was recorded in 1911 (Brooks, 1912, p. 33). Work continued intermittently from 1911 to 1958. The gold varies from 814 to 834 fine (Glover, 1950). Between 1938 and 1942, more than 1,500 feet of shafts, 2,000 feet of drifts, adits and crosscuts, and more than 2,800 feet of trenching was completed (Warfield and Thomas, 1972). From 1987

to 1989, approximately 320,000 tons of ore were mined from an open pit (R. Hughes, written communication, 1996). In recent years, sampling of the Ryan and Curlew ore bodies has been accomplished by both reverse circulation and core drilling that began in 1990 and continued until 1993 (Ryan Lode Mines, Inc., unpublished report, 1996). From this drilling, a reserve of 8.27 million tons of material grading 0.077 ounce of gold per ton has been defined (Masterman and Campbell, 1993).

The 2002 resource estimate was an indicated resource of 3.0 million tonnes grading 2.37 grams of gold per tonne (Kinross Gold Corp., 2003).

Alteration:

A surface oxidation zone is present at both the Ryan and Curlew shears and varies in depth from 150 feet to more than 300 feet. There has been extensive sericitic alteration along shears and fractures within the quartz monzonite intrusion. At least three alteration assemblages have been identified: quartz-muscovite-siderite, quartz-muscovite-chlorite, and silicification (Ryan Lode Mines, Inc., unpublished report, 1996).

Age of mineralization:

McCoy and others (1997) dated both hydrothermal and intrusion-related minerals using the 40Ar/39Ar method. At the Ryan lode, hydrothermal white mica has been dated at 89.1 +/- 0.3 Ma, and white mica from hydrothermally altered schist has been dated at 87.6 +/- 0.3 Ma. The quartz diorite hornblende was dated at 90.6 +/- 0.3 Ma, and the quartz diorite biotite was dated at 90.2 +/- 0.3 Ma; both are cut by mineralized shear zones and thus are earlier than the mineralization.

Generic deposit model:

Deposit model:

Schist-hosted gold-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

Work was reported on the property as early as 1911 (Brooks, 1912, p. 33). In 1913, a shaft was reported to be 90 feet deep (Smith, 1913 [B 525, p. 207]). By 1931, the workings consisted of shallow shafts and pits, a tunnel 300 feet long, and a shaft 200 feet deep (Hill, 1933, p. 135-138). In 1938, Bartholomae Oil Co. had control of the property and cleaned out the old shaft to a depth of 160 feet and drove 330 feet of drift and several hundred feet of crosscuts and raises (Smith, 1939 [B 917-A, p. 26]). In 1940, a large amount of development work was reported including trenching and geophysical work (Smith, 1942, p. 23). Between 1938 and 1942, more than 1,500 feet of shafts, 2,000 feet of drifts, adits and crosscuts, and more than 2,800 feet of trenching was completed (Warfield and Thomas, 1972). From 1954 to 1958, there was minor trenching and drlling (Warfield and Thomas, 1972). In 1969-70, the U.S. Bureau of Mines conducted a drilling program that was a pilot study to compare the cost and environmental damage of rotary drilling versus bulldozer trenching (Warfield and Thomas, 1972). Citigold Mining Company Ltd. acquired the project in 1985 and began a test heap leach, which was unsuccessful (Ryan Lode Mines, unpublished report, 1996). In 1986, La Teko Resources merged with Citigold, and a small, more successful heap leach test was conducted. Full scale production began in 1987. From 1987 to 1989, approximately 320,000 tons of ore were mined from the property by open pit methods (Rich Hughes, written communication, 1996). In recent years, sampling of the Ryan and Curlew ore bodies has been accomplished by both reverse circulation and core drilling, which began in 1990 and continued until 1993 (Ryan Lode Mines, Inc., unpublished report, 1996). In 1993, Citigold Alaska, Inc. was renamed Ryan Lode Mines, Inc. Exploration activity was suspended at the project at the end of 1993, although heap reclamation and detoxification efforts continue at the project site (Ryan Lode Mines, Inc., unpublished report, 1996). In 1997, over 8,000 feet of reverse-

circulation holes were drilled on the Ryan Lode (Swainbank and Clautice, 1998, p. 8). In 1999, the property was acquired by Kinross Gold Corporation. The deposit was idle while geology and development teams evaluate recent drilling and metallurgical studies (Kinross Gold Corporation, 2001a).

In 1999 Kinross Gold Corp. acquired La Teko and with it, their interests in the True North and Ryan Lode deposits. From 1999 until 2004, Kinross conducted drilling, resource estimates, and engineering of the Ryan Lode and adjacent Curlew deposits. Work in 2001 also included substantial confirmation and exploration drilling, and environmental baseline and geological and metallurgical studies (Kinross Gold Corp., 2001b). The 2002 resource estimate was an indicated resource of 3.0 million tonnes grading 2.37 grams of gold per tonne (Kinross Gold Corp., 2003).

In mid-2006 Kinross terminated its lease and relinquished Ryan Lode to the current owners, Gold Run Ltd. (Freeman, 2014).

Production notes:

The first shipment of ore was reported in 1911 (Brooks, 1912, p. 33). In 1938, Bartholomae Oil Co. cleaned out the old shaft and ore was taken out and milled (Smith, 1939 [B 917-A, p. 26]). There is no further production until the late 1980s when La Teko Resources mined approximately 320,000 tons of ore from a pit on the property from 1987 to 1989. This ore contained 19,220 ounces of gold and 14,330 ounces of silver (R. Hughes, written commun., 1996).

Reserves:

The 2002 resource estimate was an indicated resource of 3.0 million tonnes grading 2.37 grams of gold per tonne (Kinross Gold Corp., 2003).

In 2014, Freeman (2014) updated the resource estimate to 676,000 ounces of gold grading 0.066 ounce per ton in 10,167,000 tons of material, based on a 0.030 ounce per ton cut off.

Additional comments:

References:

Brooks, A.H., 1912, The mining industry in 1911, in Brooks, A.H., and others, Mineral resources of Alaska, report on progress of investigations in 1911: U.S. Geological Survey Bulletin 520-A, p. 17-44.

Cobb, E.H., 1972, Metallic mineral resources map of the Fairbanks quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-410, 1 sheet, scale 1:250,000.

Freeman, C.J., 2014, Ryan Lode Project, Avalon Development Corporation Summary Report 2014, 8 p.: http://www.avalonalaska.com/RL-2014-Summary1.pdf (as of December 2, 2014).

Glover, A.E., 1950, Placer gold fineness: Alaska Territorial Department of Mines Miscellaneous Report 195-1, 38 p.

Hill, J.M., 1933, Lode deposits of the Fairbanks district, Alaska: U.S. Geological Survey Bulletin 849-B, p. 29-163.

Kinross Gold Corporation, 2001a: http://www.kinross.com/op/expdev/ala.htm (as of July 31, 2001).

Kinross Gold Corporation, 2001b, 2000 Annual Report, 60 p.: http://www.kinross.com/pdf/Other%20Reports/00ar.pdf (as of Sept. 20, 2014).

Kinross Gold Corporation, 2003, 2002 Annual Report, 112.:http://www.kinross.com/pdf/Other%20Reports/02ar.pdf (as of Sept. 20, 2014).

Masterman, S.S., and Campbell, B., 1993, The Ryan Lode Project, Ester Dome, Alaska: Alaska Miner, June 1993, p. 11.

McCoy, Dan, Newberry, R.J., Layer, Paul, DiMarchi, J.J., Bakke, Arne, Masterman, J.S., and Minehane, D.L., 1997, Plutonic-related gold deposits of interior Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 191-241.

Smith, P.S., 1913, Lode mining near Fairbanks, in Prindle, L.M., A geologic reconnaissance of the Fairbanks quadrangle, Alaska: U.S. Geological Survey Bulletin 525, p. 153-216.

Smith, P.S., 1939, Mineral industry of Alaska in 1938: U.S. Geological Survey Bulletin 917-A, p. 1-113.

Smith, P.S., 1942, Mineral industry of Alaska in 1940: U.S. Geological Survey Bulletin 933-A, p. 1-102.

Warfield, R.S., and Thomas, B.I., 1972, Rotary drilling exploration of the Ryan lode properties, Fairbanks mining district, Alaska: U.S. Bureau of Mines Open-File Report 23-72, 21 p.

Primary Reference: Ryan Lode Mines, Inc., unpublished report, 1996; Freeman, 2014

Reporter(s): J.R. Guidetti Schaefer and C.J. Freeman (Avalon Development Corporation); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-09

Site name(s): Unnamed (in upper Treasure Creek); Treasure Creek

Site type: Prospect

ARDF no.: FB074

Latitude: 64.997 **Quadrangle:** FB D-2

Longitude: 147.813

Location description and accuracy:

This prospect is a 1,700-foot by 1,000-foot area on the western side of upper Treasure Creek that is defined by anomalous gold, antimony, arsenic, lead, and silver in soils. It trends southwest toward the saddle along Any Creek Trail (winter) that is 2,500 feet north of Old Murphy Dome Road in the SE1/4 sec. 18, T. 2 N., R. 1 W ., Fairbanks Meridian.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

The following geologic description is summarized from a report by Sam Dashevsky (1993) on work done by American Copper and Nickel Company on the Eagle Creek property in the early 1990s. In the 1970s, an arsenic soil anomaly was identified in the area, and two samples were identified that contained more than 100 ppb gold. The soil anomaly is approximately 1,700 feet by 1,000 feet in area and contains anomalous levels of gold, antimony, arsenic, lead, and silver with erratic boron, copper and zinc values. The soil anomaly is underlain by quartz-mica schists, minor quartzite, and minor graphitic schist. This area was mapped by Newberry and others (1996) as Fairbanks Schist that consists of quartz-muscovite schist, quartzite, and chlorite-quartz schist. Silicification and quartz veining were noted in approximately half the soil pits. The trace of the anomaly follows the southern contact zone of a feldspar porphyry body. The soil anomaly diminishes over an intrusive. The igneous float in the area is altered to clay and locally silicifiied. A north-dipping fault has been inferred from airphotos and soil geochemistry. An east-northeast trending linear was traced from airphotos; the linear trends from the saddle between the east fork of Any Creek and Treasure Creek through the main body of the geochemical anomaly. Cross-cutting faulting is indicated by a sharp break in slope, suggestive of a fault scarp, that runs north-northeast through the anomalous area. Rock geochemistry on float fragments of the intrusive that were found in the soil pits indicates as much as 250 ppb gold. In a trench sample, rare quartz-stibnite-veined schist contains 6,050 ppb gold, 4.4 percent antimony, 2 ounces of silver per ton, and 758 ppm arsenic. Another specimen of silicified schist from the same location that is cross-cut by vuggy crustiform quartz veins contains 4,610 ppb gold, 4,601 ppm arsenic, 98 ppm antimony, and 3.5 ppm silver. Silicification and quartz veining are widespread throughout the anomaly. Iron staining, clay alteration, and bleaching of schist are noted in soil pit schist fragments. The quartz porphyry that marks the north edge of the anomaly is silicified and vuggy, and limonite fills vugs locally (Dashevsky, 1993).

Alteration:

Silicification and quartz veining are common in rock fragments found throughout the anomaly, as well as iron staining, clay alteration, and bleaching of schist. The quartz porphyry that marks the north edge of the anomaly is silicified and vuggy, and limonite fills vugs locally (Dashevsky, 1993).

Age of mineralization:

Generic deposit model:

Deposit model:
Schist-hosted gold- and antimony-bearing quartz veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:
In the 1970s, Cantu Minerals conducted a soil-geochemistry survey of the area. In the 1980s, Tri-Con Mining, Inc. (the operating arm of CAN-EX Resources Inc.) reanalyzed some of the old soil sample pulps for gold and conducted some trenching. In 1990, American Copper and Nickel Company assumed interest in the Eagle Creek properties and sampled existing trenches and check-sampled across the previously defined gold-arsenic soil anomaly (Dashevsky, 1993).

In 2016, the Treasure Creek Partnership consolidated three, separately owned properties, including numerous prospects and occurrences (LG038; LG039; FB074; FB075; FB076; FB077; FB078; FB079; FB080; FB081) in the Treasure and Any Creek watersheds that potentially host plutonic-related, lode-gold mineralization contained in shear zones north of Fairbanks. Exploration activity in 2016 included conducting field work and reviewing and updating 1990s-era exploration information (Athey and Werdon, 2017).

Production notes:
None.

Reserves:
None.

Additional comments:

References:
Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Dashevsky, S.S., 1993, Eagle Creek project (Au), Fairbanks district, Alaska: American Copper and Nickel Company, Inc., 60 p. (Report held by Sam Dashevsky, Northern Associates Inc., Fairbanks, Alaska; can be examined with permission from current lease holders).

Newberry, R.J., Bundtzen, T.K., Clautice, K.C., Combellick, R.A., Douglas, T., Laird, G.M., Liss, S.A., Pinney, D.S., Reifenstuhl, R.R., and Solie, D.N., 1996, Preliminary geologic map of the Fairbanks mining district, Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 96-16, 17 p., 2 sheets, scale 1:63,360.

Primary Reference: Dashevsky, 1993

Reporter(s): J.R. Guidetti Schaefer and C.J. Freeman (Avalon Development Corporation); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Redline; Treasure Creek

Site type: Prospect

ARDF no.: FB075

Latitude: 64.997

Quadrangle: FB D-2

Longitude: 147.788

Location description and accuracy:

The Redline prospect is a linear 2,000-foot anomaly of gold in soil on the ridge between Treasure Creek and Eagle Creek, about 2,000 feet north of Old Murphy Dome Road. It is in the SE1/4 sec. 17, T. 2 N., R. 1 W., Fairbanks Meridian, at an elevation of about 1400 feet.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

The following geologic description is summarized from a report by Sam Dashevsky (1993) on work done by American Copper and Nickel Company on the Eagle Creek property in the early 1990s. Soil samples anomalous in gold,arsenic,and antimony define a linear trend 2,000 feet long. A 1,000-foot portion near the crest of a loess ridge contains 1,500 ppb gold. The linear gold anomaly coincides with the northern limit of an isolated block of schist. This area was mapped by Newberry and others (1996) as Fairbanks Schist that consists of quartz-muscovite schist, quartzite, and chlorite-quartz schist. Rock fragments in float collected at various sample sites consisted of limonite-stained, altered, quartz-mica schist; chips of vein quartz were also noted. The schist fragments appear to be weakly argillized, are bleached, and contain quartz veins.

A strongly mineralized zone is present on the upper contact of a 25-foot-thick felsic sill; the sill dips shallowly to the north, is fine- to medium-grained, and is equigranular to weakly porphyritic. This upper contact appears to be a fault, the Redline shear, that contains calcite veining and limonite staining. A hornfelsed, 3-foot-thick siliceous schist marks the base of the sill. The mineralized fault contact was sampled and contains 10 feet of rock that assays 0.09 ounce of gold per ton. One hole was drilled on the Redline shear and assays from the samples showed values similar to those found in the soil samples: 120-165 ppb gold, 588-1,148 ppm arsenic, 26-50 ppm antimony. The Redline shear was recognized in the drill hole as argillized, black, silicified phyllite. The sheared upper intrusive contact is marked by carbonate and limonite alteration.

Alteration:

Schist fragments in soils appear to be weakly argillized, bleached, and veined with quartz. The Redline shear was recognized in the drill hole as argillized, black, silicified phyllite. The sheared upper contact of an intrusive body is marked by carbonate and limonite alteration (Dashevsky, 1993).

Age of mineralization:

Generic deposit model:

Deposit model:

Gold-bearing shear zone at the contact of a felsic sill with schist.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

In 1992, American Copper and Nickel Company conducted reconnaissance soil sampling and drilled one hole (Dashevsky, 1993).

In 2016, the Treasure Creek Partnership consolidated three, separately owned properties, including numerous prospects and occurrences (LG038; LG039; FB074; FB075; FB076; FB077; FB078; FB079; FB080; FB081) in the Treasure and Any Creek watersheds that potentially host plutonic-related, lode-gold mineralization contained in shear zones north of Fairbanks. Exploration activity in 2016 included conducting field work and reviewing and updating 1990s-era exploration information (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Dashevsky, S.S., 1993, Eagle Creek project (Au), Fairbanks district, Alaska: American Copper and Nickel Company, Inc., 60 p. (Report held by Sam Dashevsky, Northern Associates Inc., Fairbanks, Alaska; can be examined with permission from current lease holders).

Newberry, R.J., Bundtzen, T.K., Clautice, K.C., Combellick, R.A., Douglas, T., Laird, G.M., Liss, S.A., Pinney, D.S., Reifenstuhl, R.R., and Solie, D.N., 1996, Preliminary geologic map of the Fairbanks mining district, Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 96-16, 17 p., 2 sheets, scale 1:63,360.

Primary Reference: Dashevsky, 1993

Reporter(s): J.R. Guidetti Schaefer and C.J. Freeman (Avalon Development Corporation); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): West Fork; Treasure Creek

Site type: Prospect

ARDF no.: FB076

Latitude: 64.996 **Quadrangle:** FB D-2

Longitude: 147.775

Location description and accuracy:

The West Fork prospect is a soil anomaly approximately 2,500 feet by 1,500 feet in area. It is centered about 0.3 mile north of Old Murphy Dome Road in the southwest headwater tributary of Eagle Creek; it is in sec. 16, T. 2 N., R. 1 W., Fairbanks Meridian.

Commodities:

Main: Sb

Other:

Ore minerals:

Gangue minerals:

Geologic description:

The following geologic description is summarized from a report by Sam Dashevsky (1993) on work done by American Copper and Nickel Company on the Eagle Creek property in the early 1990s. Five lines of soil samples spaced 600 feet apart define a 2,500-foot by 1,500-foot area of anomalous antimony; within it there is a 1,000-foot by 1,400-foot zone of weakly elevated silver. Rock fragments in soil are quartz-mica schist that is argillized, bleached, and veined with quartz. This area was mapped by Newberry and others (1996) as Fairbanks Schist that consists of quartz-muscovite schist, quartzite, and chlorite-quartz schist.

Alteration:

Schist fragments are weakly argillized, bleached, and veined with quartz (Dashevsky, 1993).

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

In 1992, American Copper and Nickel Company conducted a soil survey that identified an area with anomalous antimony in the soil (Dashevsky, 1993).

In 2016, the Treasure Creek Partnership consolidated three, separately owned properties, including numerous prospects and occurrences (LG038; LG039; FB074; FB075; FB076; FB077; FB078; FB079; FB080; FB081) in the Treasure and Any Creek watersheds that potentially host plutonic-related, lode-gold mineralization contained in shear zones north of Fairbanks. Exploration activity in 2016 included conducting field work and reviewing and updating 1990s-era exploration information (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Dashevsky, S.S., 1993, Eagle Creek project (Au), Fairbanks district, Alaska: American Copper and Nickel Company, Inc., 60 p. (Report held by Sam Dashevsky, Northern Associates Inc., Fairbanks, Alaska; can be examined with permission from current lease holders).

Newberry, R.J., Bundtzen, T.K., Clautice, K.C., Combellick, R.A., Douglas, T., Laird, G.M., Liss, S.A., Pinney, D.S., Reifenstuhl, R.R., and Solie, D.N., 1996, Preliminary geologic map of the Fairbanks mining district, Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 96-16, 17 p., 2 sheets, scale 1:63,360.

Primary Reference: Dashevsky, 1993

Reporter(s): J.R. Guidetti Schaefer and C.J. Freeman (Avalon Development Corporation); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Scrafford; Treasure Creek

Site type: Mine

ARDF no.: FB077

Latitude: 64.999 **Quadrangle:** FB D-2

Longitude: 147.757

Location description and accuracy:

The Scrafford mine is located in the SE1/4 sec. 16, T. 2 N., R. 1 W., Fairbanks Meridian. This mine is accessible from the Elliott Highway and Old Murphy Dome Road. Approximately 4 miles down Old Murphy Dome Road, a steep, rough road leads 0.5 mile north to the Scrafford mine. The mine is just north of the southeast fork of Eagle Creek, a tributary of Treasure Creek.

Commodities:

Main: Sb

Other: Ag, Au, Pb

Ore minerals: Galena, gold, stibnite

Gangue minerals:

Geologic description:

The Scrafford mine is the largest producer of antimony ore in the Fairbanks mining district; production has been estimated at more than 2,700 tons of ore (Robinson and Bundtzen, 1982). Mining from open cuts took place from 1915 to 1916, in 1926, and from 1968 to 1970 (Cobb, 1976 [OFR 76-662, p. 169-170]). The deposit consists of massive stibnite localized along shear zones associated with stockwork-type quartz veinlets containing disseminated arsenopyrite and stibnite. The stibnite occurs in fibrous and columnar twinned crystals and as fine-grained massive aggregates (Robinson and Bundtzen, 1982). In 1916, an assay of mineralized rock showed an average grade of $4 in gold (about 0.19 ounce of gold per ton) and 8 ounces of silver per ton (Brooks, 1916 [B 649, p. 29]). Most of the antimony ore that was produced had grades of 56 to 60 percent antimony; ore mined in 1970 and 1971 had a lower grade of 12 to 16 percent antimony (Robinson and Bundtzen, 1982, p. 3).

In 1982, Robinson and Bundtzen (1982) spent three days mapping and sampling several trenches on the Scrafford property and the following is a summary of their findings. Rocks in the trenches include quartz-mica schist, micaceous quartz schist, calc-schist, feldspathic schist, felsic tuff, and graphitic schist. Several felsic dikes are also present. The center of antimony-gold mineralization occurs along an east-west-trending shear zone that separates a barren hanging-wall sequence of quartz-muscovite schist, micaceous quartzite, and quartz-feldspar schist from a mineralized footwall sequence of feldspathic, micaceous quartzite and minor quartz-mica schist. The footwall rocks are highly oxidized, sheared, and cut by anastomosing quartz-sulfide veinlets. The shear zone in the main open cut is exposed for at least 320 feet; it strikes N. 80-85 E and dips 55-60 S. The stibnite-bearing vein in the shear pinches and swells from a width of 4 to 19 feet and is confined to the footwall side of the shear zone. The shear zone ranges from 6 to 38 feet wide. The hanging wall of the shear zone is dominated by incompetent quartz-mica schist, and the footwall is locally mineralized feldspathic quartzite (metatuff). The footwall quartzite is competent and highly fractured; the result is a favorable site for ore deposition.

In 1991-93, American Copper and Nickel Company drilled three reverse-circulation holes to investigate gold mineralization within the shear zone and in the silicified footwall schist (Dashevsky, 1993). The 1992 core hole was 330 feet deep. Nineteen feet assayed 0.107 ounce of gold per ton; five feet in the Scrafford shear zone assayed 0.026 ounce of gold per ton; and 14 feet in the silicified footwall assayed 0.136 ounce of

gold per ton. The drilling program indicated that the footwall mineralization is confined within a narrow, sub-parallel zone beneath the Scrafford shear, and was probably not a viable bulk-minable target (Dashevsky, 1993).

Alteration:

The footwall rocks of the deposit are highly oxidized and contain stibiconite and scorodite (Robinson and Bundtzen, 1982, p. 5). The main shear is filled with black graphitic gouge, bright-orange iron-stained clay, and white clay that supports clasts of schist, stibnite, and stibnite oxidation products (Dashevsky, 1993). Strong clay and sericite alteration is confined to gouge zones within the shear. The schist footwall is silicified and quartz veined (Dashevsky, 1993).

Age of mineralization:

Generic deposit model:

Deposit model:

Simple Sb deposit (Cox and Singer, 1986; model 27d)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

27d

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

Mining from open cuts took place from 1915 to 1916, in 1926, and from 1968 to 1970 (Cobb, 1976 [OFR 76-662, p. 169-170]). The shear-zone system in the main opencut is exposed for at least 320 feet (Robinson and Bundtzen, 1982). In 1982, Robinson and Bundtzen (1982) spent 3 days mapping and sampling several trenches on the Scrafford property. In 1991-93, American Copper and Nickel Company conducted soil sampling and drilled three reverse-circulation holes, totalling 1295 feet, to pursue the gold potential that was reported by Robinson and Bundtzen (Dashevsky, 1993).

In 2016, the Treasure Creek Partnership consolidated three, separately owned properties, including numerous prospects and occurrences (LG038; LG039; FB074; FB075; FB076; FB077; FB078; FB079; FB080; FB081) in the Treasure and Any Creek watersheds that potentially host plutonic-related, lode-gold mineralization contained in shear zones north of Fairbanks. Exploration activity in 2016 included conducting field work and reviewing and updating 1990s-era exploration information (Athey and Werdon, 2017).

Production notes:

Mining from open cuts took place from 1915 to 1916, in 1926, and from 1968 to 1970 (Cobb, 1976 [OFR 76-662, p. 169-170]). Production has been estimated at over 2,700 tons of ore, much of it from ore that ran 50 to 60 percent antimony (Robinson and Bundtzen, 1982).

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Brooks, A.H., 1916, Antimony deposits of Alaska: U.S. Geological Survey Bulletin 649, 67 p.

Chapin, Theodore, 1914, Placer mining in the Yukon-Tanana region: U.S. Geological Survey Bulletin 592-J, p. 357-362.

Chapin, Theodore, 1919, Mining in the Fairbanks district: U.S. Geological Survey Bulletin 692-F, p. 321-327.

Dashevsky, S.S., 1993, Eagle Creek project (Au), Fairbanks district, Alaska: American Copper and Nickel Company, Inc., 60 p. (Report held by Sam Dashevsky, Northern Associates Inc., Fairbanks, Alaska; can be examined with permission from current lease holders).

Hill, J.M., 1933, Lode deposits of the Fairbanks district, Alaska: U.S. Geological Survey Bulletin 849-B, p. 29-163.

Killeen, P.L., and Mertie, J.B., 1951, Antimony ore in the Fairbanks District, Alaska: U.S. Geological Survey Open-File Report 51-46, 43 p.

Robinson, M.S., and Bundtzen, T. K., 1982, Geology of the Scrafford antimony-gold lode deposit, Fairbanks mining district, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File Report 173, 7 p., 1 sheet, scale 1:120.

Primary Reference: Robinson and Bundtzen, 1982

Reporter(s): J.R. Guidetti Schaefer and C.J. Freeman (Avalon Development Corporation); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): East Scrafford; Treasure Creek

Site type: Prospect

ARDF no.: FB078

Latitude: 65.0 **Quadrangle:** FB D-2

Longitude: 147.746

Location description and accuracy:

The East Scrafford prospect is about 1,900 feet east of the Scrafford mine (FB077); it is located just north of Old Murphy Dome Road in the NE1/4 SE1/4 sec. 16, T. 2 N., R. 1 W., Fairbanks Meridian.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

The following geologic description is summarized from a report by Sam Dashevsky (1993) on work done by American Copper and Nickel Company on the Eagle Creek property in the early 1990s. In the shallow subsurface at this prospect, a 30-foot-thick, medium-grained, equigranular granite and quartz porphyry sill intrudes quarz-mica schist and micaceous quartzite. The intrusion is truncated by a major fault, believed to be the eastern extension of the Scrafford shear zone (see FB077). The Scrafford shear trends N80-85E and dips 55-60 S. (Robinson and Bundtzen,1982). The upper intrusive contact is irregular and sub-horizontal and lies under 10 feet of schist and 4 feet of loess. At the surface, chip samples across the 30-foot exposure of the intrusion, are enriched in gold and arsenic; the samples average 0.024 ounce of gold per ton and 2,060 to 6,490 ppm arsenic. No significant antimony values are reported. Schist in the wallrock is weakly to unmineralized. The Scrafford shear contains as much as 350 ppb gold, 2,480 ppm arsenic, and 102 ppm antimony. Drilling indicated that the quartz porphyry sill does not exceed 210 ppb gold. The deeper intersection of the sill and the shear, which is composed largely of intrusive and quartz clasts in gouge, averages 0.029 ounce of gold per ton over 35 feet and 0.1 to 1.0 percent arsenic. The intrusive at the surface is moderately to strongly silicified, locally bleached, and iron stained. The schist country rock is strongly silicified at the intrusive contact. Downhole, the sill is cut by sparse, hairine quartz veinlets. In the shear zone, intrusive fragments are highly silicified and locally altered to clay.

Alteration:

The intrusive at the surface is moderately to strongly silicified, locally bleached, and iron stained. The schist country rock is strongly silicified at the intrusive contact. Downhole, the sill is cut by sparse hairline quartz veinlets. In the shear zone, intrusive fragments are highly silicified and locally altered to clay (Dashevsky, 1993).

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

In the 1970s, Cantu Minerals Association trenched at the East Scrafford site in pursuit of the eastern extension of the Scrafford shear (FB077). In 1991-93, American Copper and Nickel Company mapped the trench exposure, took soil samples, and drilled two reverse-circulation holes (Dashevsky, 1993). The gold assays of samples did not encourage them to continue.

In 2016, the Treasure Creek Partnership consolidated three, separately owned properties, including numerous prospects and occurrences (LG038; LG039; FB074; FB075; FB076; FB077; FB078; FB079; FB080; FB081) in the Treasure and Any Creek watersheds that potentially host plutonic-related, lode-gold mineralization contained in shear zones north of Fairbanks. Exploration activity in 2016 included conducting field work and reviewing and updating 1990s-era exploration information (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Dashevsky, S.S., 1993, Eagle Creek project (Au), Fairbanks district, Alaska: American Copper and Nickel Company, Inc., 60 p. (Report held by Sam Dashevsky, Northern Associates Inc., Fairbanks, Alaska; can be examined with permission from current lease holders).

Robinson, M.S., and Bundtzen, T. K., 1982, Geology of the Scrafford antimony-gold lode deposit, Fairbanks mining district, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File Report 173, 7 p., 1 sheet, scale 1:120.

Primary Reference: Dashevsky, 1993

Reporter(s): J.R. Guidetti Schaefer and C.J. Freeman (Avalon Development Corporation); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Old No. 2; Treasure Creek

Site type: Prospect

ARDF no.: FB079

Latitude: 64.992 **Quadrangle:** FB D-2

Longitude: 147.759

Location description and accuracy:

This prospect is on the south side of Old Murphy Dome Road; it is across the road from the western gate to the road down to the Scrafford mine (FB077) in the NE1/4 sec. 21, T. 2 N., R. 1 W., Fairbanks Meridian.

Commodities:

Main: Au, Sb

Other:

Ore minerals: Gold, stibnite

Gangue minerals:

Geologic description:

The following geologic description is summarized from a report by Sam Dashevsky (1993) on work done by American Copper and Nickel Company on the Eagle Creek property in the early 1990s. In 1964, a high-grade antimony shear zone, the No. 2 vein, was discovered by Silver Ridge Mining Co. The shear was explored by minor trenching and a 35-foot shaft. In 1976, high gold values were recognized at the prospect. The prospect is within sub-horizontal, quartz-mica and graphitic phyllitic schists that are cut by a 4.5-foot-wide zone filled with gouge. The fault zone is exposed in one of several sloughed trenches that trend east-northeast across the ridge along Old Murphy Dome road. The fault zone is exposed for 160 feet along strike in trenches; it is 3.5 to 9.5 feet thick and extends beyond the trenches for an unknown distance. Twenty-five feet of schist in the footwall contains 220 to 750 ppb gold and averages 0.01 ounces of gold per ton. A 4.5-foot-wide fault zone at the southeast end of the trench averages 11,300 ppb gold (0.33 ounce of gold per ton) and 1 to 3 percent antimony. A reverse circulation drill hole intercepted a weakly mineralized zone, 5 feet long of quartz, limonitic schists, and abundant gouge that contained 130 ppb gold, 722 ppm arsenic, and 1,334 ppm anitmony. Limonitic footwall schist persists for 85 feet,and is truncated by a shear zone that runs 0.06 ounces of gold per ton over 5 feet.

Alteration:

Pervasive iron-staining is found in the footwall schist. Clay-sericite alteration and fault gouge are developed in the shear zone (Dashevsky, 1993).

Age of mineralization:

Generic deposit model:

Deposit model:

Gold-antimony shear zone in quartz-mica and graphitic, phyllitic schists.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Undetermined

Site Status: Inactive

Workings/exploration:

In 1964, a high-grade antimony shear zone, the No. 2 vein, was discovered by Silver Ridge Mining Co. while clearing a turnout beside the road. Minor trenching took place, and a 35-foot shaft was sunk. The original trenches were periodically cleaned out and resampled by later operators. In 1991, additional prospecting was conducted by American Copper and Nickel Company and one hole was drilled.

In 2016, the Treasure Creek Partnership consolidated three, separately owned properties, including numerous prospects and occurrences (LG038; LG039; FB074; FB075; FB076; FB077; FB078; FB079; FB080; FB081) in the Treasure and Any Creek watersheds that potentially host plutonic-related, lode-gold mineralization contained in shear zones north of Fairbanks. Exploration activity in 2016 included conducting field work and reviewing and updating 1990s-era exploration information (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Dashevsky, S.S., 1993, Eagle Creek project (Au), Fairbanks district, Alaska: American Copper and Nickel Company, Inc., 60 p. (Report held by Sam Dashevsky, Northern Associates Inc., Fairbanks, Alaska; can be examined with permission from current lease holders).

Primary Reference: Dashevsky, 1993

Reporter(s): J.R. Guidetti Schaefer and C.J. Freeman (Avalon Development Corporation); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Antimony Ridge; Treasure Creek

Site type: Prospect

ARDF no.: FB080

Latitude: 64.99 **Quadrangle:** FB D-2

Longitude: 147.758

Location description and accuracy:

The Antimony Ridge prospect is located in the W1/2NE1/4 sec. 21, T. 2 N., R. 1 W., Fairbanks Meridian. This prospect is near the top of the hill just south of the road at mile 4 on the Old Murphy Dome Road. This prospect is locality 22 of Cobb (1972 [MF 410]).

Commodities:

Main: Sb

Other: Au

Ore minerals:

Gangue minerals:

Geologic description:

A shaft was sunk on stibnite-bearing breccia associated with a northeast-trending reverse fault that cuts schistose quartzite and mica schist (Chapman and Foster, 1969, p. D14). The vein trends N. 47 E., dipping 60 SE. (Pilkington and others, 1969). Stibnite occurs as lenses or nodules surrounded by sheared material. Channel samples across the vein range from 3.4 to 69.0 ppm gold with an average value of 16.1 ppm (Pilkington and others, 1969).

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Simple Sb deposit (Cox and Singer, 1986; model 27d)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

27d

Production Status: Undetermined

Site Status: Inactive

Workings/exploration:

A shaft of unknown depth was reported (Chapman and Foster, 1969).

In 2016, the Treasure Creek Partnership consolidated three, separately owned properties, including numerous prospects and occurrences (LG038; LG039; FB074; FB075; FB076; FB077; FB078; FB079; FB080; FB081) in the Treasure and Any Creek watersheds that potentially host plutonic-related, lode-gold mineralization contained in shear zones north of Fairbanks. Exploration activity in 2016 included conducting field work and reviewing and updating 1990s-era exploration information (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Chapman, R.M., and Foster, R.L., 1969, Lode mines and prospects in the Fairbanks district, Alaska: U.S. Geological Survey Professional Paper 625-D, 25 p., 1 plate.

Cobb, E.H., 1972, Metallic mineral resources map of the Fairbanks quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-410, 1 sheet, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Fairbanks quadrangle, Alaska: U.S. Geological Survey Open-File Report 76-662, 174 p.

Pilkington, H.D., Forbes, R. B., Hawkins, D.B., Chapman, R.M., and Swainbank, R.C., 1969, Preliminary investigation of gold mineralization in the Pedro Dome-Cleary Summit area, Fairbanks District, Alaska: U.S. Geological Survey Open-File Report 69-206, 47 p.

Primary Reference: Pilkington and others, 1969

Reporter(s): J.R. Guidetti Schaefer and C.J. Freeman (Avalon Development Corporation); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): East Gate; Treasure Creek

Site type: Prospect

ARDF no.: FB081

Latitude: 64.993 **Quadrangle:** FB D-2

Longitude: 147.733

Location description and accuracy:

The East Gate prospect extends southwest from the headwaters of Independence Creek and the west branch of Wildcat Creek and covers the ridgetop near mile 3 of Old Murphy Dome Road; it is in the NE1/4 NW1/4 sec. 22, T. 2 N., R. 1 W., of the Fairbanks Meridian.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

The following geologic description is summarized from a report by Sam Dashevsky (1993) on work done by American Copper and Nickel Company (ACNC) on the Eagle Creek property in the early 1990s. Local zones of anomalous arsenic in soils were first identified on the property in the 1970s by Cantu Minerals Association. In the 1980s, Silverado Gold Mines, Ltd. and Tri-Con Mining delineated a gold anomaly; trenching resulted in the discovery of a narrow, high-grade quartz breccia vein near mile 3 of Old Murphy Dome road. In 1991 and 1992, ACNC conducted a soil sampling program and drilled four reverse circulation holes. Soil sampling identified an irregularly shaped multi-element soil anomaly measuring 5,000 feet long by 500 to 2,500 feet wide that was marked by anomalous arsenic, lead, and bismuth. Three nodes of anomalous gold, antimony, and lead also occur in the area. Silt samples from Independence Creek at the 1,000-, 1,100- and 1,200-foot elevations show anomalous gold. On Wildcat Creek, stream sediment samples contained anomalous gold at the 850-, 900-, 1,000- and 1,150-foot elevations. Drilling and distribution of rock fragments in soil sample pits indicate that the area is predominantly underlain by quartz-mica schist and micaceous quartzite, with subordinate graphitic phyllite and chloritic-biotite schists at depth. Soil samples from the east flank of upper Independence Creek, and several other nearby sites have abundant felsic intrusive rocks mixed with schist chips and regolith. Rock fragments are commonly altered and limonitic, and vein quartz fragments are broadly distributed throughout the zone. Drilling intersected sporadic pegmatite veinlets. Directly east of the gate to the East Scrafford prospect, limonite-stained finely fractured schist without quartz veining contains 5,000-6,000 ppb gold (0.14-0.18 ounce of gold per ton). Five hundred feet farther east, pieces of quartz-sulfide float as much as 18 inches thick contain 11,000 to 19,000 ppb gold (0.32 to 0.55 ounce of gold per ton). Isolated fragments of silicified felsic intrusive breccia contain 6,850 ppb gold. Four drill holes indicate broad zones of weakly mineralized schist in sparsely veined, weakly pyritic, silicified zones that are at depths exceeding 400 feet. The high-grade veins at the surface were intercepted in the drilling program; one 110-foot intercept ran 0.026 ounce of gold per ton, and one 5-foot interval ran 0.068 ounce of gold per ton. Rock fragments in soils show much evidence of silicification, clay alteration, and limonite. Drilling identified broad zones of pyritic silicification at a depth of more than 400 feet; argillation, patchy silicification, and chloritic alteration were confined to sheared zones at higher levels.

Alteration:

Rock fragments in soils show much evidence of silicification, clay alteration, and limonite. Drilling identified broad zones of pyritic silicification at depths of more than 400 feet; argillation, patchy silicification, and chloritic alteration occurred in shallower rocks (Dashevsky, 1993).

Age of mineralization:

Generic deposit model:

Deposit model:

Schist-hosted gold-quartz vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

In the 1970s, Cantu Minerals Association conducted soil sampling in the area. In the 1980s, Silverado Gold Mines, Ltd. and Tri-Con Mining completed a small soil grid and identified a gold anomaly. In 1991 and 1992, American Copper and Nickel Company conducted silt and soil sampling and in 1993 drilled four holes that totaled 2,335 feet (Dashevsky, 1993).

In 2016, the Treasure Creek Partnership consolidated three, separately owned properties, including numerous prospects and occurrences (LG038; LG039; FB074; FB075; FB076; FB077; FB078; FB079; FB080; FB081) in the Treasure and Any Creek watersheds that potentially host plutonic-related, lode-gold mineralization contained in shear zones north of Fairbanks. Exploration activity in 2016 included conducting field work and reviewing and updating 1990s-era exploration information (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Dashevsky, S.S., 1993, Eagle Creek project (Au), Fairbanks district, Alaska: American Copper and Nickel Company, Inc., 60 p. (Report held by Sam Dashevsky, Northern Associates Inc., Fairbanks, Alaska; can be examined with permission from current lease holders).

Primary Reference: Dashevsky, 1993

Reporter(s): J.R. Guidetti Schaefer and C.J. Freeman (Avalon Development Corporation); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Fox Creek

Site type: Mine

ARDF no.: FB086

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

At least two miles of Fox Creek has been mined; part is in the Fairbanks quadrangle, part is in the Livengood quadrangle. Most of the mining or at least the mining since WWII, has been in the Livengood quadrangle. But much of the information of record about placer mining on Fox creek cannot be assigned to one of the quadrangles. For convenience, all of the information on Fox Creek has been consolidated into a single Livengood-quadrangle record (LG081).

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Fort Knox

Site type: Mine

ARDF no.: FB115

Latitude: 64.992 **Quadrangle:** FB D-1

Longitude: 147.3614

Location description and accuracy:

As of the end of 2011, the Fort Knox Mine was a large operating open pit nearly a mile in diameter that covers much of the area between Melba Creek and Monte Cristo Creeks at the head of Fish Creek. The coordinates are at about the center of the pit. The mine occupies much of the northwest quarter of section 21 and the southwest quarter of section 16, T. 2 N., R. 2 E. The location is accurate.

Commodities:

Main: Au

Other: As, Bi, Mo, Te, W

Ore minerals: Arsenopyrite, bismite, bismuth, bismuthinite, eulytite, gold, maldonite, molybdenite, scheelite, tellurobismuthite, tetradymite

Gangue minerals: Quartz

Geologic description:

In 1913, a bismuth-bearing, gold-quartz vein was prospected on the ridge between Melba and Monte Cristo Creeks by Edward Voght (see FB116) (Chapin, 1914). When visited in July of 1949, the workings were completely caved, and all that remained was almost completely disintegrated rock on dumps around an old caved shaft and the ruins of a small mill (Wedow and White, 1954).

In 1987, geologist Rodney A. Blakestad, graduate of the University of Alaska, Geology, 1973, was sampling and mapping a trench that was dug the previous day. It became apparent that close inspection of the two- to four-millimeter thick, sheeted quartz veins cutting through the granite contained specks of free gold approximately 0.5 mm in diameter. It took only an hour of observing the multitude of veinlets exposed over the entire length of the 200 foot long trench to decide that another trench might be instructive as to the magnitude of the 'discovery'.

The bulldozer was owned by Mr. Blakestad, so he fired it up and drove 200 feet up hill and dug a second trench parallel to the first. Similar quartz veinlets with similar free gold were encountered in the second trench. Without taking a sample, Blakestad drove back to Fairbanks and reported the news to the funding group and a second geologist, Dr. Benjamin I. Collins, was dispatched to verify the discovery (Rodney A. Blakestad, personal communication, 2015).

This discovery was followed by an extensive exploration program. By 1989, Fairbanks Gold Ltd. and its joint venture partners had spent $4.5 million on exploration at the Fort Knox deposit. More than 72,000 feet of drilling and 5 miles of trenching outlined an area predicted to contain 4 million ounces of gold. In 1990, five drill rigs were operating 24 hours a day, drilling almost 60,000 feet in 104 drill holes, and a 170,000-ton bulk sample was taken. In 1990, the Fort Knox property was the largest exploration project outside of southeast Alaska (Swainbank and others, 1991). Exploration consisted of 46,300 feet of diamond drilling and 62,600 feet of reverse circulation drilling. The 170,000-ton bulk sample was reduced to 45 tons; seven tons of this sample was split for metallurgical testing. In 1991, another 32,600 feet of reverse circulation drilling was completed (Bundtzen and others, 1991). Geotechnical work consisted mainly of condemnation drilling to determine where to put the mill, tailings pond, and other mine support facilities (Bundtzen and others, 1991). Late in 1991, Amax Gold Inc. announced its intention to purchase all assets of Fairbanks

Gold Ltd. (Bundtzen and others, 1991). By 1996, as many as 800 workers had completed a power line to the site, the freshwater dam and tailings dam, the primary crusher, a coarse-ore conveyor, apron feeders, and all components of the mill (Swainbank and others, 1997). In November, 1996, the first gold was produced from the mine and it has been in continual operation to the present (Feb. 2011) as a large open pit. In 1998, Kinross Gold Corp. acquired a 100 percent interest in the mine and operated it continuous to early 2012. As of early 2012, they have resources that they predict will allow operation until 2018 (Kinross Gold Corp., 2011).

The Fort Knox gold deposit is in a granite body, now commonly referred to as the Fort Knox pluton, which has been dated at 92 Ma by the U/Pb method (Bakke, 1992, 1994). Gold occurs along margins of stockwork quartz veins and veinlets, along quartz-filled shear zones, and along fractures within the granite. In the ore zones, the sulfide content is low, less than 0.5 percent. There are only minor amounts of arsenopyrite (McCoy and others, 1997) and the dominant sulfide is bismuthinite. There is strong geochemical association of the gold with bismuth and tellurium. The following bismuth and tellurium minerals have been identified in small amounts: native bismuth, maldonite, tellurobismuthite, bismite, tetradymite, and eulytite. Trace to minor molybdenite and scheelite also occur. The pluton has been subdivided into three phases, primarily on on the basis of texture: (1) fine-grained, biotite- and hornblende-rich granite, (2) medium- to coarse-grained, seriate, porphyritic granite (the youngest phase), and (3) a hybrid, biotite- and hornblende-rich rock with relict texture similar to the porphyritic granite, and formed by local contact metamorphism of impermeable country rocks (Bakke, 1992; J. Odden, written communication, 2000). The most significant gold mineralization is in milky-white, quartz-stockworks veins and along shear zones (Bakke, 1992). The stockwork veins mostly strike east and have no consistent dip. The gold distribution in the stockwork veins is erratic; some ore contains as high as 7.0 ounces of gold per ton; the gold occurs in grains that vary in size from less than 0.1 to 2 mm. In contrast, the quartz-filled shear zones contain evenly distributed, micron-size gold. White mica from the stockworks has been dated by the 40Ar/39Ar method at 86.2 to 89.3 Ma (McCoy and others, 1997). Alteration consists of vein-controlled phyllic, potassic, albitic, and argillic alteration (Bakke, 1992). A late, low-temperature, thermal alteration event has produced an assemblage of calcite, zeolite (stilbite), chalcedony, and clay in breccia zones, on joint surfaces, and in fractures within the granite (Bakke, 1992).

From 1996 to December 31, 2011, the Fort Knox Mine produced 5,246,631 ounces of gold (Quant, 29008; Szumigala and others, 2011, Kinross Gold, Corp., 2012). This included 289,794 ounces of gold that was produced in 2011. Most of this was processed through a carbon-in-pulp mill with a capacity of about 33 to 45 thousand tonnes per day. A large heap leach facility was constructed in 2009 that began processing a large stockpile of low grade ore; the company anticipates adding low-grade material to the heap leach pile from the pit, material that would not be economical to process through the mill. This heap-leach facility will extend the life of the mine to 2018 and and should increase gold production to an average 370,000 ounces of gold per year.

As of December 31, 2011, the Fort Knox Mine has proven and probable reserves of 314.669 million tonnes with an average grade of 0.43 grams of gold per tonne (or 4.303 million ounces of gold) (Kinross Gold Corp., 2012). There is an addition measured and indicated resource of 112.098 million tonnes with an average grade of 0.40 grams of gold per tonne (or 1.426 million ounces of gold).

Alteration:

The deposit features vein-controlled phyllic, potassic, albitic, and argillic alteration (Bakke, 1992). A late, low-temperature, thermal alteration event has resulted in an assemblage of calcite, zeolite (stilbite), chalcedony and clay in breccia zones, on joint surfaces, and in fractures in the granite (Bakke, 1992).

Age of mineralization:

Stockwork white mica which is probably contemporaneous with the mineralization has been dated by the 40Ar/39Ar method at 86.2 to 89.3 Ma (McCoy and others, 1997).

Generic deposit model:

Deposit model:

Intrusion related gold.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; large

Site Status: Active

Workings/exploration:

In 1913, a bismuth-bearing, gold-quartz vein was prospected on the ridge between Melba and Monte Cristo Creeks by Edward Voght (see FB116) (Chapin, 1914). When visited in July of 1949, the workings were completely caved, and all that remained was almost completely disintegrated rock on dumps around an old filled shaft and the ruins of a small mill (Wedow and White, 1954). In 1987, a geologist walking behind a bulldozer on the Fort Knox claims picked up a piece of granite containing visible gold; this discovery was followed by an extensive exploration program. By 1989, Fairbanks Gold Ltd. and its joint venture partners had spent $4.5 million on exploration at the Fort Knox deposit. More than 72,000 feet of drilling and 5 miles of trenching outlined an area predicted to contain 4 million ounces of gold. In 1990, five drill rigs were operating 24 hours a day, drilling almost 60,000 feet in 104 drill holes, and a 170,000-ton bulk sample was taken. In 1990, the Fort Knox property was the largest exploration project outside of southeast Alaska (Swainbank and others, 1991). Exploration consisted of 46,300 feet of diamond drilling and 62,600 feet of reverse circulation drilling. The 170,000-ton bulk sample was reduced to 45 tons; seven tons of this sample was split for metallurgical testing. In 1991, another 32,600 feet of reverse circulation drilling was completed (Bundtzen and others, 1991). Geotechnical work consisted mainly of condemnation drilling to determine where to put the mill, tailings pond, and other mine support facilities (Bundtzen and others, 1991). Late in 1991, Amax Gold Inc. announced its intention to purchase all assets of Fairbanks Gold Ltd. (Bundtzen and others, 1991). By 1996, as many as 800 workers had completed a power line to the site, the freshwater dam and tailings dam, the primary crusher, a coarse-ore conveyor, apron feeders, and all components of the mill (Swainbank and others, 1997). In November, 1996, the first gold was produced from the mine and it has been in continual operation to February of 2011 as a large open pit. In 1998, Kinross Gold Corp. acquired a 100 percent interest in the mine and operated it continuous to early 2012. As of early 2012, they have resources that they predict will allow operation until 2018 (Kinross Gold Corp., 2011).

In 2016, Kinross Gold Corporation conducted exploration at Fort Knox mine and surrounding brownfield properties. Exploration drilling of the east and south walls of the existing open pit returned positive results. A total of 2,300 meters were drilled, and the 15-hole program tested the existing geologic-resource model for a potential mineral-resource addition, and refined the granite-schist contact. Positive intercepts were intersected in every hole drilled; highlights include 29 meters of 0.029 ounce of gold per ton, 13.7 meters of 0.054 ounce of gold per ton, 36.6 meters of 0.019 ounce of gold per ton, 35 meters of 0.029 ounce of gold per ton, and 24.4 meters of 0.058 ounce of gold per ton (Athey and Werdon, 2017).

Production notes:

From 1996 to December 31, 2011, the Fort Knox Mine produced 5,246,631 ounces of gold (Quant, 2008; Szumigala and others, 2011, Kinross Gold, Corp., 2012). This included 289,794 ounces of gold that was produced in 2011. Most of this was processed through a carbon-in-pulp mill with a capacity of about 33 to 45 thousand tonnes per day. A large heap leach facility was constructed in 2009 that began processing a large stockpile of low grade ore; the company anticipates adding low-grade material to the heap leach pile from the pit, material that would not be economical to process through the mill. This heap-leach facility will extend the life of the mine to 2018 and and should increase gold production to an average 370,000 ounces of gold per year.

Fort Knox mine celebrated its 20th anniversary of operation and poured its 7-millionth ounce of gold in 2016; gold production totaled 409,844 ounces. Production increased slightly compared with 2015, mainly as a result of record production from the heap leach, but was partially offset by lower mill grades. Fort Knox mined 34,998,000 tons of material, processed 14,570,000 tons of ore through the mill, and processed 32,124,000 tons of ore on the heap leach pad. Mill grade averaged 0.022 ounce of gold per ton with an 83 percent recovery rate, and the heap-leach grade averaged 0.009 ounce of gold per ton. As of 2016, termination of open pit mining is scheduled for 2019. In May 2016, the U.S. Bureau of Land Management announced it is considering a proposal to relinquish 709 acres of National Oceanic and Atmospheric

Administration land immediately west of the phase-8 expansion of Fort Knox mine to the State of Alaska, as this land is no longer needed to fulfill its mission. Access to this land could add to the mine's life (Athey and Werdon, 2017).

Reserves:

As of December 31, 2011, the Fort Knox Mine has proven and probable reserves of 314.669 million tonnes with an average grade of 0.43 grams of gold per tonne (or 4.303 million ounces of gold) (Kinross Gold Corp., 2012). There is an addition measured and indicated resource of 112.098 million tonnes with an average grade of 0.40 grams of gold per tonne (or 1.426 million ounces of gold).

As of December 31, 2016, Fort Knox contains proven and probable reserves of 115,399,732 short tons grading 0.014 ounce of gold per ton, for a contained metal content of 1,506,000 ounces of gold. Measured and indicated resources include 104,745,905 tons grading 0.016 ounce of gold per ton, for a contained metal content of 1,440,000 ounces of gold, and inferred resources include 14,369,713 tons grading 0.016 ounce of gold per ton, for a contained metal content of 193,000 ounces of gold (Kinross Gold Corporation, 2016).

Additional comments:

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Primary Reference: Quandt and others, 2008; Fort Knox, 2011

Reporter(s): J.R. Guidetti Schaefer and C.J. Freeman (Avalon Development Corporation); D.J. Grybeck (Contractor, USGS); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Liberty Bell

Site type: Mine

ARDF no.: FB132

Latitude: 64.052 **Quadrangle:** FB A-4

Longitude: 148.845

Location description and accuracy:

The Liberty Bell mine is located approximately 5.6 miles south-southeast of Rex Dome in the NW1/4 sec. 13, T. 10 S., R. 7 W., of the Fairbanks Meridian. This mine is marked on the Fairbanks A-4 topographic map, and the buildings and workings are prominent in the field. As of 1998, the Liberty Bell property was owned by Columbia Yukon Exploration Inc., and it consisted of five targets over a 10,500-acre claim block (Columbia Yukon Exploration Inc., news release no. 83, June 9, 1998). The mine is locality 40 of Cobb (1972 [MF 410]). This location is probably accurate to within 1000 feet.

Commodities:

Main: Ag, Au, Bi, Cu

Other: Pb, Zn

Ore minerals: Arsenopyrite, bismuthinite, bornite, chalcopyrite, covellite, enargite, galena, gold, kobellite, loellingite, malachite, pyrite, pyrrhotite, sphalerite, tennantite, ullmannite

Gangue minerals: Actinolite, allanite, biotite, carbonate, feldspar, quartz, sericite

Geologic description:

The following geologic summary is taken from Yesilyurt, 1996. The geology of the Liberty Bell gold mine area is dominated by weakly metamorphosed volcaniclastic-sedimentary rocks of the California Creek Member of the Totatlanika Schist, which is of Devonian-Mississippian(?) age. Metamorphosed Mesozoic(?) mafic dikes and unmetamorphosed Late Cretaceous felsic porphyry dikes and plugs are scattered throughout the area. Continental clastic rocks of the Tertiary Nenana Gravel overlie these rocks in angular unconformity. Gold mineralization is associated with sulfide- and sulfosalt-rich lenses, veins, and low-angle shear zones in the Paleozoic phyllitic rocks adjacent to a porphyry intrusion.

Six types of hydrothermal alteration have been differentiated. Carbonate-quartz alteration occurs in a peripheral zone of the metasomatic mineralization at the mine area. An actinolite-pyrrhotite assemblage occurs adjacent to the gold mineralization. Potassium silicate alteration occurs adjacent to the porphyry intrusions; it consists mainly of alkali feldspar, biotite, tourmaline, allanite, and quartz. A chlorite-sericite-carbonate alteration assemblage occurs sporadically in the area. The most widespread type of alteration at Liberty Bell is a quartz-sericite-clay assemblage. Supergene alteration and weathering overprint all of the hydrothermal assemblages. The age of hydrothermal alteration is about 92 Ma, based on two K-Ar radiometric determinations on hydrothermal biotite and sericite.

The principal ore minerals at Liberty Bell are arsenopyrite, pyrite, and pyrrhotite. Also present are chalcopyrite, kobellite, ullmannite, bismuthinite, tennantite, and loellingite, and trace amounts of enargite, covellite, bornite, sphalerite, galena, malachite, and native gold. The ore minerals occur mostly as tabular and stringer replacement bodies, disseminations, cross-cutting veins, and as open space fillings.

The initial discovery was float samples that contained arsenopyrite, bismuth, and bismuthinite. Several shafts and tunnels were driven in 1915 and 1916. By 1930, development included more than 1,000 feet of adits, and several shafts and raises (Moffit, 1933). In 1931 a mill was installed; mining in 1932-33 produced a total of 8,400 ounces of gold from 17,500 tons of ore (Smith, 1933 [B 844-A, p. 19]; Smith, 1937; Toupe and others, 1986). In midsummer of 1936, all work was discontinued and work on the property did not

resume until the 1970s (Smith, 1938, p. 35-36). Since 1973, more than 16,000 feet of core has been produced by diamond drilling, and there has been considerable trenching, geologic mapping, geophysical surveys, and several thousand feet of reverse-circulation drilling (see Workings and Exploration field). Recently, five targets have been identified on the 10,500-acre property. The Mine Zone has mineable resources of 1,240,000 tons with an average grade of 0.1 ounce of gold per ton. Drilling has indicated that there is the potential for 250,000 ounces of gold in the Mine Zone and the Northwest Copper Zone (Columbia Yukon Explorations Inc., web site describing 1998 exploration activity).

Results from a detailed state airborne geophysical survey completed in 2002 by Alaska Division of Geological and Geophysical Surveys (DGGS) in the Bonnifield Mining District reveal a positive aeromagnetic anomaly at Liberty Bell which suggests an underlying large pluton. This idea is supported by follow-up ground truthing by DGGS in 2005 that noted extensive hornfels and hydrothermal alteration, in addition to granite and granodiorite dikes. The authors suggested from this work that viable exploration targets in the area include replacement/skarn and structurally controlled mineralization, which are both documented at Liberty Bell (Athey and others, 2006).

Alteration:

Six types of hydrothermal alteration have been differentiated (Yesilyurt, 1996). Carbonate-quartz alteration occurs in a peripheral zone of the metasomatic minerlization at the mine. An actinolite-pyrrhotite assemblage occurs adjacent to the gold mineralization. Potassium silicate alteration occurs adjacent to the porphyry intrusions and consists mainly of alkali feldspar, biotite, tourmaline, allanite, and quartz. A chlorite-sericite-carbonate alteration assemblage occurs sporadically in the area. The most widespread type of alteration at Liberty Bell is a quartz-sericite-clay assemblage. Supergene alteration and weathering overprint all of the hydrothermal assemblages (Yesilyurt, 1996).

Age of mineralization:

The age of mineralization has been a source of controversy; the suggestions range from Mesozoic to late Tertiary (Yesilyurt, 1996, p. 1282). Yesilyurt (1996) gives the age of hydrothermal alteration associated with the ore as about 92 Ma, on the basis of two K-Ar radiometric determinations on hydrothermal biotite and sericite that was probably formed contemporaneously with the mineralization.

Generic deposit model:

Deposit model:

Many investigators of the property have suggested various types of syngenetic massive sulfide models. Others favor an epigenetic origin, for instance, Yesilyurt (1996, p. 1282), who has done the most thorough modern work on the deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

By 1918, a tunnel 35 feet long and a shaft 15 feet deep were opened in loose rock (Overbeck, 1918, p. 360). Development work was reported in 1922, 1923, and 1924 (Brooks and Capps, 1924, p. 40; Brooks, 1925, p. 31; Smith, 1926, p. 26). By 1930, developments included more than 1,000 feet of adits and several shafts and raises (Moffit, 1933). In 1931, a mill was constructed by the Fairbanks-based Eva Creek Mining Company (Smith, 1933 [B 844-A, p. 19]). Due to the intense shearing and the degree of decomposition of the schist, much timbering was required to prevent caving (Moffit, 1933). In 1934, very little work was done, and mining was reported to be expensive due to the caving (Smith, 1936, p. 24). In the mid-summer of 1936, all work was discontinued (Smith, 1938, p. 35-36). Interest in the property resumed in the 1970s. In 1973, Alaska Petroleum and Mining and its joint partner Gulf Mineral Company drilled 20 diamond-drill

holes totaling 5,839 feet (Yesilyurt, 1996, p. 1282). In 1977, Resource Associates of Alaska (RAA) drilled six diamond-drill holes totaling 4,289 feet (Yesilyurt, 1996, p. 1282). In 1978, the claims were optioned to Cominco Limited, and in 1984 Cominco drilled seven diamond-drill holes totaling 1,578 feet. After the 1984 drilling, RAA acquired the claims under a joint-venture agreement with Cyprus Gold Corporation. A preliminary field study was conducted in 1986, and advanced exploration work began in 1987; it included thirty reverse-circulation drill holes, trenching, and detailed geologic mapping and sampling. In 1989, Nerco Minerals conducted exploration and detailed metallurgical studies at the property (Bundtzen and others, 1990, p. 12). In 1991, some exploration was reported by Amax Gold Inc. (Bundtzen and others, 1991, p. 10). In 1992, Amax Gold completed 5,845 feet of reverse-circulation drilling at the (Nerco-owned) property (Swainbank and others, 1993, p. 9). In 1993, operating on an option from the Liberty Bell Mining Company, Noranda Exploration Inc., funded by Hemlo Gold, mapped and sampled several mineralized zones (Bundtzen and others, 1994, p. 10). In 1994, Noranda Exploration trenched several anomalies that were discovered through geochemistry and geophysics (Swainbank and other, 1995, p. 10). In 1996, lessees of Pacific Northwest Resources Co. conducted a small drilling program (Swainbank and others, 1997, p. 8). In 1997, Liberty Bell Mining conducted a 5,000-foot core-drill program (Swainbank and others, 1998, p. 9).

During 2008, New Gold Inc. completed an exploration program at Liberty Bell consisting of a property-wide geophysical IP-Resistivity survey in combination with surface mapping and geochemical sampling. This work, combined with the results of work completed in 2007, has resulted in the delineation of five separate areas of prospective gold mineralization (New Gold Inc., 2008).

New Gold’s 2009 field program included more geologic mapping, geochemical sampling, and a core drilling program, although no results were announced (Szumigala and others, 2010).

Field work during 2010 by New Gold included geologic mapping, geochemical sampling, and a 9,967-foot core drilling program. Geochemical sampling included whole-rock analysis, U–Pb SHRIMP geochronology, and petrographic analysis. No results were announced. New Gold dropped its option on the Liberty Bell property at year’s end (Szumigala and others, 2011).

In 2002, Alaska Department of Natural Resources-Division of Geological and Geophysical Surveys completed a detailed state airborne geophysical survey covering 276 square miles in the Western Bonnifield Mining district, in which lies Liberty Bell. Follow-up geologic ground-truth mapping took place in 2005 and covered 131 square miles. The purpose of the Liberty Bell project was to produce a 1:50,000-scale geologic map to foster a better understanding of the geology and mineral potential of the area (Athey, 2006). This map was published in 2006 (Athey and others, 2006).

Production notes:

Mining in 1932 and 1933 produced a total of 8,400 ounces of gold from 17,500 tons of ore (Smith, 1937; Toupe and others, 1986).

Reserves:

In 1933, the reserves were estimated at 37,000 tons of ore that had an average assay of $22 in gold per ton (1.06 ounces of gold per ton) (Moffit, 1933). More recent drilling on the Northwest Copper Zone, approximately 2,000 feet from the Mine Zone, indicated an aggregated resource of 2,000,000 tons with a grade of 0.05 ounce of gold per ton (Columbia Yukon Explorations Inc., news release no. 83, June 9, 1998). The Mine Zone has mineable resources of 1,240,000 tons with an average grade of 0.1 ounce of gold per ton. Drilling has indicated that there is the potential for 250,000 ounces of gold in the Mine Zone and the Northwest Copper Zone (Columbia Yukon Explorations Inc., web site describing the 1998 exploration).

Additional comments:

Other names associated with Liberty Bell include 'Bearpaw', 'Eva Mining Co.', 'Eva Quartz Mining Co.', 'Irene', 'Johnson, Norberg and Erickson', 'Swanson and Mountaine', 'Short', 'Rose', and 'Wild Goose' (Cobb, 1976 [OFR 76-662 p. 162-167]).

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Primary Reference: Yesilyurt, 1996

Reporter(s): J.R. Guidetti Schaefer and C.J. Freeman (Avalon Development Corporation); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-02-25

Site name(s): Unnamed (near Ester Dome)

Site type: Prospect

ARDF no.: FB156

Latitude: 64.8897 **Quadrangle:** FB D-3

Longitude: 148.0675

Location description and accuracy:

Although several other older, small prospects (FB005 to FB011) are peripheral to or within the large block of claims of this prospect, it covers an area trending north-northwest about 5,900 feet long by 590 to 1,640 feet wide that was drilled in 2011. The coordinates are near the center of the area about a mile north-northwest of the top of Ester Dome in the north half of section 25, T. 1 N., R. 3 W. The location is accurate.

Commodities:

Main: Au

Other: As, Sb

Ore minerals: Arsenopyrite, gold, stibnite

Gangue minerals: Quartz

Geologic description:

Since the early 1900s , the Ester Dome area has been known for scattered gold-quartz veins with stibnite and arsenopyrite, some of which have been mined. Much of the area has been claimed and reclaimed several times, including the area surrounding this prospect on the north side of Ester Dome. In 2009, Miranda Gold Corporation (2009) leased a large block of claims from Range Minerals Inc. on the north side of Ester Dome and began exploration. The block included several older, small prospects (FB005-FB011), mostly gold-quartz veins, but Miranda's work was m mainly to test the area for large, bulk-minable, intrusion-related gold deposits. By 2011, Miranda had defined a north-northwest-trending area, geochemically anomalous in gold, about 5,900 feet long ft long by 590 to 1,640 feet wide. Miranda and their partner Agnico-Eagle (USA) drilled 6 holes on the anomaly in 2011 (Miranda Gold Corporation, 2012); four of the holes cut mineralization with more than 0.01 ounce of gold per ton. The four mineralized holes had 17 intercepts 0.9 to 6.1 meters wide with more than 0.5 gram of gold per tonne. Notable intercepts were 0.9 meters with 0.922 gram of gold per tonne, 2.3 meters with 0.723 gram of gold per tonne, 2.6 meters with 0.831 gram of gold per tonne, and 6.1 meters with 0.603 gram of gold per tonne, and 1.5 meters with 1.005 gram of gold per tonne. The mineralization is related to quartz sulfide veinlets and intense fracturing accompanied by iron oxides and selvages with quartz-sericite-pyrite alteration. In 1998, Placer Dome drilled similar mineralization (FB011) near the southern border of Miranda's geochemical anomaly.

The rocks in the area are part of the Fairbanks Schist composed of quartz-muscovite schist, quartzite, and chlorite-quartz schist that are cut by thrust faults (Newberry and others, 1996). The geochemical anomaly defined and drilled by Miranda is associated with a cluster of granitic bodies that intrude the metamorphic rocks (Miranda Gold Corp., 2011).

Alteration:

The mineralization is related to quartz sulfide veinlets and to intense fracturing accompanied by iron oxides and selvages with quartz-sericite-pyrite alteration.

Age of mineralization:

Probably about 90 Ma based on similarities to many gold deposits in the Fairbanks District.

Generic deposit model:

Deposit model:

Gold-quartz veins; intrusion-related, bulk-tonnage gold deposit (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

In 2009. Miranda Gold Corporation (2009) leased a large block of claims from Range Minerals Inc. on the north side of Ester Dome 11, and began exploration. By 2011, Miranda had defined a north-northwest-trending area, geochemically anomalous in gold, about 5,900 feet long by 590 to 1,640 feet wide, within their block of claims. Miranda and their partner Agnico-Eagle (USA) drilled 6 holes on the anomaly in 2011 (Miranda Gold Corporation, 2012).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Primary Reference: Miranda Gold Corp., 2011

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Wattamuse Creek

Site type: Mine

ARDF no.: GO021

Latitude: 59.3278 **Quadrangle:** GO B-6

Longitude: 161.2391

Location description and accuracy:

Wattamuse Creek is a northwest tributary to Slate Creek (GO020), a north tributary to Goodnews River. It has been placer mined from its junction with Slate Creek for a distance of about 2 miles. The coordinates are at the approximate midpoint of the workings, in the NE1/4 of section 9, T. 10 S., R. 71 W., of the Seward Meridian.

There are conflicting opinions about the extent of Wattamuse Creek. Some hold that it extends down to Slate Creek; some that it continues to the mouth of Cascade Creek (GO022) and Cascade Creek continues to Slate Creek. For this record, Wattamuse Creek continues to Slate Creek following local usage.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Wattamuse Creek is the principal gold producer in the Goodnews River drainage. Gold was discovered in 1917 by a native reindeer herder (Harrington, 1921), and the first mining took place in the fall of 1917, when about 500 ounces were produced. There has been extensive mining along Wattamuse Creek for at least two miles above the mouth of Slate Creek (Fechner, 1988; Calista Corp., 2008). Much of the mining until the early 30s was by various hand and small-scale mechanized mining when the New York-Alaska Company drilled the property. It was subsequently leased and a 2 1/2- foot dredge was built in 1938. The dredge operated until 1941 and mined from near the mouth of Cascade Creek downstream for about 1.4 miles to Slate Creek. In 1946 and 1947, Bristol Bay Mining Company used a dragline to mine in the narrow canyon above the mouth of Cascade Creek on claims 2 Above and 5-8 Above.

The pay streak on Wattamuse Creek was 20 to 30 feet wide in upper parts of the creek to over 100 feet wide on lower parts. The pay, 1 to 2 feet of gravel and about 6 inches of bedrock, ranged in grade from 0.015 to 0.15 ounce of gold per cubic yard. The overburden was 2 to 5 feet of soil and gravel (Harrington, 1921). The gravel became coarser upstream, where boulders up to a few feet across became more abundant. The gold recovery in the dredge was about four times that indicated by the drilling due to the large boulders in the creek.

Fechner (1988) collected eight 0.1 cubic yard placer samples in the Wattamuse Creek drainage, including one from lower Wattamuse below the mouth of Cascade Creek. These samples, from along the active drainage and from benches, contained 0.0013 to 0.7583 ounce of gold per cubic yard. Fechner (1988) indicates that the tailings along the creek could be reworked and that local unmined areas are also present. One unmined area is estimated to contain 60,000 cubic yards with an average grade of 0.015 to 0.018 ounce of gold per cubic yard. The lower dredged part of the creek (included with Cascade Creek by Fechner, 1988) is estimated to have had about 800,000 cubic yards of tailings. In as much as the dredge is reported to have recovered about 0.025 ounce of gold per cubic yard (Fechner, 1988), about 20,000 ounces of gold production are indicated for this part of the creek. However, the recorded production for this creek segment

is 9,300 ounces of gold (Fechner, 1988). The upper part of the creek has recorded and estimated production of 18,300 ounces of gold (Fechner, 1988), possibly making total production from the creek as much as 38,000 ounces.

Wattamuse Creek is a glaciated drainage. Bedrock in the area includes Paleozoic and Mesozoic sedimentary and volcanic rocks intruded by an Upper Cretaceous granitic stock in the headwaters of the creek (Hoare and Coonrad, 1978).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; medium

Site Status: Probably inactive

Workings/exploration:

Gold was discovered in 1917 by a native reindeer herder (Harrington, 1921), and the first mining took place in the fall of 1917, when about 500 ounces were produced. There has been extensive mining along Wattamuse Creek for at least two miles above the mouth of Slate Creek (Fechner, 1988; Calista Corp, 2008). Much of the early mining was by various hand and small-scale mechanized mining until the early 30s when the New York-Alaska Company drilled the property. It was subsequently leased and a 2 1/2 foot dredge was built in 1938. The dredge operated until 1941 and mined from near the mouth of Cascade Creek downstream for about 1.4 miles to Slate Creek. In 1946 and 1947, Bristol Bay Mining Company used a dragline to mine in the narrow canyon above the mouth of Cascade Creek on claims 2 Above and 5-8 Above.

Production notes:

About 2,000 ounces of gold were produced from 1917 to 1919 (Harrington, 1921). Fechner (1988) indicates that the tailings along the creek could have been be reworked and that local unmined areas are also present. One unmined area is estimated to contain 60,000 cubic yards with an average grade of 0.015 to 0.018 ounce of gold per cubic yard. The lower dredged part of the creek (included with Cascade Creek by Fechner, 1988) is estimated to have had about 800,000 cubic yards of tailings. In as much as the dredge is reported to have recovered about 0.025 ounce of gold per cubic yard (Fechner, 1988), about 20,000 ounces of gold production are indicated for this part of the creek. However, recorded production for this creek segment is 9,300 ounces of gold (Fechner, 1988). The upper part of the creek has recorded and estimated production of 18,300 ounces of gold (Fechner, 1988), possibly making total production from the creek as much as 38,000 ounces.

Reserves:

None.

Additional comments:

References:

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Fechner, S.A., 1988, Bureau of Mines mineral investigation of the Goodnews Bay mining district, Alaska: U.S. Bureau of Mines Open-File Report 1-88, 230 p., 3 sheets.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Harrington, G.L., 1921, Mineral resources of the Goodnews Bay region: U.S. Geological Survey Bulletin 714-E, p. 207-228.

Hoare, J.M., and Cobb, E.H., 1977, Mineral occurrences (other than mineral fuels and construction materials) in the Bethel, Goodnews, and Russian Mission quadrangles, Alaska: U.S. Geological Survey Open-File Report 77-156, 98 p.

Hoare, J.M., and Coonrad, W.L., 1978, Geologic map of the Goodnews and Hagemeister Island quadrangles

Primary Reference: Fechner, 1988

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Cascade Creek

Site type: Prospect

ARDF no.: GO022

Latitude: 59.3311 **Quadrangle:** GO B-6

Longitude: 161.2407

Location description and accuracy:

Cascade Creek is a north tributary to Wattamuse Creek (GO021). The mouth of Cascade Creek is about 1 mile upstream from the mouth of Wattamuse Creek on Slate Creek. The lower potentially auriferous portion flows through the upper part of section 9 and the center of section 4, T. 10 S., R. 71 W.

There are conflicting opinions about the extent of Wattamuse Creek. Some hold that it extends down to Slate Creek; some that it continues to the mouth of Cascade Creek (GO022) and Cascade Creek continues to Slate Creek. For this record, Wattamuse Creek continues to Slate Creek following local usage.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Cascade Creek has been explored, and drilled but apparently the only mining was near its mouth where a dredge began to work down Wattamuse Creek (GO021) (Calista Corp., 2008). The gravels are somewhat finer than on Wattamuse Creek and 8 to 10 feet deep. The drilling on Cascade Creek produced poor results.

Six, 0.1 cubic yard placer samples from along about 4 miles of Cascade Creek contained a trace to 0.0017 ounce of gold per cubic yard (Fechner, 1988). Bedrock in the area includes Paleozoic and Mesozoic sedimentary and volcanic rocks, locally intruded by Upper Cretaceous to Lower Tertiary granitic rocks and Jurassic mafic/ultramafic plutonic rocks (Hoare and Coonrad, 1978).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au-PGE (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Inactive

Workings/exploration:

Exploration including drilling has taken place, especially along lower Cascade Creek near its confluence with Wattamuse Creek (GO021).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Calista Corp., 2008, Goodnews Bay Gold District: http://www.calistacorp.com/docs/reports/Goodnews%20Bay%20Gold%20District.pdf (as of March 4, 2008).

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Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Hoare, J.M., and Cobb, E.H., 1977, Mineral occurrences (other than mineral fuels and construction materials) in the Bethel, Goodnews, and Russian Mission quadrangles, Alaska: U.S. Geological Survey Open-File Report 77-156, 98 p.

Hoare, J.M., and Coonrad, W.L., 1978, Geologic map of the Goodnews and Hagemeister Island quadrangles

Primary Reference: Fechner, 1988

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Wattamuse

Site type: Prospect

ARDF no.: GO023

Latitude: 59.3448 **Quadrangle:** GO B-7

Longitude: 161.3346

Location description and accuracy:

This lode prospect is on the ridge crest that makes up the divide between the headwaters of Wattamuse Creek (GO021), Granite Creek, and South Fork Arolik River. It is on the saddle about 1,000 feet east of a 1,813-foot summit, and 0.6 mile due north of Granite Creek. It is accurately located.

Commodities:

Main: Au

Other: Ag, Hg, Sb, W

Ore minerals: Arsenopyrite, chalcopyrite, gold, pyrite, pyrrhotite, stibnite

Gangue minerals: Quartz

Geologic description:

An Upper Cretaceous granodiorite-diorite stock underlies the head of Granite and Wattamuse Creeks (Hoare and Coonrad, 1978). This stock hosts 1 inch- to 1-foot-thick quartz veins containing arsenopyrite, stibnite, pyrite, and some chalcopyrite (Calista Corp. 2008). A soil-geochemical grid over about a 1/4- by 1/2-mile area straddling the ridge crest showed large areas of soil containing more than 100 parts per billion (ppb) gold, and several areas containing more than 1,000 ppb gold. Individual grab samples collected for Calista Corporation contain up to 9.5 parts per million (ppm) gold, 14.9 ppm silver, 17 percent arsenic, 22 percent antimony, and 1,500 ppm mercury (Fechner, 1988, p. 58). The U. S. Bureau of Mines collected 19 grab samples of rocks in the headwaters of Wattamuse Creek. One of these, a composite grab sample collected in this prospect area, assayed 2.18 ounces of gold per ton, 6.6 ppm silver, 2,850 ppm arsenic, 400 ppm bismuth, 40 ppm antimony, and 184 ppm tungsten (Fechner, 1988). Grab samples of quartz veins contained 1.25 to 5.3 ppm Au. The country rocks around the granitic stock locally include mafic rocks; a sample of mafic rock containing arsenopyrite, pyrrhotite, and chalcopyrite assayed 17.4 ppm silver, 3.3 ppm gold, 0.13 percent arsenic, 30 ppm bismuth, and 0.19 percent copper (Fechner, 1988, p. 58).

Alteration:

Silicification.

Age of mineralization:

Late Cretaceous or younger. A K/Ar age of biotite from the host granitic stock is 71.3 +/- 2.1 Ma on biotite (Hoare and Coonrad, 1978).

Generic deposit model:

Deposit model:

Granitic rock-hosted epithermal gold/silver.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

A soil geochemistry grid, selected rock sampling, and probably surface mapping have been completed on the prospect (Calista Corp., 2008).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Calista Corp., 2008, Goodnews Bay Gold District: http://www.calistacorp.com/docs/reports/Goodnews%20Bay%20Gold%20District.pdf (as of March 4, 2008).

Fechner, S.A., 1988, Bureau of Mines mineral investigation of the Goodnews Bay mining district, Alaska: U.S. Bureau of Mines Open-File Report 1-88, 230 p., 3 sheets.

Hoare, J.M., and Coonrad, W.L., 1978, Geologic map of the Goodnews and Hagemeister Island quadrangles

Primary Reference: Fechner, 1988

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Grubstake

Site type: Prospect

ARDF no.: GU019

Latitude: 62.7888 **Quadrangle:** GU D-1

Longitude: 144.0327

Location description and accuracy:

The center of the Grubstake prospect is about 6.2 miles north-northwest of the community of Slana and about 0.5 mile west-northwest of peak 5509. It is about 0.6 mile east-southeast of the center of section 25, T. 12 N., R. 7 E., of the Copper River Meridian. The location is accurate within 1/4 mile.

Commodities:

Main: Au, Cu

Other: Fe, Pb, Zn

Ore minerals: Arsenopyrite, chalcopyrite, galena, magnetite, malachite, sphalerite

Gangue minerals: Barite, carbonate, quartz

Geologic description:

The upper Grubstake Creek area is underlain by highly altered, border-phase rocks of the Pennsylvanian to Permian, Ahtell Creek quartz monzonite pluton. The pluton intrudes the Pennsylvanian to Permian, Tetelna Formation, which is mainly volcanic rocks. Both the Ahtell pluton and the Tetelna Formation are cut by dikes and irregular bodies of a mid-Jurassic complex that varies from diorite to quartz diorite (Richter and Matson, 1968; Bull, Schneider, and Freeman, 1997; Bull, Freeman, and Schneider, 1999; Taylor 2010). Where the Tetelna rocks have been intruded by the diorite complex they have been converted to multicolored, biotite and hornblende hornfels.

Porphyry mineralization occurs mainly in the diorite complex and adjacent hornfels (Taylor, 2010). Various subtypes occur: 1) propylitic altered zones with as much as 10 percent pyrite are cut by quartz-carbonate veins that contain pyrite, chalcopyrite, and galena; 2) potassic altered zones containing secondary biotite and K-feldspar are cut by quartz-K feldspar veins, veinlets, and sporadic concentrations of as much as 15 percent pyrite, chalcopyrite, arsenopyrite, and magnetite; and 3) sericite/phyllic altered zones locally stained with malachite contain 5-30 percent sulfides. There are widespread localized zones of argillic and iron-carbonate alteration. The hornfelsed Tetelna Formation within about 100 feet of diorite also has several subtypes of porphyry mineralization including: 1) silicified zones containing as much as 15 percent pyrite; 2) quartz-carbonate veins with pyrite, chalcopyrite, arsenopyrite, and galena; and 3) chloritic-magnetite or chloritic-pyrite breccia cut by quartz-pyrite-chalcopyrite veinlets. The hornfels adjacent to chloritic zones typically is bleached. Reconnaissance mapping by Homestake Mining Company geologists (Bull, Scheider, and Freeman, 1997; Bull, Freeman, and Schneider, 1999; Taylor, 2010) indicates that the porphyry alteration and mineralization is crudely zoned, with potassic alteration at lower elevations and in upper Grubstake Creek. Discrete veins in the Grubstake area, such as the J. D. Lyons prospect (GU018), appear to be related to the hornfels phase of this porphyry deposit. As visualized by Taylor (2010), potassic alteration with potassium feldspar, biotite, and magnetite is nearest the mineralization. Outward, there is a shell of sodium-calcium alteration with albite, actinolite, and magnetite, followed by an outermost shell of propylitic alteration with pyrite, chlorite, epidote, and magnetite.

International Tower Hill Inc. staked a large block of claims in the area in 2006, carried out extensive geologic mapping, sampling, and geochemical surveys, and flew an aerial geophysical survey over the area. Corvus Gold Inc. (a spinoff of International Tower Hill) drilled 3 holes in 2010 that intersected extensive

altered and veined rock (Corvus Gold, 2010). Notable intercepts in two of the holes were 199.3 meters with 0.08 percent copper and 0.06 grams of gold per tonne and 129.9 meters with 0.19 percent copper and 0.15 grams of gold per tonne. Taylor (2010) suggests that the mineralization is Cretaceous.

In 2010, Corvus (2011) discovered a series of en-echelon quartz-dolomite-barite veins 20 centimeters to 2 meters thick at Grubstake. This swarm of veins strikes north-northeast to northeast for a strike length of more than 600 feet. Nineteen rock samples averaged 7.38 grams of gold per tonne, 8.82 grams of silver per tonne, 0.91 percent lead, and 0.16 percent zinc; the best had 46.5 grams of gold per tonne, 29.8 grams of silver per tonne, 4.22 percent lead, and 1.22 percent zinc.

Alteration:

Potassic alteration with potassium feldspar, biotite, and magnetite is nearest the mineralization. Succeeded by a shell of sodium-calcium alteration with albite, actinolite, and magnetite, followed by an outermost shell of propylitic alteration with pyrite, chlorite, epidote, and magnetite. Much hornfels locally (Taylor, 2010).

Age of mineralization:

Possibly related to the nearby Pennsylvanian to Permian Ahtell pluton or to other plutons, variously considered to be Jurassic or Cretaceous (Taylor, 2010).

Generic deposit model:

Deposit model:

Porphyry Cu-Au (Cox and Singer, 1986; model 20c) and polymetallic barite veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c

Production Status: None

Site Status: Active

Workings/exploration:

Grubstake Creek has been explored extensively since the discovery of placer deposits in the area in 1934 (GU017). Work by Richter and his associates appears to have triggered exploration in the 1960s and 1970s (Richter, 1964,1966; Richter and Matson, 1968). Kirk Stanley was active at that time. More recently, the area has been studied by Cominco Exploration (St. George, 1992), and Homestake Mining Company (Bull, Schneider and Freeman, 1997; and Bull, Freeman, and Schneider, 1999). International Tower Hill Mines Inc. staked a large block of claims in the area in 2006, carried out extensive geologic mapping, sampling, and geochemical surveys, and flew an aerial geophysical survey over the area.

In 2007, based on favorable results in the southeast end of the belt, a helicopter magnetic survey was flown over the Grubstake target. In addition, an analysis of satellite imagery was undertaken in 2007 which produced an iron oxide and clay alteration map of the region outlining a number of new target areas which have yet to be explored.

In 2008 and 2009, ITH covered the bulk of the claim blocks with a stream sediment survey which identified multiple targets in the SE extension of the main Chisna claim block. In addition, a number of magnetic anomalies were investigated in the area southwest of the main claim blocks which returned copper mineralization from follow up prospecting and additional claims were staked.

Corvus took over the project from ITH in 2010 and will be managing the joint venture with Ocean Park (OCP). The Corvus-OCP joint venture is focused on testing the porphyry and precious metal potential of the Chisna belt using detailed airborne and ground geophysics to define drill targets which will be aggressively tested. A 2010 summer exploration program was carried out and included 2,926 meters (9600 feet) of diamond drilling, soil and rock sampling, airborne ZTEM surveying, and ground-based magnetotelluric (MT) with three-dimensional induced polarization chargeability-resistivity surveying and inversion modeling over selected target areas. Three of the holes drilled intersected extensive altered and mineralized rock (Corvus Gold, 2010).

In the summer 2012 exploration season, Corvus continued with surface prospecting and mapping. High-grade structurally controlled copper mineralization was found (Corvus Gold, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Primary Reference: Taylor, 2010

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (U.S. Geological Survey); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-05-30

Site name(s): Notch; Golden Range

Site type: Prospect

ARDF no.: GU045

Latitude: 62.8914 **Quadrangle:** GU D-1

Longitude: 143.9986

Location description and accuracy:

The Notch prospect is about 13.0 miles north of Slana. It is 3.1 mile northwest of VABM 6677 'Ahtell', near the center of section 24, T. 3 S., R. 7 E. The location is accurate.

Commodities:

Main: Ag, As, Au

Other:

Ore minerals: Arsenopyrite, gold

Gangue minerals: Carbonate minerals, quartz

Geologic description:

The rocks in the area of the Notch prospect are diorite and quartz diorite of the Permian to Pennsylvania Ahtell pluton (Richter, 1966; Richter and others, 1975; Wilson and others, 1998; Corvus Gold Inc., 2012). The rocks are cut by extensive dike swarms and faults. The mineralization is on the northeast side of a regional-scale northwest-striking fault.

The Notch prospect may have been sampled in 1980 when WGM Inc. on behalf of the Ahtna Native Corporation searched for the source of geochemical anomalies in gold that outlined a northwest-trending area several miles long that WGM had identified in 1979 (WGM Inc., 1979, 1980). In 1980, they collected several rock samples at scattered locations along the trend that contained up to 3,260 parts per billion (ppb) gold.

In 2010, Corvus Gold Inc. revisited the area, outlined an area of mineralization 2 by 9 kilometers in size, and called it the Golden Range target. They collected more than 300 rock and soil samples in the area. The 151 rock samples averaged 0.6 gram of gold per tonne; 29 of the 151 had more than 0.10 gram of gold per tonne, and the best had 50.4 grams of gold per tonne.

By 2011, Corvus had identified at least 5 prospects in the Golden Range target area that they had sampled and drilled (Corvus Gold, Inc., 2012). One is the Notch prospect where they drilled 7 holes totaling 1,674 meters and dug 4 trenches that totaled 104 meters.

The Notch drilling defined a mineralized, east-west striking shear zone that can be traced for more than a kilometer; it is 40-60 meters thick and dips south. The shear zone is highly altered. The alteration consists of pre- to syn-mineralization sericitic alteration followed by syn- and postmineral carbonate and iron-carbonate alteration. The shear zone hosts arsenopyrite-quartz veins which commonly are folded and disarticulated. The hanging wall of the zone is quartz diorite; the footwall is diorite. The mineralized shear zone is offset by a steep north-dipping fault that offsets the zone for about 40 meters. The drilling indicates that the mineralization continues down dip for at least 250 meters. Some notable intercepts are: 1)15.8 meters with 23.19 grams of gold per tonne and 1.93 grams of silver per tonne; 2) 12.3 meters with 1.60 grams of gold per tonne and 1.93 grams of silver per tonne; 3) 44.9 meters with 0.34 grams of gold per tonne and 0.68 grams of silver per tonne; 4) 16.9 meters with 1.99 grams of gold per tonne, and 5) 5.1 meters with 4.57 grams of gold per tonne.

Alteration:

Pre- to syn-mineralization sericitic alteration followed by syn- and postmineral carbonate and iron-carbonate alteration.

Age of mineralization:

Younger than the Permian to Pennsylvanian host rocks.

Generic deposit model:

Deposit model:

Mineralized zone with arsenopyrite-quartz veins (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

The Notch prospect may have been sampled in 1980 when WGM Inc. on behalf of the Ahtna Native Corporation searched for the source of geochemical anomalies in gold that outlined a northwest-trending area several miles long that WGM had identified in 1979 (WGM Inc., 1979, 1980). In 1980, they collected several rock samples at scattered locations along the trend that contained up to 3,260 parts per billion (ppb) gold.

In 2010, Corvus Gold Inc. revisited the area, outlined an area of mineralization 2 by 9 kilometers in size, and called it the Golden Range target. They collected more than 300 rock and soil samples in the area. By 2011, Corvus had identified at least 5 prospects in the Golden Range target area that they had sampled and drilled (Corvus Gold, Inc., 2012). One is the Notch prospect where they drilled 7 holes totaling 1,674 meters and dug 4 trenches that totaled 104 meters.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Primary Reference: Corvus Gold Inc., 2011

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (U.S. Geological Survey); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Matador

Site type: Prospect

ARDF no.: GU047

Latitude: 62.9121 **Quadrangle:** GU D-1

Longitude: 144.0404

Location description and accuracy:

The Matador prospect is about 14.0 miles north of Slana. It is about 3.9 miles northwest of VABM 6677 'Ahtell' in the northwest quarter of section 14, T. 3 S., R. 7 E., of the Copper River Meridian. The location is accurate within 1/4 mile.

Commodities:

Main: Ag, Au

Other:

Ore minerals:

Gangue minerals: Carbonate minerals, quartz

Geologic description:

The rocks in the area of the Matador prospect are diorite and quartz diorite of the Permian to Pennsylvania, Ahtell pluton (Richter, 1966; Richter and others, 1975; Wilson and others, 1998; Myers and others, 2011; Corvus Gold Inc., 2012a). The rocks are cut by extensive dike swarms and faults. The mineralization is on the northeast side of a regional-scale northwest-striking fault.

The Matador prospect may have been sampled in 1980 when WGM Inc. on behalf of the Ahtna Native Corporation searched for the source of geochemical anomalies in gold that outlined a northwest-trending area several miles long WGM Inc. identified in 1979 (WGM Inc., 1979, 1980). In 1980, they collected several rock samples at scattered locations along the trend that contained up to 3,260 parts per billion (ppb) gold.

In 2010, Corvus Gold Inc. revisited the area, outlined an area of mineralization 2 by 9 kilometers in size, and called it the Golden Range target. They collected more than 300 rock and soil samples. The 151 rock samples averaged 0.6 gram of gold per tonne; 29 of the 151 had more than 0.10 gram of gold per tonne, and the best had 50.4 grams of gold per tonne (Corvus Gold Inc., 2011).

By 2011, Corvus had identified at least 5 specific prospects in the Golden Range target area that they had soil sampled, rock chip sampled, and drilled (Corvus Gold, Inc., 2012a). One is the Matador prospect where they drilled 2 holes. A notable intercept was 2.7 meters that averaged 0.02 gram of gold per tonne and 681.23 grams of silver per tonne.

The rock sample geochemistry has a signature of 5.3 to 1 ratio of silver to gold, 419 to 1 ratio of arsenic to antimony, 42 to 1 ratio of bismuth to tellurium, and 28 to 1 ratio of arsenic to copper (Brown and others, 2012).

No further details on the mineralization are available but it is probably similar to that at the nearby Notch prospect (GU045), where arsenopyrite-quartz veins are in a thick mineralized zone marked by sericitic and quartz-carbonate alteration (Myers and others, 2011).

Alteration:

Extensive silica-carbonate alteration of diorite and quartz diorite? (Corvus Gold Inc., 2012a).

Age of mineralization:

Younger than the Permian to Pennsylvanian host rocks (Corvus Gold Inc., 2012a).

Generic deposit model:

Deposit model:

Mineralized zone with arsenopyrite-quartz veins - polymetallic veins? (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active

Workings/exploration:

The Matador prospect may have been sampled in 1980 when WGM Inc. on behalf of the Ahtna Native Corporation searched for the source of geochemical anomalies in gold that outlined a northwest-trending area several miles long they had identified in 1979 (WGM Inc., 1979, 1980). In 2010, Corvus Gold Inc. revisited the area, outlined an area of mineralization 2 by 9 kilometers in size, and called it the Golden Range target. They collected more than 300 rocks and soil samples. By 2011, Corvus had identified at least 5 specific prospects in the Golden Range target area that they had sampled and drilled (Corvus Gold, Inc., 2012a). One is the Matador prospect where they drilled 2 holes. Highlights of intercepts are 2.7 meters averaging 681 grams of silver per tonne (Corvus Gold Inc., 2012b).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brown, Chris, Myers, Russel, Taylor, Chris, 2012, Jolly Green-A New Cu-Mo-Au Porphyry Discovery in Alaska: Alaska Miners Association, 2012 Annual Convention Abstracts, p. 33.

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Myers, Russell, Brown, Chris, Taylor Christ, Wilkins, Andres, Burnett, Bill, Stroup, Caleb, Keeley Josh, Benchley, Kristen, Robinson, John, Van Wyck Nick, and Jacobs, Joe, 2011, Golden Range- A new high grade gold discovery in Alaska: Alaska Miners Association, 2011 Annual Convention Abstracts, p. 37.

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WGM Inc., 1979, 1978 Annual Progress Report, Uranium Exploration, Ahtell Creek Area, Volume I: WGM Inc., 39 p., appendices, 4 maps. (Report available, Ahtna Mineral Co., Anchorage, Alaska).

WGM Inc., 1980, 1979 Summary report of gold potential, Slana District, Ahtna project: WGM Inc., 10 p., map, scale 1:63,360. (Report held by Ahtna Mineral Co., Anchorage, Alaska).

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Corvus Gold Inc., 2012a

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-08

Site name(s): Jolly Green; Golden Range

Site type: Prospect

ARDF no.: GU048

Latitude: 62.9171 **Quadrangle:** GU D-1

Longitude: 144.0975

Location description and accuracy:

The Jolly Green prospect is about 15.1 miles north-northwest of Slana. It is about 6.0 miles northwest of VABM 6677 'Ahtell' and about 0.4 mile south of the center of section 9, T. 13 N., R. 7 E., of the Copper River Meridian; near peak 6020. The location is accurate within 1/4 mile.

Commodities:

Main: Ag, Au, Cu

Other: Fe

Ore minerals: Chalcopyrite, gold, molybdenite, silver

Gangue minerals: Quartz

Geologic description:

The rocks in the area of the Jolly Green prospect are diorite and quartz diorite of the Permian to Pennsylvania Ahtell pluton (Richter, 1966; Richter and others, 1975; Wilson and others, 1998; Corvus Gold Inc., 2012a). The rocks are cut by extensive dike swarms and faults. The mineralization is on the northeast side of a regional-scale northwest-striking fault.

The Jolly Green prospect may have been sampled in 1980 when WGM Inc. on behalf of the Ahtna Native Corporation searched for the source of geochemical anomalies in gold that outlined a northwest-trending area several miles long that WGM had identified in 1979 (WGM Inc., 1979, 1980). In 1980, they collected several rock samples at scattered locations along the trend that contained up to 3,260 parts per billion (ppb) gold.

In 2010, Corvus Gold Inc. revisited the area, outlined an area of mineralization 2 by 9 kilometers in size, and called it the Golden Range target. They collected more than 300 rock and soil samples in the area. The 151 rock samples averaged 0.6 gram of gold per tonne; 29 of the rock samples had more than 0.10 gram of gold per tonne, and the best had 50.4 grams of gold per tonne.

By 2011, Corvus had identified at least 5 specific prospects in the Golden Range target area that they had sampled and drilled (Corvus Gold, Inc., 2012a). One is the Jolly Green prospect where they only collected rock samples; 10 of which they considered significant. Those samples contained 3.0 to 126.5 grams of gold per tonne, 25.7 to 198.0 grams of silver per tonne, and 0.4 to 17.7 percent copper. Little information is available about the mineralization other than they note it has base metals and may reflect a copper-gold porphyry at depth.

The Jolly Green mineralization may be related to that at the unnamed prospect about 1.3 miles to the southeast (GU037), where chalcopyrite and molybdenite commonly occur along joint surfaces in silica-carbonate rock, which is widely developed near the western contact of a pluton.

In 2011, Corvus performed a soil x-ray fluorescence (XRF) survey, which indicated high grade mineralization hosted in north-northwest trending shear zones/quartz vein-breccias. Pervasive fracture-controlled copper oxide coating in quartz-diorite forms supergene halos around shears. High-grade gold is constrained to Jolly Green shear zone. The Jolly Green shear zone hosts over 1 percent copper on 700 meters of strike (Brown and others, 2012).

Alteration:

Copper-oxide in supergene halos around shears. High grade copper + gold + silver + molybdenum in shear/quartz-vein breccia zones (Brown and others, 2012).

Age of mineralization:

Younger than the Permian to Pennsylvanian host rocks (Wilson and others, 1998).

Generic deposit model:

Deposit model:

Porphyry Cu-Au? (Cox and Singer, 1986; model 20c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c?

Production Status: None

Site Status: Active

Workings/exploration:

The Jolly Green prospect may have been sampled in 1980 when WGM Inc. on behalf of the Ahtna Native Corporation searched for the source of geochemical anomalies in gold that outlined a northwest-trending area several miles long that WGM. had identified in 1979 (WGM Inc., 1979, 1980). In 1980, they collected several rock samples at scattered locations along the trend.

In 2010, Corvus Gold Inc. revisited the area, outlined an area of mineralization 2 by 9 kilometers in size, and called it the Golden Range target. They collected more than 300 rock and soil samples in the area. By 2011, Corvus had identified at least 5 specific prospects in the Golden Range target area that they had sampled and drilled (Corvus Gold, Inc., 2012a). One is the Jolly Green prospect where they only collected rock samples.

In 2010 and 2011, Corvus performed a soil survey at Jolly Green of over 12 km in length and average over 10 grams of gold per ton over 12 kilometers with over 50 grams of gold per ton widespread. In 2011, Corvus performed a soil x-ray fluorescence (XRF) survey, which indicated high grade mineralization hosted in north-northwest trending shear zones/quartz vein-breccias. Pervasive fracture-controlled copper oxide coating in quartz-diorite forms supergene halos around shears. High-grade gold is constrained to Jolly Green shear zone. The Jolly Green shear zone hosts over 1 percent copper on 700 meters of strike (Brown and others, 2012). 2011 drilling highlights are 126.5 grams of gold per ton, 198 grams of silver per ton and 17.7 percent copper (Corvus Gold Inc., 2012b).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brown, Chris, Myers, Russel, Taylor, Chris, 2012, Jolly Green-A New Cu-Mo-Au Porphyry Discovery in Alaska: Alaska Miners Association, 2012 Annual Convention Abstracts, p. 33.

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Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Corvus Gold Inc., 2012a; Brown and others, 2012

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-08

Site name(s): NOM; Golden Range

Site type: Prospect

ARDF no.: GU049

Latitude: 62.89 **Quadrangle:** GU D-1

Longitude: 144.0392

Location description and accuracy:

The NOM target is about 12.7 miles north-northwest of Slana. It is about 3.4 miles northwest of VABM 6677 'Ahtell' and about 0.2 mile southwest of the center of section 23, T. 13 N., R. 7 E., of the Copper River Meridian. The location is accurate within 1/4 mile.

Commodities:

Main: Ag, Au, Cu

Other: Bi, Te, Sb

Ore minerals: Arsenopyrite, gold, stibnite

Gangue minerals: Carbonate minerals, quartz

Geologic description:

The rocks in the area of the NOM prospect are diorite and quartz diorite of the Permian to Pennsylvania Ahtell pluton (Richter, 1966; Richter and others, 1975; Wilson and others, 1998; Corvus Gold Inc., 2012). The rocks are cut by extensive dike swarms and faults. The mineralization is on the northeast side of a regional-scale northwest-striking fault.

The NOM prospect may have been sampled in 1980 when WGM Inc. on behalf of the Ahtna Native Corporation searched for the source of geochemical anomalies in gold that outlined a northwest-trending area several miles long that WGM had identified in 1979 (WGM Inc., 1979, 1980). In 1980, they collected several rock samples at scattered locations along the trend that contained up to 3,260 parts per billion (ppb) gold.

In 2010, Corvus Gold Inc. revisited the area, outlined an area of mineralization 2 by 9 kilometers in size, and called it the Golden Range prospect area. They collected more than 300 rock and soil samples in the area. The 151 rock samples averaged 0.6 gram of gold per tonne; 29 of the 151 had more than 0.10 gram of gold per tonne, and the best had 50.4 grams of gold per tonne (Corvus Gold Inc., 2011).

By 2011, Corvus had identified at least 5 specific prospects in the Golden Range target area that they had sampled and drilled (Corvus Gold, Inc., 2012). One is the NOM prospect where they drilled 4 holes and dug 3 trenches. Notable intercepts in the drill holes were: 1) 8.0 meters that averaged 0.48 gram of gold per tonne and 1.57 grams of silver per tonne; 2) 5.1 meters that averaged 0.90 grams of gold per tonne and 0.76 gram of silver per tonne; 3) 6.5 meters that averaged 0.60 gram of gold per tonne and 1.27 grams of silver per tonne, and 4) 3.1 meters that averaged 0.90 gram of gold per tonne and 0.96 gram of silver per tonne. The best sample in a trench was 7.50 meters that averaged 3.26 grams of gold per tonne and 4.74 grams of silver; this included 2.0 meters that averaged 10.40 grams of gold per tonne and 10.91 grams of silver per tonne.

No details on the mineralization are available but it is probably similar to that at the nearby Notch prospect (GU045) arsenopyrite-quartz veins are in a thick mineralized zone marked by sericitic and quartz-carbonate alteration (Myers and others, 2011).

Brown and others (2012) have defined rock geochemical signatures at NOM as follows: 3.1 to 1 ratio of silver to gold, 280 to 1 ratio of arsenic to antimony, 3 to 1 ratio of bismuth to tellurium, and 69 to 1 ratio of arsenic to copper.

Alteration:

Extensive silica-carbonate alteration of diorite and quartz diorite? (Corvus Gold Inc., 2012).

Age of mineralization:

Younger than the Permian to Pennsylvanian host rocks (Corvus Gold Inc., 2012).

Generic deposit model:

Deposit model:

Mineralized zone with arsenopyrite-quartz veins - polymetallic veins? (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active

Workings/exploration:

The NOM prospect may have been sampled in 1980 when WGM Inc. on behalf of the Ahtna Native Corporation searched for the source of geochemical anomalies in gold that outlined a northwest-trending area several miles long that WGM had identified in 1979 (WGM Inc., 1979, 1980). In 1980, they collected several rock samples at scattered locations along the trend. In 2010, Corvus Gold Inc. revisited the area, outlined an area of mineralization 2 by 9 kilometers in size, and called it the Golden Range prospect area. They collected more than 300 rock and soil samples in the area. By 2011, Corvus had identified at least 5 prospects in the Golden Range prospect area that they had sampled and drilled (Corvus Gold, Inc., 2012). One is the NOM prospect where they drilled 4 holes and dug 3 trenches.

Production notes:

None.

Reserves:

None.

Additional comments:

The 2014 version of this record removed the site name 'Corazon' from 2012 version of record since prospects are geologically distinct and results are reported separately for each record (Myers and others, 2011; Brown and others, 2012).

References:

Brown, Chris, Myers, Russel, Taylor, Chris, 2012, Jolly Green-A New Cu-Mo-Au Porphyry Discovery in Alaska: Alaska Miners Association, 2012 Annual Convention Abstracts, p. 33.

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WGM Inc., 1979, 1978 Annual Progress Report, Uranium Exploration, Ahtell Creek Area, Volume I: WGM Inc., 39 p., appendices, 4 maps. (Report available, Ahtna Mineral Co., Anchorage, Alaska).

WGM Inc., 1980, 1979 Summary report of gold potential, Slana District, Ahtna project: WGM Inc., 10 p., map, scale 1:63,360. (Report held by Ahtna Mineral Co., Anchorage, Alaska).

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Corvus Gold Inc., 2012; Brown and others, 2012

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-08

Site name(s): City; Golden Range

Site type:

ARDF no.: GU050

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

The previous version of this record incorrectly located this site in the Gulkana quadrangle, further work indicated that the site is actually located in the Nabesna quadrangle (see NB110). This ARDF number is retained only for accounting purposes.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): West Green

Site type: Prospect

ARDF no.: GU051

Latitude: 62.9248

Quadrangle: GU D-1

Longitude: 144.1185

Location description and accuracy:

The West Green prospect is located about 15.8 miles north-northwest of Slana. It is about 6.6 miles northwest of VABM 6677 'Ahtell' and about 0.4 mile northeast from the center of section 8, T. 13 N., R. 7 E., of the Copper River Meridian. The location is accurate within 1/4 mile.

Commodities:

Main: Ag, Au, Cu

Other: Fe

Ore minerals: Chalcopyrite, gold, molybdenite

Gangue minerals: Calcite, quartz

Geologic description:

The rocks in the area of the West Green prospect are diorite and quartz diorite of the Permian to Pennsylvania Ahtell pluton (Wilson and others, 1999). The rocks are cut by extensive dike swarms and faults. Mineralization is on the northeast side of a regional-scale northwest-striking fault (Corvus Gold Inc., 2012).

In 2011, Corvus identified the West Green prospect, where mineralization is in a typical copper porphyry style with high grade gold, through sampling and drilling (Corvus Gold Inc. 2012). Mineralization is centered on second order conjugate structures (Brown and others, 2012).

Over 0.5 percent copper grade follows potassic-propylitic alteration front with disseminated and veinlet chalcopyrite. Alteration is characterized as porphyry zoned alteration of potassic core with propylitic shell. Extensive quartz-calcite-chalcopyrite sheeted veins, stockwork veins, and vein breccias are present. Grab samples resulted in assay values of up to 10 parts per million (ppm) silver, 1 ppm molybdenum, and 0.6 percent copper (Brown and others, 2012).

Alteration:

Porphyry zoned alteration of potassic core with propylitic shell. Over 0.5 percent copper grade follows potassic-propylitic alteration front with disseminated and veinlet chalcopyrite. Extensive quartz-calcite-chalcopyrite sheeted veins, stockwork veins, and vein breccias (Brown and others, 2012).

Age of mineralization:

Younger than the Permian to Pennsylvanian host rocks (Wilson and others, 1998).

Generic deposit model:

Deposit model:

Porphyry Cu-Au (Cox and Singer, 1986; model 20c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c

Production Status: None

Site Status: Active

Workings/exploration:

In 2011, Corvus Gold Inc. identified the West Green prospect, where mineralization is in a typical copper porphyry style, through sampling and drilling (Corvus Gold Inc. 2012). In 2010 to 2011, Corvus completed soil surveys of over 12 km in length. Results were over 10 gram per tonne gold over 12 km, and over 50 gram per tonne gold widespread. In 2011, a soil X-ray fluorescence (XRF) survey was executed. Corvus reported that mineralization is centered on second order conjugate structures (Brown and others, 2012).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brown, Chris, Myers, Russel, Taylor, Chris, 2012, Jolly Green-A New Cu-Mo-Au Porphyry Discovery in Alaska: Alaska Miners Association, 2012 Annual Convention Abstracts, p. 33.

Corvus Gold Inc., 2011, Corvus Gold announces discovery of new gold targets at the Chisna project, Alaska: http://www.corvusgold.com/news/index.php?&content_id=44.(News release, Jan. 18, 2011).

Corvus Gold Inc., 2012, Chisna: http://www.corvusgold.com/projects/alaska/chisna/ (as of March 1, 2012).

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Myers, Russell, Brown, Chris, Taylor Christ, Wilkins, Andres, Burnett, Bill, Stroup, Caleb, Keeley Josh, Benchley, Kristen, Robinson, John, Van Wyck Nick, and Jacobs, Joe, 2011, Golden Range- A new high grade gold discovery in Alaska: Alaska Miners Association, 2011 Annual Convention Abstracts, p. 37.

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Brown and others, 2012

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-05-30

Site name(s): Southwest Grubstake

Site type: Occurrence

ARDF no.: GU052

Latitude: 62.892 **Quadrangle:** GU D-1

Longitude: 144.038

Location description and accuracy:

The Southwest Grubstake target is about 12.7 miles north-northwest of Slana. It is about 3.4 miles northwest of VABM 6677 'Ahtell' and about 0.2 mile southwest of the center of section 23, T. 13 N., R. 7 E., of the Copper River Meridian. The location is accurate within 1/4 mile.

Commodities:

Main: Ag, Au, Pb, Zn

Other: Ba

Ore minerals: Barite, galena, gold, magnetite

Gangue minerals: Biotite, dolomite, quartz

Geologic description:

This occurrence is part of the Chisna Project; operated as of 2014 by Corvus Gold Inc. Stream sediment surveying and geological mapping in the greater area identified several areas with alteration and mineralization styles that are typical of high level porphyry-type alteration including potassic alteration with biotite and magnetite veining. Mineralization is generally hosted in Permian-Triassic volcanic rocks which have been intruded by Jurassic and Cretaceous mafic and felsic intrusions (Corvus Gold Inc., 2014).

Southwest Grubstake is a mineral occurrence that presents as a series of en-echelon quartz-dolomite-barite veins up to 2 meters wide defined over a 600-meter-long trend. These polymetallic quartz veins have returned high gold values along with significant silver, lead and zinc values from veins ranging in width from 20 cm up to 2 meters. This vein swarm, which strikes NNE to NE within a NW to SW mineralized trend, has been delineated over a strike length in excess of 600 meters. A total of 19 rock samples derived from in-place quartz-dolomite-barite boulder trains and outcrops returned an average of 7.38 grams per tonne gold, 8.82 grams per tonne silver, 0.91 percent lead and 0.16 percent zinc, with highs of 46.5 grams per tonne gold, 29.8 grams per tonne silver, 4.22 percent lead and 1.22 percent zinc (Corvus Gold Inc., 2014).

Mapping of vein lengths and density, and determination of the relationship between this veined mineralization and the adjacent Grubstake copper-gold porphyry system, was the primary focus of 2011 exploration in advance of drilling (Corvus Gold Inc., 2014).

Alteration:

Potassic alteration with biotite and magnetite veining (Corvus Gold, 2014).

Age of mineralization:

Younger than the Permian - Triassic host rocks (Corvus Gold, 2014).

Generic deposit model:

Deposit model:

Porphyry Cu-Au (Cox and Singer, 1986; model 20c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
20c

Production Status: None

Site Status: Active

Workings/exploration:
Corvus Gold Inc., in a joint venture with Ocean Park, discovered the Southwest Grubstake target from the results of surface exploration in summer 2010 (Corvus Gold Inc., 2011).
In summer 2011, Corvus conducted an exploration program that included mapping of vein lengths and density, and determination of the relationship between this veined mineralization and the adjacent Grubstake copper-gold porphyry system. Corvus reported that rock samples from networks of quartz-galena-barite veins at the Southwest Grubstake prospect have produced a large number of high grades samples with gold values of over 5 parts per million (Corvus Gold Inc., 2011).

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Corvus Gold Inc, 2011, Corvus Gold Announce Discovery of New Gold Targets at the Chisna Project, Alaska: http://www.corvusgold.com/news/index.php?&content_id=44 (News release, January 18, 2011).

Corvus Gold Inc, 2011, Corvus Gold Announces 2011 Exploration Update at the Chisna Project, Alaska: http://www.corvusgold.com/news/2011/index.php?&content_id=59 (News release, August 18, 2011).

Corvus Gold Inc., 2014, Chisna: http://www.corvusgold.com/projects/alaska/chisna/ (as of May 8, 2014).

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Corvus Gold Inc., 2014

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-05-30

Site name(s): Corazon; El Corazon

Site type: Occurrence

ARDF no.: GU053

Latitude: 62.8877 **Quadrangle:** GU D-1

Longitude: 144.0404

Location description and accuracy:

The Corazon target is about 12.7 miles north-northwest of Slana. It is about 4.4 miles west-northwest of VABM 6677 'Ahtell' and about 0.5 mile southwest of the center of section 23, T. 13 N., R. 7 E., of the Copper River Meridian. The location is accurate within 1/4 mile. The previous record listed Corazon as the same as NOM; however current workers distinguish the two based on location and geochemistry.

Commodities:

Main: Ag, Au

Other:

Ore minerals: Arsenopyrite, gold

Gangue minerals: Carbonate minerals, quartz

Geologic description:

The rocks in the area of the Corazon prospect are diorite and quartz diorite of the Permian to Pennsylvania Ahtell pluton (Wilson and others, 1998; Corvus Gold Inc., 2012). The rocks are cut by extensive dike swarms and faults. The mineralization is on the northeast side of a regional-scale northwest-striking fault (Corvus Gold Inc., 2012).

In 2010, Corvus Gold Inc. outlined an area of mineralization 2 by 9 kilometers in size, and called it the Golden Range prospect area. Through exploration in the general area, Corvus identified Corazon prospect in 2011. They drilled two holes and dug two trenches. Drilling highlights include 5.1 meters of 0.9 gram per ton of gold and 0.76 grams per ton of silver from GR-11-04. The best sample in a trench was 7.5 meters that averaged 3.3 g/t gold and 4.6 g/t silver (Corvus Gold Inc., 2012). The mineralization is associated with a shear zone. The rock sample geochemistry has a signature of 1.6 to 1 ratio of silver to gold, 302 to 1 ratio of arsenic to antimony, 12 to 1 ratio of bismuth to tellurium, and 32 to 1 ratio of arsenic to copper (Brown and others, 2012).

Alteration:

Extensive silica-carbonate alteration of diorite and quartz diorite? (Corvus Gold Inc., 2012).

Age of mineralization:

Younger than the Permian to Pennsylvanian host rocks (Corvus Gold Inc., 2012).

Generic deposit model:

Deposit model:

Mineralized zone with arsenopyrite-quartz veins - polymetallic veins? (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active

Workings/exploration:

The Corazon prospect may have been sampled in 1980 when WGM Inc. on behalf of the Ahtna Native Corporation searched for the source of geochemical anomalies in gold that outlined a northwest-trending area several miles long that WGM had identified in 1979 (WGM Inc., 1979, 1980). In 1980, they collected several rock samples at scattered locations along the trend.

In 2010, Corvus Gold Inc. outlined an area of mineralization 2 by 9 kilometers in size, and called it the Golden Range target. They collected more than 300 rock and soil samples in the area. By 2011, Corvus had identified at least 5 prospects in the Golden Range target area that they had sampled and drilled (Corvus Gold, Inc., 2012). One is the Corazon prospect where they completed a soil and rock sampling program in 2011 and followed up with two drill holes and two trenches in 2012 (Corvus Gold, Inc., 2012).

Production notes:

None.

Reserves:

None.

Additional comments:

In 2014, 'Corazon' was removed from GU049 'NOM' to create a unique site record for Corazon since both prospects are geologically distinct and results are reported separately for each record (Myers and others, 2011; Brown and others, 2012).

References:

Brown, Chris, Myers, Russel, Taylor, Chris, 2012, Jolly Green-A New Cu-Mo-Au Porphyry Discovery in Alaska: Alaska Miners Association, 2012 Annual Convention Abstracts, p. 33.

Corvus Gold Inc., 2011, Corvus Gold announces discovery of new gold targets at the Chisna project, Alaska: http://www.corvusgold.com/news/2011/index.php?&content_id=44. (News release, Jan. 18, 2011).

Corvus Gold Inc., 2012, Corvus Gold intersects 7.5 metres @ 3.3g/t Gold & 2.7 metres @ 681 g/t Silver on its Chisna Project, Alaska:http://www.corvusgold.com/news/2012/index.php?&content_id=70. (News release, Jan. 12, 2012).

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Myers, Russell, Brown, Chris, Taylor Christ, Wilkins, Andres, Burnett, Bill, Stroup, Caleb, Keeley Josh, Benchley, Kristen, Robinson, John, Van Wyck Nick, and Jacobs, Joe, 2011, Golden Range- A new high grade gold discovery in Alaska: Alaska Miners Association, 2011 Annual Convention Abstracts, p. 37.

Richter, D.H., 1966, Geology of the Slana district, southcentral Alaska: Alaska Division of Geological and Geophysical Surveys Geological Report 2l, 54 p., 3 sheets, scale 1:63,360.

Richter, D.H., Lanphere, M.A., and Matson, N.A., Jr., 1975, Granite plutonism and metamorphism, eastern Alaska Range, Alaska: Geological Society of American Bulletin, v. 86, p. 819-820.

WGM Inc., 1979, 1978 Annual Progress Report, Uranium Exploration, Ahtell Creek Area, Volume I: WGM Inc., 39 p., appendices, 4 maps. (Report available, Ahtna Mineral Co., Anchorage, Alaska).

WGM Inc., 1980, 1979 Summary report of gold potential, Slana District, Ahtna project: WGM Inc., 10 p., map, scale 1:63,360. (Report held by Ahtna Mineral Co., Anchorage, Alaska).

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Corvus Gold Inc., 2012

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-05-30

Site name(s): McCall

Site type: Prospect

ARDF no.: HE001

Latitude: 63.69 **Quadrangle:** HE C-6

Longitude: 149.74

Location description and accuracy:

The McCall prospect is at an elevation of about 2,400 feet on a northeast-trending spur above the headwaters of the Sushana River. It is in the northwest corner of sec. 19, T. 14 S., R. 11 W., of the Fairbanks Meridian. The location is accurate to within 1 mile. This is location 1 of Clark and Cobb (1972).

Commodities:

Main: Ag, Pb

Other:

Ore minerals: Galena

Gangue minerals: Calcite, quartz, siderite

Geologic description:

Little information about this prospect has been made public. Apparently, it consists of galena-bearing quartz-carbonate veins that cut Devonian metavolcanic schist and phyllite. Samples contain up to 55 percent lead and 6 ounces of silver per ton (Berg and Cobb, 1967).

Alteration:

Age of mineralization:

The veins are Devonian or younger.

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Inactive

Workings/exploration:

Minor surface workings. Samples contain up to 55 percent lead and 6 ounces of silver per ton (Berg and Cobb, 1967).

Production notes:

None.

Reserves:

None.

Additional comments:

This site is in Denali National Park.

References:

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Clark, A.L., and Cobb, E.H., 1972, Metallic mineral resources map of the Healy quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-394, 1 sheet, scale 1:250,000.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Healy quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-1062, 113 p.

Primary Reference: Cobb, 1978

Reporter(s): N. Van Wyck (Stevens Exploration Management Corporation); F.H. Wilson (USGS)

Last report date: 2016-03-28

Site name(s): Silver King

Site type: Prospect

ARDF no.: HE026

Latitude: 63.26 **Quadrangle:** HE B-6

Longitude: 149.55

Location description and accuracy:

The Silver King prospect is located on the eastern side of Colorado Creek in the northern half of sections 19 and 24, T. 19 S., R. 10 W., of the Fairbanks Meridian. The location is accurate to within 0.5 mile. The Silver King prospect is not the same as the Silver King mine shown on the Healy A-6 1:63,360-scale topographic sheet.

Commodities:

Main: Ag, Au, Cu

Other: Bi, Co, Sb

Ore minerals: Arsenopyrite, chalcopyrite, pyrite, pyrrhotite, stibnite

Gangue minerals: Calcite, quartz

Geologic description:

Thick Quaternary glacial deposits and Upper Tertiary sedimentary strata cover the bedrock in this area. The country rocks in the area of the Silver King prospect consist of Upper Jurassic to Upper Triassic(?) crystal tuff, argillite, chert, graywacke, and limestone that are intruded by Upper Cretaceous quartz diorite porphyry stocks and dikes (Wilson and others, 1998). Intrusion of the dikes and quartz-sulfide mineralization are localized along the nearby Chulitna fault. The Silver King deposit includes: tactite (skarn) replacement bodies; auriferous arsenopyrite-chalcopyrite quartz veins; stibnite-gold-silver veins; silver-lead-zinc veins; and as breccia pipes associated with porphyry stock and dikes. Sporadic mineralization is present over a 2,000 feet by 800 feet area. (Hawley and Clark, 1974).

Hawley and Clark (1974) reported the following sample analyses. A massive sulfide pod in skarn contained 8.3 ounces of gold per ton. An arsenopyrite-rich vein contained 50 ppm silver, 200 ppm gold, 700 ppm cobalt, 1,500 ppm copper, 200 ppm lead, 500 ppm antimony, 200 ppm zinc, more than 1,000 ppm bismuth and more than 10,000 ppm arsenic. A stibnite-rich vein contained 10 ppm silver, 23 ppm gold, 200 ppm copper, 300 ppm lead, 1,500 ppm zinc, 7,000 ppm arsenic and more than 10,000 ppm antimony. Salisbury and Dietz (1984) reported the following: arsenopyrite veins returned assay values of 0.85 ounces of silver per ton, 0.87 ounces of gold per ton and 0.44% cobalt; and stibnite-bearing veins contained 0.12 ounces of silver per ton and 0.29 ounces of gold per ton. The Silver King deposit is part of a northeast trending mineralized zone that includes the Liberty (HE028), Lucrata (HE029) and Eagle (HE030) prospects.

Alteration:

Skarn formation widespread; porphyry-type alteration is also reported.

Age of mineralization:

Similar sulfide-bearing intrusive rocks and veins in the district have been dated as Late Cretaceous (Swainbank and others, 1977), but Au-Ag-stibnite and Ag-Pb-Zn veins could be younger (Early Tertiary?).

Generic deposit model:

Deposit model:

Polymetallic vein, Cu-Au porphyry, Cu skarn, and Simple Sb veins (Cox and Singer, 1986; models 22c, 20c, 18b, and 27d)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c, 20c, 18b, 27d

Production Status: Undetermined

Site Status: Active

Workings/exploration:

Surface workings, mostly trenches and pits. Site-specific geophysical surveys noted in literature and probably drill testing, but specific data are not available.

Hawley and Clark (1974) reported the following sample analyses. A massive sulfide pod in skarn contained 8.3 ounces of gold per ton. An arsenopyrite-rich vein contained 50 ppm silver, 200 ppm gold, 700 ppm cobalt, 1,500 ppm copper, 200 ppm lead, 500 ppm antimony, 200 ppm zinc, more than 1,000 ppm bismuth and more than 10,000 ppm arsenic. A stibnite-rich vein contained 10 ppm silver, 23 ppm gold, 200 ppm copper, 300 ppm lead, 1,500 ppm zinc, 7,000 ppm arsenic and more than 10,000 ppm antimony. Salisbury and Dietz (1984) reported the following: arsenopyrite veins returned assay values of 0.85 ounces of silver per ton, 0.87 ounces of gold per ton and 0.44% cobalt; and stibnite-bearing veins contained 0.12 ounces of silver per ton and 0.29 ounces of gold per ton.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Balen, M.D., 1990, Geochemical sampling results from the Bureau of Mines investigations in the Valdez Creek mining district, Alaska: U.S. Bureau of Mines Open-File Report 34-90, 218 p., 2 plates, scale 1:250,000.

Bundtzen, T.K., 1983, Mineral resource modeling, Kantishna-Dunkle mine-study areas: Alaska Division of Geological and Geophysical Surveys Report of Investigations 83-12, 51 p.

Capps, S.R., 1919, Mineral resources of the upper Chulitna region: U.S. Geological Survey Bulletin 692-D, p. 207-232.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Healy quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-1062, 113 p.

Hawley, C.C., and Clark, A.L., 1968, Occurence of gold and other metals in the upper Chulitna district, Alaska: U.S. Geological Survey Circular 564, 21 p.

Hawley, C.C., and Clark, A.L., 1974 (1975), Geology and mineral deposits of the upper Chulitna district, Alaska: U.S. Geological Survey Professional Paper 758-B, p. B1-B47, 2 plates, scale 1:12,000 and 1:48,000.

Hawley, C.C., Clark, A.L., Herdrick, M.A., and Clark, S.H.B., 1969, Results of geological and geochemical investigations in an area northwest of the Chulitna River, central Alaska Range: U.S. Geological Survey Circular 617, 19 p.

Hawley, C.C., and others, 1978, Mineral appraisal of lands adjacent to Mt. McKinley National Park, Alaska. Contract No. JO166107: U.S. Bureau of Mines Open-File Report 24-78, 274 p., 12 sheets.

Ross, C.P., 1933, Mineral deposits near the west fork of the Chulitna River, Alaska: U.S. Geological Survey Bulletin 849-E, 56 p., 1 sheet.

Salisbury and Dietz, Inc., 1984, 1983 mineral resource studies--Kantishna Hills and Dunkle Mine areas, Denali National Park and Preserve, Alaska: U.S. Bureau of Mines, Contract No. S0134031, 1,080 p.

Swainbank, R.C., Smith, T.E., and Turner, D.L., 1977, Geology and K-Ar age of mineralized intrusive rocks from the Chulitna mining district, central Alaska, in Short notes on Alaskan geology-1977: Alaska Division of Geological and Geophysical Surveys Geologic Report 55, p. 23-28.

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Salisbury and Dietz, 1984

Reporter(s): N. Van Wyck (Stevens Exploration Management Corporation); F.H. Wilson (USGS)

Last report date: 2016-03-28

Site name(s): Liberty

Site type: Prospect

ARDF no.: HE028

Latitude: 63.263 **Quadrangle:** HE B-6

Longitude: 149.538

Location description and accuracy:

The Liberty prospect is at an elevation of about 2,700 feet on the broad flat ridge between Costello Creek and Colorado Creek. It is in sec. 18, T. 19 S., R. 10 W., of the Fairbanks Meridian. Access to the prospect is from the road to the Dunkle Coal mine. The prospect is approximately 200 feet east of the road and approximately 500 feet south of the airstrip. The location is accurate to within 500 feet. This is locality 3 of Cobb (1978: OFR 78-1062).

Commodities:

Main: Ag, Au

Other:

Ore minerals: Arsenopyrite

Gangue minerals: Quartz

Geologic description:

Thick Quaternary glacial deposits and Upper Tertiary sedimentary cover the older rocks in this area, which consist of Upper Jurassic to Upper Triassic(?) crystal tuff, argillite, chert, graywacke, and limestone. The older rocks are intruded by Late Cretaceous quartz diorite dikes, mainly along the nearby Chulitna fault (Wilson and others, 1998). The Liberty deposit consists of arsenopyrite-bearing quartz veins, reportedly in silicified limestone. Samples from trenches and pits contain 0.06-0.14 ounce of gold per ton and 1.2-8.6 ounces of silver per ton (Ross, 1933). Hawley and others (1978) report values of 0.005 to 0.06 ounce of gold per ton and traces of silver in samples from the same trenches sampled by Ross (1933).

Alteration:

Age of mineralization:

Probably Late Cretaceous (70-65 Ma) or younger, assuming deposit is related to the diorite dikes.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1987; model 36a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Inactive

Workings/exploration:

Surface trenching and pitting. Samples from trenches and pits contain 0.06-0.14 ounce of gold per ton and 1.2-8.6 ounces of silver per ton (Ross, 1933). Hawley and others (1978) report values of 0.005 to 0.06 ounce of gold per ton and traces of silver in samples from the same trenches sampled by Ross (1933).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Balen, M.D., 1990, Geochemical sampling results from the Bureau of Mines investigations in the Valdez Creek mining district, Alaska: U.S. Bureau of Mines Open-File Report 34-90, 218 p., 2 plates, scale 1:250,000.

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Bundtzen, T.K., 1983, Mineral resource modeling, Kantishna-Dunkle mine-study areas: Alaska Division of Geological and Geophysical Surveys Report of Investigations 83-12, 51 p.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Healy quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-1062, 113 p.

Hawley, C.C., and Clark, A.L., 1974 (1975), Geology and mineral deposits of the upper Chulitna district, Alaska: U.S. Geological Survey Professional Paper 758-B, p. B1-B47, 2 plates, scale 1:12,000 and 1:48,000.

Hawley, C.C., and others, 1978, Mineral appraisal of lands adjacent to Mt. McKinley National Park, Alaska. Contract No. JO166107: U.S. Bureau of Mines Open-File Report 24-78, 274 p., 12 sheets.

Ross, C.P., 1933, Mineral deposits near the west fork of the Chulitna River, Alaska: U.S. Geological Survey Bulletin 849-E, 56 p., 1 sheet.

Salisbury and Dietz, Inc., 1984, 1983 mineral resource studies--Kantishna Hills and Dunkle Mine areas, Denali National Park and Preserve, Alaska: U.S. Bureau of Mines, Contract No. S0134031, 1,080 p.

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Hawley and Clark, 1974

Reporter(s): N. Van Wyck (Stevens Exploration Management Corporation); F.H. Wilson (USGS)

Last report date: 2016-03-28

Site name(s): Lucrata; Lucrative Group

Site type: Prospect

ARDF no.: HE029

Latitude: 63.265 **Quadrangle:** HE B-6

Longitude: 149.529

Location description and accuracy:

The Lucrata prospect is at an elevation of about 2,700 feet on the west bank of Costello Creek, about 0.3 mile south of the Dunkle mine camp. It is in sec. 18, T. 19 S., R. 10 W., of the Fairbanks Meridian. Accuracy of location is to within 500 feet. This is locality 2 of Cobb (1978: OFR 78-1062).

Commodities:

Main: Ag, Au

Other: Cu

Ore minerals: Arsenopyrite, chalcopyrite

Gangue minerals: Quartz

Geologic description:

The general area of this prospect is characterized by thick Quaternary glacial deposits and Upper Tertiary sedimentary strata that mostly cover Upper Jurassic to Upper Triassic(?) crystal tuff, argillite, chert, graywacke, and limestone (Wilson and others, 1998). Upper Cretaceous quartz diorite dikes cut the mesozoic bedded rocks, mainly along the nearby Chulitna fault. At the Lucrata prospect, arsenopyrite-chalcopyrite pods up to 4 feet thick and 5 feet long area in a quartz stockwork in gabbro and basalt along the Chulitna fault zone. Assay values as high as 1.26 ounces of gold per ton and 3.8 ounces of silver per ton are reported by Hawley and Clark (1974); average grades of 0.49 ounce of gold per ton and 1.03 ounces of silver per ton are reported by Bundtzen (1983).

Alteration:

Quartz-sericite-pyrite alteration.

Age of mineralization:

Late Cretaceous or younger, assuming that the deposit is related to the intrusion of the quartz diorite.

Generic deposit model:

Deposit model:

Polymetallic vein (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: Undetermined

Site Status: Active

Workings/exploration:

There has been both surface and underground exploration; a 15 ft tunnel was driven in 1920. Assay values as high as 1.26 ounces of gold per ton and 3.8 ounces of silver per ton are reported by Hawley and Clark (1974); average grades of 0.49 ounce of gold per ton and 1.03 ounces of silver per ton are reported by Bundtzen (1983).

Production notes:

None.

Reserves:

None.

Additional comments:

The Lucrata prospect has also been referred to as the Dunkle mine. This should be dropped as it invites comparison to the Dunkle coal mine, a separate deposit.

References:

Balen, M.D., 1990, Geochemical sampling results from the Bureau of Mines investigations in the Valdez Creek mining district, Alaska: U.S. Bureau of Mines Open-File Report 34-90, 218 p., 2 plates, scale 1:250,000.

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Bundtzen, T.K., 1983, Mineral resource modeling, Kantishna-Dunkle mine-study areas: Alaska Division of Geological and Geophysical Surveys Report of Investigations 83-12, 51 p.

Capps, S.R., 1919, Mineral resources of the upper Chulitna region: U.S. Geological Survey Bulletin 692-D, p. 207-232.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Healy quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-1062, 113 p.

Hawley, C.C., and Clark, A.L., 1968, Occurence of gold and other metals in the upper Chulitna district, Alaska: U.S. Geological Survey Circular 564, 21 p.

Hawley, C.C., and Clark, A.L., 1974 (1975), Geology and mineral deposits of the upper Chulitna district, Alaska: U.S. Geological Survey Professional Paper 758-B, p. B1-B47, 2 plates, scale 1:12,000 and 1:48,000.

Ross, C.P., 1933, Mineral deposits near the west fork of the Chulitna River, Alaska: U.S. Geological Survey Bulletin 849-E, 56 p., 1 sheet.

Townsend, H.H., 1925, Assay returns: Alaska Territorial Department of Mines Itinerary Report 195-48, 4 p.

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Ross, 1933

Reporter(s): N. Van Wyck (Stevens Exploration Management Corporation); F.H. Wilson (USGS)

Last report date: 2016-03-28

Site name(s): Eagle; Northern Light

Site type: Prospect

ARDF no.: HE030

Latitude: 63.266 **Quadrangle:** HE B-6

Longitude: 149.524

Location description and accuracy:

The Eagle prospect is at an elevation of about 2,800 feet on Costello Creek, about 0.3 mile south-southwest of the Dunkle mine camp. It is near the east-central boundary of sec. 18, T. 19 S., R. 11 W., of the Fairbanks Meridian. Access to the Eagle prospect is via the road to the Dunkle Coal Mine. The location is accurate within 500 feet. Published maps showing this prospect are Hawley and Clark (1974) and Hawley and others (1978). This is location 1 of Cobb (1978: OFR 78-1062).

Commodities:

Main: Ag, Au, Cu, Zn

Other: Sb

Ore minerals: Arsenopyrite, chalcopyrite, sphalerite, stibnite

Gangue minerals: Quartz

Geologic description:

The Eagle prospect, formerly called the Northern Light was developed by a tunnel 62 feet long and several small cuts (Ross, 1933). He reported that the country rock is chloritic and cherty argillite and tuff, with some lava in the vicinity. The average trend is northeast, but locally the beds trend northwest, probably because of faulting. The average trend of the mineralized zones is somewhat east of north, but there is much local variation, resulting in part from irregular deposition, in part from later faulting. The dip is generally steep to the east. If the pits are all on the same lode, it has a known length of about 300 feet, but it is doubtful if underground development would show continuous ore throughout this distance. The width of the mineralized shear zones varies in different exposures, ranging from 1 to 10 feet. The vertical range between the tunnel and the highest cut is roughly 185 feet. The shear zones generally contain bands of white, coarsely crystalline quartz from a few inches to 2 1/2 feet in width. Locally, the quartz contains numerous vugs. Most of the sulfides were deposited along fissures, and the best samples are reported to have been taken along the fissures that traverse the bedding at considerable angles. Most of the rock in and near the shear zones contains sparsely disseminated sulfides, mainly pyrite. There are a few lenses of massive arsenopyrite with a little pyrite, which are several inches wide. Small amounts of somewhat oxidized chalcopyrite are present at some places. Two samples were taken in the cut immediately north of the tunnel, which is reported to contain the best ore so far exposed. One of these, taken across a quartz lens somewhat more than 2 feet wide, yielded 0.20 ounce of gold and 6 ounces of silver to the ton. The other, taken across the full 4 feet of exposed lode, yielded 0.18 ounce of gold and 9.10 ounces of silver to the ton. A sample probably from the quartz lens in this pit contained 0.56 ounce of gold and 3.20 ounces of silver to the ton. Capps (1919) stated that at the time of his visit in 1917 the area of heaviest mineralization had been traced along the surface for a distance of about 800 feet, considerably farther than Ross (1933) could trace it in 1931. Capps (1919) noted the presence of arsenopyrite, pyrite, chalcopyrite, sphalerite, and a little stibnite.

Thick Quaternary glacial deposits and Upper Tertiary sedimentary strata cover most of the older bedrock in this area. Regionally, the main geologic feature is the northeast-trending Chulitna fault, which separates a sequence of Upper Jurassic to Upper Triassic(?) crystal tuff, argillite, chert, graywacke, and limestone on the north, from Upper Devonian to Lower Triassic volcanogenic and sedimentary rocks on the south.

Faulting and shearing of the rocks has occurred, along with intrusions of Late Cretaceous dikes and stocks. The Eagle prospect is a 3-foot wide quartz vein that contains pods of arsenopyrite, chalcopyrite, sphalerite, and stibnite up to 1 foot wide. The vein is spatially associated with one or more dikes. The sulfide pods contain substantial Au and Ag values. Seven chip samples of the veins averaged 0.23 ounce of gold per ton and 4.55 ounces of silver per ton (Hawley and Clark, 1974; Ross, 1933; Bundtzen, 1983). The deposit is discontinuous, owing to post mineralization faulting and to pinch-and-swell structure of the vein. The Eagle vein is subparallel and about 400 feet east of the Lucrata segment of Upper Chulitna fault.

Alteration:

Age of mineralization:

Probably Late Cretaceous or younger.

Generic deposit model:

Deposit model:

Polymetallic vein (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: Undetermined

Site Status: Active

Workings/exploration:

Exploration includes a 62-foot tunnel and open cuts over a strike length of 300 to 800 feet (Ross, 1933).

Production notes:

None.

Reserves:

The pits suggest that approximately 12,000 tons of mineralized rock exists in this lode above the level of Costello Creek. Discontinuity resulting from numerous minor faults is likely to prove a handicap in development. (Ross, 1933).

Additional comments:

Also see: Silver King (HE026), Liberty (HE028) and Lucrata (HE029).

References:

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Bundtzen, T.K., 1983, Mineral resource modeling, Kantishna-Dunkle mine-study areas: Alaska Division of Geological and Geophysical Surveys Report of Investigations 83-12, 51 p.

Capps, S.R., 1919, Mineral resources of the upper Chulitna region: U.S. Geological Survey Bulletin 692-D, p. 207-232.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Healy quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-1062, 113 p.

Hawley, C.C., and Clark, A.L., 1973, Geology and mineral deposits of the Chulitna -Yentna mineral belt, Alaska: U.S. Geological Survey Professional Paper 758-A, p. A1-A10, 2 plates, scale 1:250,000 and 1:500,000.

Hawley, C.C., and Clark, A.L., 1974 (1975), Geology and mineral deposits of the upper Chulitna district, Alaska: U.S. Geological Survey Professional Paper 758-B, p. B1-B47, 2 plates, scale 1:12,000 and 1:48,000.

Hawley, C.C., and others, 1978, Mineral appraisal of lands adjacent to Mt. McKinley National Park, Alaska. Contract No. JO166107: U.S. Bureau of Mines Open-File Report 24-78, 274 p., 12 sheets.

Ross, C.P., 1933, Mineral deposits near the west fork of the Chulitna River, Alaska: U.S. Geological Survey Bulletin 849-E, 56 p., 1 sheet.

Primary Reference: Ross, 1933

Reporter(s): N. Van Wyck (Stevens Exploration Management Corporation); F.H. Wilson (USGS)

Last report date: 2016-03-28

Site name(s): Riverside; Flaurier

Site type: Prospect

ARDF no.: HE033

Latitude: 63.2388 **Quadrangle:** HE A-6

Longitude: 149.6121

Location description and accuracy:

The Riverside prospect is on the south bank of the West Fork Chulitna River, about 0.7 mile upstream from the mouth of Bryn Mawr Creek. It is about 0.3 mile west of the center of section 26, T.19 S., R. 11 W. The location is accurate. This is apparently the modern name for the old Flaurier prospect (HE036).

Commodities:

Main: Ag, Au

Other: Cu, Pb, Zn

Ore minerals: Arsenopyrite, chalcopyrite, galena, pyrite, pyrrhotite, sphalerite

Gangue minerals: Quartz

Geologic description:

Ross (1933) reported that the principal cuts he saw disclosed two nearly parallel lodes about 80 feet apart, both of which are replacement deposits that approximately follow the bedding of limestone lenses. The eastern lode strikes N 15 W and dips about 70 NE. Ore deposition has in part been controlled by poorly defined sheeting that trends N 25 W. The maximum observed width of mineralization is 5.5 feet, most of the ore is contained within a total width of 8 feet. This lode has been traced for about 60 feet along the strike. The second lode is similar, but its average strike is north and it stands nearly vertical. It has been traced for fully 80 feet on the strike, and the ore averages about 8 feet in width. Small cuts and outcrops in the general vicinity show that there are several other lenses of mineralized rock. One of these lenses parallels the bedding of banded limestone which dips vertical and trends N. 60 E., suggesting faulting or other structural disturbance.

The lode is composed irregular bunches and lenses of vein quartz and sulfides, in partly silicified and chloritized limestone. The principal sulfide is arsenopyrite, but pyrrhotite, pyrite, and chalcopyrite are also abundant, and sphalerite and galena are locally present. There is a very small amount of supergene chalcocite. Within a few inches of the surface the lode is thoroughly oxidized and in part clayey (Ross, 1933).

The rocks surrounding the Riverside prospect are Triassic, redbed sandstone, conglomerate, and limestone that have been intruded by a dike of hornblende, quartz diorite. The deposit is in hornfelsed bedded rocks and consists chiefly of quartz-sulfide veins, stockworks, and disseminated sulfides. The sulfide minerals are arsenopyrite, chalcopyrite, galena, pyrite, pyrrhotite, and sphalerite. Small, sulfide-bearing skarn deposits are in marble adjacent to the dike (unpublished report by Addwest Minerals International Ltd., 1997). Samples contained 0.02 to 0.72 ounce of gold per ton and 0.3 to 2.10 ounces of silver per ton (Ross, 1933). The relatively high gold and silver values may be due to supergene enrichment. A fault may truncate the deposit to the south. The Riverside deposit is similar in mineralogy and type to other deposits satellite to the Golden Zone Mine (HE043). The Riverside is the old Flaurier prospect that was briefly described by Capps (1919).

The 5-foot-wide Wells vein at the Riverside prospect was exposed and chip sampled by Hidefield Gold PLC in 2006 (Alix Resources Corp., 2011). Some notable intervals were 25.9 grams of gold per tonne across 0.79 meters; 34.6 grams of gold per tonne across 1.49 meters; and 30.9 grams of gold per tonne

across 1.40 meters. The Riverside prospect was drilled in 2011 by Alix Resources Corp. (2012). The two holes successfully intercepted the Well vein. The vein in one hole was 1.50 meters thick and averaged 11.43 grams of gold per tonne, 24.57 grams of silver per ton, and 0.23 percent copper. In the other hole, the vein was 1.78 meters thick and contained 19.1 grams of gold per tonne, 48.63 grams of silver per tonne, and 0.77 percent copper.

Alteration:

Narrow phyllic alteration haloes around and in porphyry dikes typically consists of sericite, quartz, and pyrite. In addition, skarn alteration is present as garnet, pyroxene, and epidote.

Age of mineralization:

Late Cretaceous (70-65 Ma), assuming that the deposit is a satellite to the Golden Zone Mine (HE043).

Generic deposit model:

Deposit model:

Cu skarn; Polymetallic veins (Cox and Singer, 1986; models 18b, 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b, 22c

Production Status: None

Site Status: Active

Workings/exploration:

Ross (1933) reported numerous cuts and pits on the property and several tunnels had been started, but none were carried far.

There are reports of a 10-foot tunnel and 15-foot shaft that are now caved. Recent geochemical exploration has identified a broad soil anomaly that outlines the deposit. The 5-foot-wide Wells vein at the Riverside prospect was exposed and chip sampled by Hidefield Gold Plc. in 2006 (Alix 2011). In 2011, two holes were drilled at the Riverside prospect and cut the Wells vein (Alix Resources Corp. (2012).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Alix Resources Corp., 2011, Golden Zone, Alaska (Gold): http://www.alixresources.com/index.php?page=project&project=6 (as of Feb. 17, 2012)

Alix Resources Corp., 2012, Alix announces completion of 2011 program at the Golden Zone property, Alaska: http://www.alixresources.com/index.php?page=news&id=1104 (News release, Jan 5, 2012).

Capps, S.R., 1919, Mineral resources of the upper Chulitna region: U.S. Geological Survey Bulletin 692-D, p. 207-232.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Healy quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-1062, 113 p.

Hawley, C.C., and Clark, A.L., 1974 (1975), Geology and mineral deposits of the upper Chulitna district, Alaska: U.S. Geological Survey Professional Paper 758-B, p. B1-B47, 2 plates, scale 1:12,000 and 1:48,000.

Hawley, C.C., and others, 1978, Mineral appraisal of lands adjacent to Mt. McKinley National Park, Alaska. Contract No. JO166107: U.S. Bureau of Mines Open-File Report 24-78, 274 p., 12 sheets.

Kerr, S.R., and Loveday, Derek, 2011, Technical report, Golden Zone property, Alaska, USA: Technical report for Alix Resources Corporation, 115 p. (posted on www.sedar.com, Jan 18, 2011).

Ross, C.P., 1933, Mineral deposits near the west fork of the Chulitna River, Alaska: U.S. Geological Survey Bulletin 849-E, 56 p., 1 sheet.

Townsend, H.H., 1925, Assay returns: Alaska Territorial Department of Mines Itinerary Report 195-48, 4 p.

Primary Reference: Kerr and Loveday, 2011; Alix Resources Corp., 2012

Reporter(s): N. Van Wyck (Stevens Exploration Management Corporation); D.J. Grybeck (Contractor, USGS); F.H. Wilson (USGS)

Last report date: 2016-03-28

Site name(s): Flaurier

Site type:

ARDF no.: HE036

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

The old Flaurier prospect described briefly by Capps (1919) has long since been known as the Riverside prospect. It was originally described in ARDF as a separate site. The information from that site has been integrated into the record for the Riverside (HE033) and this ARDF number has only been preserved for accounting purposes.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Mayflower

Site type: Prospect

ARDF no.: HE040

Latitude: 63.216 **Quadrangle:** HE A-6

Longitude: 149.643

Location description and accuracy:

The Mayflower prospect is at an elevation of about 3,400 feet, on the west side of Bryn Mawr Creek. It is in the NW1/4 of sec. 3, T. 20 S., R. 11 W., of the Fairbanks Meridian. The location is accurate to within 400 feet.

Commodities:

Main: Ag, Au, Cu

Other: As, Pb, Sb, Zn

Ore minerals: Arsenopyrite, chalcopyrite, galena, gold, pyrite, pyrrhotite, sphalerite, stibnite

Gangue minerals: Ankerite, quartz

Geologic description:

The country rocks in the area of the Mayflower prospect include Devonian to Triassic clastic, carbonate, volcanic, and volcaniclastic strata, which are intruded by a plug and dikes of Upper Cretaceous (70-65 Ma) quartz diorite porphyry (Swainbank and others, 1977). The Mayflower prospect is associated with a dike-like extension of the intrusive plug at the Golden Zone mine (HE043). Major faults trend northeast-southwest and have imparted a strong northeast-trending fabric to the host rocks. These faults have controlled the emplacement of intrusive rocks. At the Mayflower there is evidence that northwest-trending faults predated intrusion, as the dike trends northwest before swinging back to the northeast. The northwest-trending shear zone was also important during mineralization (unpublished report by Addwest Minerals International Ltd., 1997).

There are three types of deposits: sulfide disseminations, veins, and skarns. The dike contains disseminated sulfides and stockwork quartz-sulfide veinlets. Limonite and ankerite alteration is widespread. Adjacent to the dike, calc-silcate skarn bodies up to 15 feet thick contain 0.1 ounce of gold per ton and 10 percent combined lead and zinc. The skarn comprises pyrrhotite, pyrite, chalcopyrite, and arsenopyrite (up to 10 percent by volume) in a epidote, garnet, and actinolite (unpublished report by Addwest Minerals International Ltd., 1997).

Alteration:

Alteration consists of a combination of skarn (epidote, garnet and actinolite), silica flooding, ankerite, pyrite and sericite. Limonite and uncommon chalcocite are oxidation and supergene mineral assemblages.

Age of mineralization:

The Mayflower prospect is a satellite of the nearby Golden Zone mine (HE043) which has been dated at 70-65 Ma (Late Cretaceous) (Swainbank and others, 1977).

Generic deposit model:

Deposit model:

Combination of polymetallic vein and Au-Ag breccia pipe or Cu-Au porphyry (Cox and Singer, 1986; models 22c, 20c), with Cu skarn (Cox and Singer, 1986; model 18b)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c, 20c, 18b

Production Status: Undetermined

Site Status: Active

Workings/exploration:

The Mayflower prospect comprises two claims adjoining the Golden Zone on the north and was developed only by a few pits at the time of Ross's (1933) visit. The rock is brecciated, iron-stained, and soaked with quartz, so that identification is difficult, but it appears to be, at least in part, a continuation of the fine-grained intrusive mass of the Golden Zone (HE043). The lode can be traced with fair accuracy by means of the pits for a length of 350 feet trending N 30-35 E and dipping 70 SE. One of the pits shows mineralization off the line of this lode. The most northerly pit is the largest and the only one in which bedrock was satisfactorily exposed at the time of Ross's visit. There the well-mineralized part of the zone of shearing and brecciation was 32 inches wide. A sample across it yielded on assay 0.07 ounce of gold and 2.60 ounces of silver to the ton. Some specimens from the pit contain considerable chalcopyrite, but the average copper content of the lode as exposed was low. Samples collected by Henry Stevens of the Bureau of Mines in 1929, yielded the between 0.06 and 0.34 ounces of gold and 1.20 to 15.80 ounces of silver to the ton and as much 5.3 percent copper.

The prospect was explored by a reconnaissance IP and CS-AMT survey and by 1,500 feet of trenching. One shallow shaft was dug (during the 1930s?) and since has collapsed (Hawley and Clark, 1974).

Production notes:

None.

Reserves:

None.

Additional comments:

See Golden Zone mine (HE043).

References:

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Healy quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-1062, 113 p.

Hawley, C.C., and Clark, A.L., 1974 (1975), Geology and mineral deposits of the upper Chulitna district, Alaska: U.S. Geological Survey Professional Paper 758-B, p. B1-B47, 2 plates, scale 1:12,000 and 1:48,000.

Mulligan, J.J., Warfield, R.S., and Wells, R.R., 1967, Sampling a gold-copper deposit, Golden Zone mine, south-central Alaska: U.S. Bureau of Mines Open-File Report 9-67, 59 p.

Ross, C.P., 1933, Mineral deposits near the west fork of the Chulitna River, Alaska: U.S. Geological Survey Bulletin 849-E, 56 p., 1 sheet.

Primary Reference: unpublished report by Addwest Minerals International Ltd., 1997

Reporter(s): N. Van Wyck (Stevens Exploration Management Corporation); F.H. Wilson (USGS)

Last report date: 2016-03-28

Site name(s): Golden Zone

Site type: Mine

ARDF no.: HE043

Latitude: 63.2138 **Quadrangle:** HE A-6

Longitude: 149.6493

Location description and accuracy:

The Golden Zone Mine is at the headwaters of Bryn Mawr Creek, a tributary of the West Fork Chulitna River. It is at an elevation of about 3,500 feet, on the north bank of the creek, and about 2,000 feet southwest of the Golden Zone mine symbol on the 1:63,360-scale topographic map. Access is via dirt road from Colorado Station on the Alaska Railroad. The mine is about 0.5 mile west-northwest of the center of section 3, T. 20 S., R. 11 W.. The location is accurate.

Commodities:

Main: Ag, Au, Cu

Other: As, Pb, Sb, Zn

Ore minerals: Arsenopyrite, chalcopyrite, galena, pyrite, sphalerite, tetrahedrite

Gangue minerals: Calcite, quartz, sericite

Geologic description:

The country rocks in the vicinity of the Golden Zone Mine are Devonian to Triassic clastic, carbonate, volcanic, and volcaniclastic rocks that are intruded by a plug of Upper Cretaceous biotite-quartz-diorite porphyry (Perry and others, 2005; Hidefield, 2008; Kerr and Loveday, 2011). The deposit is in a breccia pipe that measures 250 feet by 300 feet at the surface and tapers downward. The contacts of the pipe dip steeply except on the northern side where the dips appear to flatten to the north. Drilling has confirmed that the pipe reaches a depth of 650 feet and possibly 1,500 feet. The pipe is almost entirely contained in the plug of biotite-quartz-diorite porphyry that is about 600 by 1,000 feet in size at the surface. The breccia pipe was produced by magmatic devolatilization, either from the diorite porphyry or from a related intrusion at depth. Both the breccia and the porphyry have been dated at 65-70 Ma. Major faults in the area trend northeast and have imparted a strong northeast-trending fabric to the host rocks. Differential motion along these faults has localized the subsequent emplacement of the biotite-quartz diorite porphyry and mineralizing fluids. Postmineral northwest-trending faults cut the breccia (unpublished report by Addwest Minerals International, Ltd., 1997). Early brecciation produced angular clasts cemented by vuggy, pale-gray quartz and minor arsenopyrite, pyrite, pyrrhotite, chalcopyrite and sphalerite. Several younger, sulfide-dominated events have overprinted the earlier, relatively barren, quartz-dominated brecciation, producing breccia containing over 10 percent sulfides. The younger breccia can be subdivided into early arsenic-rich zones and older copper-rich zones; the former contain better gold grades, in places up to 5 ounces of gold per ton.

The Golden Zone pipe is marked by extensive alteration and mineral zonation. A lead and zinc halo extends up to 2 miles from the pipe; the gold/silver ratios in arsenopyrite and chalcopyrite show a systematic variation; red bed units around the plug show widespread bleaching (C.C. Hawley, oral communication, 1999). Propylitic haloes consisting of epidote, carbonate minerals, and chlorite are present at the margin of the quartz diorite plug, and hornfels-skarn zones are developed in carbonate-rich country rock. Sericite is the dominant alteration mineral in the breccia; argillic overprinting (?), quartz flooding and Fe-carbonates are also reported, but their paragenesis is unclear.

Since its discovery in 1906, the Golden Zone Mine has been explored on the surface, in underground

workings, and by extensive drilling. Through 2008, the property was explored by about 20,100 meters of core and reverse-circulation drilling, extensive trenching, and about 1,200 meters of underground workings on three levels. The details of the exploration and the many companies that have been involved are well documented in Perry and others (2005) and Kerr and Loveday (2011). Close-spaced helicopter aeromagnetic and EM geophysical surveys have been flown over the mine; some ground-based IP work has been done as well. The State of Alaska sponsored an aeromagnetic survey in 1996 that included the mine site (Burns, 1997).

In 2011, Alix Resources Corp. (2012) drilled 7 holes. Two holes totaling 574 meters were in the breccia pipe; the best intercept was 256 meters with 1.50 gram of gold per tonne, 12.15 grams of silver per ton and 0.11 percent copper. Three holes were drilled at the GAS prospect south of the breccia pipe; numerous intercepts contained more than 0.1 gram of gold per ton but the highest was only 0.80 gram of gold per tonne. Two holes were drilled across the BLT zone on the northeast side of the breccia pipe. One was abandoned at 22 meters. The other was 178 meters deep; the best intercept was 4.0 meters with 0.77 gram of gold per tonne, 4.5 grams of silver per tonne, and 0.03 percent copper.

The mine produced 49,169 grams of gold, 267,990 grams of silver, and 19 tonnes of copper between 1941 and 1942 (Hawley and Clark, 1974).

Alix Resources Corp. entered into option agreement with Hidefield Gold Inc. and Mines Trust Company on the Golden Zone mine in 2010 and commissioned a new study of the deposit using new and reinterpreted drilling and analyses (Kerr and Loveday, 2011). The work included a new estimate of the resources in 0.5-grams-of-gold-per-tonne steps from 0.5 gram to 4.0 grams. The estimate is lengthy and should be consulted in its entirely for a complete picture. However, to use an estimate near the midpoint of their cutoff grades: 1) at a cutoff of 1.5 grams of gold per tonne, the Golden Zone has a combined measured and indicated resource of about 1.679 million tonnes with an average grade of 4.33 grams of gold per tonne, 20.94 grams of silver per tonne, and 0.11 percent copper; and 2) at a cutoff grade of 1.0 gram of gold per tonne, it has an inferred resource of 186,181 tonnes with an average grade of 1.52 grams of gold per tonne, 6.49 grams of silver per tonne, and 0.4 percent copper.

In 2016, Avidian Gold Inc. purchased Hidefield Gold PLC’s 29.4 percent interest outright, and entered into a purchase agreement with Chulitna & Mines Trust to acquire the remaining 70.6 percent interest in the Golden Zone property (Athey and Werdon, 2017).

Alteration:

The Golden Zone pipe is marked by extensive alteration and mineral zonation. Propylitic haloes consisting of epidote, carbonate minerals, and chlorite are present at the margin of the quartz diorite plug, and hornfels-skarn zones are developed in carbonate-rich country rock. Sericite is the dominant alteration mineral in the breccia; argillic overprinting(?), quartz flooding and Fe-carbonates are also reported, but their paragenesis is unclear.

Age of mineralization:

The Golden Zone is a magma-driven breccia pipe. Both the intrusion and the breccia minerals are Late Cretaceous (65-70 Ma) (Swainbank and others, 1977).

Generic deposit model:

Deposit model:

Polymetallic vein and Au-Ag breccia pipe or Cu-Au porphyry (Cox and Singer, 1986; models 22c, 20c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c, 20c

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Since its discovery in 1906, the Golden Zone Mine was been explored on the surface, in underground workings, and by extensive drilling. Through 2008, the property has been explored by about 20,100 meters of core and reverse-circulation drilling, extensive trenching, and about 1,200 meters of underground workings on three levels. Closely-spaced helicopter aeromagnetic and EM geophysical surveys have been flown over the mine; some ground-based IP work has been done as well. The State of Alaska sponsored an aeromagnetic survey in 1996 that included the mine site (Burns, 1997). As of early 2011, the Golden Zone Mine has been optioned by the Alix Resources Corp. who drilled 7 holes in 2011.

Production notes:

The mine produced 49,169 grams of gold, 267,990 grams of silver, and 19 tonnes of copper between 1941 and 1942 (Hawley and Clark, 1974).

Reserves:

Kerr and Loveday (2011) estimated the resources of the Gold Zone Mine in 0.5-grams-of-gold-per-tonne steps from 0.5 gram to 4.0 grams. The estimate is lengthy and should be consulted in its entirely for a complete picture. However, using an estimate near the midpoint of their cutoff grades: 1) at a cutoff of 1.5 grams of gold per ton, the Golden Zone has a combined measured and indicated resource of 1,679,596 tonnes of ore with an average grade of 4.33 grams of gold per tonne, 20.94 grams of silver per tonne, and 0.11 percent copper; and 2) at a cutoff grade of 1.0 gram of gold per tonne, it has an inferred resource of 186,181 tonnes with an average grade of 1.52 grams of gold per tonne, 6.49 grams of silver per tonne, and 0.4 percent copper.

The Golden Zone property hosts a number of high-grade gold occurrences, and in 2016, Avidian released a NI 43-101-compliant indicated gold resource of 4.187 million tonnes of material at a grade of 1.99 grams of gold per tonne, for total contained 267,400 ounces of gold, at a cut-off grade of 0.5 gram of gold per tonne in one of the occurrences that remains open and not fully tested (Avidian, 2016).

Additional comments:

References:

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Primary Reference: Perry and others, 2005

Reporter(s): N. Van Wyck (Stevens Exploration Management Corporation); D.J. Grybeck (Contractor, USGS); F.H. Wilson (USGS); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Lindfors

Site type: Prospect

ARDF no.: HE046

Latitude: 63.208

Quadrangle: HE A-6

Longitude: 149.653

Location description and accuracy:

The Lindfors prospect is at an elevation of about 3,900 feet on the divide at the head of Bryn Mawr Creek. It is in the SE1/4 of sec. 4, T. 20 S., R. 11 W., of the Fairbanks Meridian. The location is accurate to within 500 feet. This is location 11 of Cobb (1978: OFR 78-1062).

Commodities:

Main: Au, Cu, Zn

Other: Pb, Sb

Ore minerals:

Gangue minerals: Quartz

Geologic description:

The Lindfors prospect lies at the head of Bryn Mawr Creek adjoining the Golden Zone claims. According to Ross (1933) no work had been done here for some time, but the prospect had been restaked in the summer of 1931. He reported development comprised a number of trenches and shallow ditches from which a very small amount of ground sluicing was done. Most of the trenches did not expose bedrock and were in frost-shattered material, largely rusty dioritic porphyry but including representatives of the clastic rocks of the vicinity. Capps (1919) noted that at the time of his visit in 1917 one open cut exposed a vein of massive arsenopyrite 4 to 20 inches thick on the contact of a decomposed dike and altered tuff. Another cut showed disseminated sulfides and veinlets containing sulfides, quartz, and a carbonate resembling ankerite, in calcareous strata. He reported that arsenopyrite, pyrite, chalcopyrite, and sphalerite were present there and that gold was reported in encouraging amounts.

The Lindfors prospect is about 1,500 feet south-southwest of the Golden Zone mine (HE043). The country rocks at the prospect are Permo-Triassic redbed sandstones, conglomerates, limestones and volcaniclastic sediments, which are intruded by Upper Cretaceous quartz diorite dikes. The deposit consists of quartz veins containing arsenopyrite, chalcopyrite, galena, pyrite, sphalerite, and tetrahedrite. Surface geochemistry values of 0.2 to 14 ppm gold, high silver, arsenic, lead, antimony and zinc have been reported (Hawley and Clark, 1974). The Lindfors deposit probably is a continuation of the deposit at the Golden Zone mine.

Alteration:

Quartz, sericite (?), and pyrite.

Age of mineralization:

Synchronous with the Golden Zone mineralization, dated as Late Cretaceous.

Generic deposit model:

Deposit model:

Polymetallic vein (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
22c

Production Status: None

Site Status: Active

Workings/exploration:
Early development comprised a number of trenches and shallow ditches from which a very small amount of ground sluicing was done. Most of the trenches did not expose bedrock and were in frost-shattered material, largely rusty dioritic porphyry but including representatives of the clastic rocks of the vicinity. Capps (1919) noted that at the time of his visit in 1917 one open cut exposed a vein of massive arsenopyrite 4 to 20 inches thick on the contact of a decomposed dike and altered tuff. Another cut showed disseminated sulphides and veinlets containing sulphides, quartz, and a carbonate resembling ankerite, in calcareous strata. He reported that arsenopyrite, pyrite, chalcopyrite, and sphalerite were present there and that gold was reported in encouraging amounts.

One drill hole has explored the Lindfors zone at depth; there is a report of a shallow shaft, now collapsed, dug in the 1920s. Surface exploration consists of numerous pits and trenches. Close-spaced helicopter aeromagnetic and EM geophysical surveys have been flown over this prospect. In 1996, the State of Alaska flew a wider-spaced helicopter aeromagnetic survey that included this prospect (Burns, 1997).

Surface geochemistry values of 0.2 to 14 ppm gold, high silver, arsenic, lead, antimony and zinc have been reported (Hawley and Clark, 1974).

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Capps, S.R., 1919, Mineral resources of the upper Chulitna region: U.S. Geological Survey Bulletin 692-D, p. 207-232.

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Ross, C.P., 1933, Mineral deposits near the west fork of the Chulitna River, Alaska: U.S. Geological Survey Bulletin 849-E, 56 p., 1 sheet.

Primary Reference: Hawley and Clark, 1974

Reporter(s): N. Van Wyck (Stevens Exploration Management Corporation); F.H. Wilson (USGS)

Last report date: 2016-03-28

Site name(s): Long; Copper King; Hector Group; Long Creek

Site type: Prospect

ARDF no.: HE049

Latitude: 63.1958 **Quadrangle:** HE A-6

Longitude: 149.6575

Location description and accuracy:

The Copper King prospect is at an elevation of about 3,450 feet near the head of Long Creek. The site is near the center of the east boundary of section 9 , T. 20 S., R. 11 W. The location is accurate to within 0.2 mile.

Commodities:

Main: Ag, Au, Cu

Other: Mo, Zn

Ore minerals: Chalcopyrite, molybdenite, pyrite, pyrrhotite

Gangue minerals: Quartz, skarn minerals

Geologic description:

Ross (1933) reported the mineralized rock comprises lenses and seams of massive pyrrhotite and chalcopyrite in silicified limestone containing chlorite and probably other silicates. The larger masses parallel the bedding of the cherty rocks. The strike of the beds in this vicinity ranges from N 20 E to N 55 E with the average closer to the latter. The main trench showed mineralization at intervals throughout its length of about 70 feet but exposed massive sulfide only over a width of 2 or 3 feet about 15 feet from its northwest end. A sample of freshly blasted material yielded on assay 0.22 ounce of gold and 4.90 ounces of silver to the ton and 7.34 percent of copper. Trenches about 45 feet to the southwest on the line of strike show little mineralization. The continuation of the same beds in bluffs about 1,000 feet to the northeast contained no visible copper minerals. A very little copper stain and a little pyrite were present in a limestone bed on the approximate line of strike in the gorge of Long Creek about 2,000 feet to the southwest. There are several scattered pits in the vicinity, but copper was not observed in any of them.

The Copper King prospect is primarily a skarn deposit. The country rocks are hornfelsed Permo-Triassic redbeds that consist of calcareous siltstone, and conglomerate; these have been intruded by Upper Cretaceous(?) quartz porphyry dikes. The deposit chiefly consists of massive chalcopyrite, pyrite, and pyrrhotite in a skarn zone 20 to 40 feet thick that is exposed for about 200 feet at the surface. Subsidiary zones of quartz-stockwork veins and disseminated sulfides also occur (unpublished report by Addwest Minerals International Ltd., 1997). The pattern of mineralization suggests a zonal distribution of copper around quartz porphyry intrusions. This is the only prospect in the district explored primarily for copper and is also the only prospect in the area where arsenopyrite has not been found (Hawley and Clark, 1974). In addition, molybdenite is more abundant here than at other nearby prospects; e.g., the Golden Zone Mine (HE043). Ross (1933) reported a sample yielded 7.34 percent copper, 4.9 ounces of silver, and 0.22 ounce of gold per ton.

Through 1999, the exploration included geochemical soil surveys, 1,500 feet of trenching, and 9 drill holes that totaled 1,700 feet. As part of the Golden Zone project, there was some work done at or near this prospect from 2001 to 2005 (Hidefield, 2005 and 2008). The work included some initial ground geophysical surveys. One hole was drilled in 2005. The best interval contained 2.04 grams of gold per tonne across 1.5 meters. In 2011, Alix Resources Corp. drilled 4 holes totaling 434 meters to test the stratigraphy of the redbeds. The results were encouraging with many intercepts up to 9 meters long that contained more than

0.1 gram of gold per ton. But the richest, 1.5 meters long, only contained 0.90 gram of gold per tonne.

Alteration:

Skarn zones contain diopside, epidote, sericite, and anhydrite.

Age of mineralization:

Late Cretaceous?

Generic deposit model:

Deposit model:

Cu skarn (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b

Production Status: None

Site Status: Active

Workings/exploration:

Ross (1933) reports several trenches were dug in August 1931 for exploration. The main trench showed mineralization at intervals throughout its length of about 70 feet but exposed massive sulfide only over a width of 2 or 3 feet about 15 feet from its northwest end. A sample of freshly blasted material yielded on assay 0.22 ounce of gold and 4.90 ounces of silver to the ton and 7.34 percent of copper. Trenches about 45 feet to the southwest on the line of strike show little mineralization.

Through 1999, the exploration included geochemical soil surveys, 1,500 feet of trenching and 9 drill holes that totaled 1,700 feet. As part of the Golden Zone project, there was some work done at or near this prospect from 2001 to 2005 (Hidefield, 2005 and 2008). The work included some initial ground geophysical surveys; one hole was drilled in 2005. Alix Resources Corp. drilled 4 holes in 2011 (Alix Resources Corp., 2012).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Alix Resources Corp., 2012, Alix announces completion of 2011 program at the Golden Zone property, Alaska: http://www.alixresources.com/index.php?page=news&id=1104 (News release, Jan 5, 2012).

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Kurtak, J.M., Southworth, D.D., Balen, M.D., and Clautice, K.H., 1992, Mineral investigations in the Valdez Creek mining district, south-central Alaska: U.S. Bureau of Mines Open-File Report 1-92, 659 p., 2 plates, scale 1:250,000.

Ross, C.P., 1933, Mineral deposits near the west fork of the Chulitna River, Alaska: U.S. Geological Survey

Primary Reference: Hawley and Clark, 1974; Hidefield Gold Plc., 2008

Reporter(s): N. Van Wyck (Stevens Exploration Management Corporation); D.J. Grybeck (Contractor, USGS); F.H. Wilson (USGS)

Last report date: 2016-03-28

Site name(s): Ready Cash

Site type: Prospect

ARDF no.: HE057

Latitude: 63.15 **Quadrangle:** HE A-6

Longitude: 149.86

Location description and accuracy:

The Ready Cash prospect is at an elevation of about 2,700 feet on Canyon Creek, a northern tributary to Ohio Creek. The map site is in the SW1/4 of sec. 28, T. 20 S., R. 12 W., of the Fairbanks Meridian. This is locality 21 of Cobb (1978: OFR 78-1062).

Commodities:

Main: Ag, Au, Cu, Pb, Sn, Zn

Other: Sb

Ore minerals: Argentite, arsenopyrite, cassiterite, chalcopyrite, covellite, galena, pyrite, pyrrhotite, sphalerite, tennantite, tetrahedrite

Gangue minerals: Calcite, quartz

Geologic description:

Ross (1933) examined the site and reported that the bedrock in the vicinity of the tunnel is uniformly a coarse, somewhat chloritic rock without discernible bedding, which microscopic examination shows to be altered andesite or related rock. Three segments of quartz veins exist. The segment on the west side of Canyon Creek is 3 feet wide, strikes about N 58 W, and stands vertical. There are several minor quartz stringers and lenses of oxidized sulfide south of this vein. The main vein contains rather sparsely disseminated arsenopyrite, galena, and other sulfides. A sample yielded on assay 0.01 oz. of gold and 4.20 ounces of silver to the ton and 0.52 percent of lead. Some of the rusty lenses south of it were probably high in sulfide before oxidation, but none of these are more than a few inches wide and apparently none much more than 2 feet long.

Another vein segment is exposed for about 30 feet on the east side of Canyon Creek about 80 feet above the tunnel portal. It strikes about N 25 E and stands vertical. Its walls are curved so that their strike ranges from N 40 E to N 20 E. At the north end of the exposure the vein is about 10 feet wide. A sample contained a trace of gold and 0.70 ounce of silver to the ton. Its lead content was not determined but is obviously small. About 25 feet to the south the vein has a width of only 4 feet. On the east wall there are slickensides which dip 65 N. Sulfides are less abundant in this vein segment than in that to the west and occur mainly in small streaks and bunches. They include arsenopyrite, pyrite, and some chalcopyrite. Most of the quartz has been fractured and locally is stained and impregnated with the oxidation products of iron, copper; and manganese. The tunnel below trends N 83 E for 169 feet and hence extends well beyond the line of the vein as exposed 80 feet above it. The tunnel exposes only broken ground and minor stringers of quartz and calcite with small amounts of sulfides, mainly pyrite (Ross, 1933).

The third vein segment is exposed on the hillside above and east of the segment just described. A tunnel in the face of a steep bluff has been driven 60 feet to this vein, and a drift tunnel off from it to the southeast follows the vein for a distance of 16 feet. The vein as exposed in this tunnel is 5 feet wide, strikes N 20 W, and dips about 60 NE. The face of the lower tunnel is within 120 feet of the point where this vein would be if projected northwestward with the same strike and dip. A sample across the southeast face of the drift yielded on assay a trace of gold and 1.80 ounces of silver to the ton, but no lead. This vein contains numerous stringers and bunches of sulfides, some as much as 10 inches wide. They include arsenopyrite,

pyrrhotite, pyrite, galena, chalcopyrite, and sphalerite, listed roughly in the order of decreasing abundance. Most of the bands of nearly pure sulfide consist mainly of arsenopyrite. Some of the pyrite is in imperfect cubes as much as an inch wide. There are small amounts of supergene covellite. The gangue is white, rather coarsely crystalline quartz, somewhat fractured (Ross, 1933).

The country rocks in the area of the Ready Cash prospect consist of several hundred meters of Upper Triassic interbedded limestone, marble, basalt, metachert, and argillite. The strata are intruded by quartz diorite porphyry dikes of probable Late Cretaceous to Early Tertiary age, and by Tertiary tourmaline-bearing granite. The Ready Cash prospect consists of quartz-calcite-sulfide veins, and pods of skarn. The ore minerals consist chiefly of arsenopyrite, pyrite, chalcopyrite, galena and sphalerite, accompanied by minor amounts of tetrahedrite, tennantite, argentite, and cassiterite. The skarn consists of pyrite, pyrrhotite and chalcopyrite in a matrix of calc-silicate minerals and sparse quartz. The deposit can be subdivided into: a) copper-rich pods of skarn having grades of 0.5 to 0.9 percent copper (Hawley and Clark, 1974); b) arsenopyrite-quartz veins, containing 0.08 ounce of gold per ton, 1.06 ounce of silver per ton, and 0.33 percent copper; and c) high silver-lead-tin veins containing up to 20.8 ounces of silver per ton, 4.0 percent lead, and 0.5 percent tin (Hawley and others, 1978). The several types of deposits may be related to two or more magmatic events in the area.

The deposit at the Ready Cash prospect is more or less continuous with the deposit at the Canyon Creek prospect (HE055), encompassing an area about 2.5 miles long and 1 mile wide.

Alteration:

There probably have been multiple alteration events; including skarn formation and silicification.

Age of mineralization:

Probably Late Cretaceous and (or) younger.

Generic deposit model:

Deposit model:

Cu skarn and younger Ag-Pb-Sn veins (Cox and Singer, 1986; models 18b, 15b)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b, 15b

Production Status: None

Site Status: Active

Workings/exploration:

The ground wras located in May 1915 by Otto Tangel, J.P. Frisly, William Murry, and E. Miller; later ownership was acquired by J.H McCallie, who patented the property in 1927; there are nine claims covering an area of 132.627 acres, developed by two tunnels and nine discovery pits. It appears from the description by Capps that all this work had done prior to his visit in July 1917. The two tunnels and their relations to the veins found are shown in plate 26 of Ross (1933). As mentioned above the two tunnels are 169 feet and 60 feet long, with a 16 foot drift (Ross, 1933).

The deposit can be subdivided into: a) copper-rich pods of skarn having grades of 0.5 to 0.9 percent copper (Hawley and Clark, 1974); b) arsenopyrite-quartz veins, containing 0.08 ounce of gold per ton, 1.06 ounce of silver per ton, and 0.33 percent copper; and c) high silver-lead-tin veins containing up to 20.8 ounces of silver per ton, 4.0 percent lead, and 0.5 percent tin (Hawley and others, 1978).

Production notes:

None.

Reserves:

The two principal silver-rich veins on the prospect contain approximately 200,000 tons of ore carrying 10

to 20 ounces of silver per ton and 0.5 percent tin (C. Hawley, personal communication, 1999). This estimate does not include the skarn deposits.

Additional comments:

References:

Balen, M.D., 1989, Results of 1988 Bureau of Mines investigations in the Valdez Creek mining district, Alaska: U.S. Bureau of Mines Open-File Report 31-89, 136 p.

Balen, M.D., 1990, Geochemical sampling results from the Bureau of Mines investigations in the Valdez Creek mining district, Alaska: U.S. Bureau of Mines Open-File Report 34-90, 218 p., 2 plates, scale 1:250,000.

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Primary Reference: Hawley and Clark, 1974

Reporter(s): N. Van Wyck (Stevens Exploration Management Corporation); F.H. Wilson (USGS)

Last report date: 2016-03-28

Site name(s): Red Mountain Creek; WTF (Western Tundra Flats); Dry Creek

Site type:

Prospect

ARDF no.: HE122

Latitude: 63.92 **Quadrangle:** HE D-1

Longitude: 147.38

Location description and accuracy:

This site represents an area of about a square mile between upper Red Mountain Creek and Dry Creek. The map site is at an elevation of about 4,300 feet, on the west wall of the valley of upper Red Mountain Creek, in the SW1/4 of sec. 33, T. 11 S., R. 2 E., of the Fairbanks Meridian. This is locality 7 of Cox and others (1989).

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, sphalerite

Gangue minerals: Chlorite, feldspar, quartz, white mica

Geologic description:

The country rocks in the area of this prospect are mapped as the Lower Mississippian to Middle Devonian Totatlanika Schist, composed predominantly of metavolcanic and metavolcaniclastic rocks, and subordinate amounts of intercalated metasedimentary rocks (Wilson and others, 1998). The dominant structural fabric on the property is a strong mylonitic foliation, and there is a consistent east-northeasterly lineation that plunges at about 20-30 degrees. The deposit is in greenschist-grade metasedimentary rocks and altered rhyolite schist, and consists of stratiform bodies of massive sulfides that occur on the northern and southern limbs of an east-trending synclinal fold. The southern limb of the syncline contains three ore horizons that dip to the north at about 70 to 80 degrees (Schuster, 1998). These are referred to as the DC zones, which have been subdivided into the DC-North, DC-South, and DC-17 zones.

The DC-North zone is defined by a 2-kilometer-long EM conductor. This zone has been further subdivided into three areas: Discovery, which roughly bisects the EM anomaly; Lago Creek, which is 200-400 meters west of the Discovery area; and Fosters Creek, about 800 meters west of the Discovery area. In the Fosters Creek area, drilling has intercepted a 29-meter interval (true width) grading 6.22 percent zinc, 2.56 percent lead and 0.22 percent copper, as well as 182.8 grams silver and 1.03 grams gold per tonne. A 3.7-meter intercept in the hole produced assay results as high as 23.58 percent zinc, 8.46 percent lead, 1.02 percent copper, and 531.5 grams silver and 2.24 grams gold (Schuster, 1998). The DC-South zone is virtually unexplored except for a few reconnaissance drill holes. The DC-17 zone is a 15-meter-thick bed of pyrite (with minor amounts of lead and zinc) that is believed to be genetically related to other zones.

The northern limb of the syncline dips gently to the south and hosts the WTF zone, a layer of massive sulfides 0.3 to 5 meters thick that has been tested by 26 widely-spaced drill holes (Schuster, 1998).

Alteration:

The footwall schist contains chlorite and sericite.

Age of mineralization:

Mineralization was syngenetic with the Lower Mississippian to Middle Devonian host rocks.

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Active

Workings/exploration:

Exploration of the area includes an EM geophysical survey and extensive drilling. Press releases indicate that over 60 drill holes totaling approximately 7600 m have been drilled to date (Robertson, 1998; The Northern Miner, 1998 and 1999: v. 84, nos. 26 and 52).

In February 2016, White Rock Minerals Ltd. announced the proposed acquisition of the Red Mountain polymetallic volcanogenic massive sulfide (VMS) project in the north-central Alaska Range, with two known deposits: Dry Creek (101 historical drill holes for 13,831 m) and West Tundra Flats (26 historical drill holes for 5,349 m). As of May 2016, White Rock acquired 100 percent ownership of the property. In March 2016, White Rock Minerals Ltd. staked 85 new mining claims in the Bonnifield district. In June through August 2016, White Rock focused on identifying high-priority magnetic, conductivity, and geochemical targets for future follow-up work utilizing geochemical vector analysis, detailed geologic maps published by DGGS, and contracted detailed interpretation of a DGGS airborne magnetic and electromagnetic survey of the area (Burns and others, 2016). The resulting integrated assessment led to an additional 114 claims being staked and prioritization of the ReRun, Smog (HE126) and Glacier target areas as highly prospective for additional VMS deposits, which are included within 30 geochemical-geophysical targets classified as of high interest (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

Reserves for part of this deposit have been estimated at 1.10 million tonnes grading 0.15 percent copper, 2.5 percent lead, 7.9 percent zinc, and 270 grams silver, and 1.9 grams of gold per tonne (Nokleberg and others, 1987). An estimate based on 38 of 60 holes drilled to test the southern limb of the syncline gave an inferred resource of 2.9 million tonnes grading 4.4 percent zinc, 1.9 percent lead, 0.2 percent copper, and 0.55 gram gold and 93.6 grams silver per tonne. Included in this estimate is a higher-grade core of 1.5 million tonnes grading 6.4 percent zinc, 2.9 percent lead, 0.3 percent copper, and 0.79 gram gold and 123.8 grams silver per tonne. The bulk of the resource is in the Fosters Creek and Discovery zones, respectively in pyritic sedimentary rocks and intensely altered rhyolite. On the north limb of the syncline, the WTF resource currently (1999) stands at 2.8 million tonnes grading 6 percent zinc, 2.5 percent lead, 0.1percent copper, and 0.9 gram gold and 178.2 grams silver per tonne (The Northern Miner, 1998 and 1999: v. 84, nos. 26 and 52).

Additional comments:

References:

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Schuster, T., 1998, Grayd advances Alaskan properties: The Northern Miner, v. 84, no. 18, p. 2.

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Nokleberg and others, 1994

Reporter(s): N. Van Wyck (Stevens Exploration Management Corporation); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Smog

Site type: Occurrence

ARDF no.: HE126

Latitude: 63.99 **Quadrangle:** HE D-1

Longitude: 147.39

Location description and accuracy:

This occurrence is at an elevation of about 4,200 feet, on the north side of an east-flowing tributary to upper Slide Creek. The map site is about 1.7 miles northeast of VABM 6463 (Art), in the SE1/4 of sec. 5, T. 11 S., R. 2 E., of the Fairbanks Meridian. The location is accurate to within 1.5 miles. This is locality 6 of Cox and others (1989).

Commodities:

Main: Pb, Zn

Other: Ag, Au, Cu

Ore minerals: Chalcopyrite, galena, pyrite, sphalerite

Gangue minerals: Chlorite, quartz, sericite

Geologic description:

The country rock in the area of this occurrence is the Lower Mississippian to Middle Devonian Totatlanika Schist. The deposit is in schist and consists of lenses of massive chalcopyrite, galena, pyrite, and sphalerite, accompanied by chlorite, quartz, and sericite (www.grayd.com, 1999).

Alteration:

Footwall alteration zones contain chlorite and sericite.

Age of mineralization:

The deposit is interpretted to have formed synchronously with the deposition of the mid-Paleozoic protoliths of the Totatlanika Schist.

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Active?

Workings/exploration:

In February 2016, White Rock Minerals Ltd. announced the proposed acquisition of the Red Mountain polymetallic volcanogenic massive sulfide (VMS) project in the north-central Alaska Range, with two

known deposits: Dry Creek (101 historical drill holes for 13,831 m) and West Tundra Flats (26 historical drill holes for 5,349 m). As of May 2016, White Rock acquired 100 percent ownership of the property. In March 2016, White Rock Minerals Ltd. staked 85 new mining claims in the Bonnifield district. In June through August 2016, White Rock focused on identifying high-priority magnetic, conductivity, and geochemical targets for future follow-up work utilizing geochemical vector analysis, detailed geologic maps published by DGGS, and contracted detailed interpretation of a DGGS airborne magnetic and electromagnetic survey of the area (Burns and others, 2016). The resulting integrated assessment led to an additional 114 claims being staked and prioritization of the Dry Creek West, ReRun, West Tundra Flats, and Glacier target areas as highly prospective for additional VMS deposits, which are included within 30 geochemical-geophysical targets classified as of high interest (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

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Cox, D.P., Light, T.D., Csejtey, Bela, Jr., and Campbell, D.L., 1989, Mineral resource assessment map of the Healy quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map, MF-2058-A, 1 sheet, scale 1:250,000.

www.grayd.com, 1999.

Primary Reference: Cox and others, 1989

Reporter(s): N. Van Wyck (Stevens Exploration Management Corporation); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Honolulu

Site type: Prospect

ARDF no.: HE131

Latitude: 63.03 **Quadrangle:** HE A-5

Longitude: 149.48

Location description and accuracy:

The Honolulu prospect is at an elevation of about 2,950 feet in the headwaters of Honolulu Creek. The location is accurate to within 0.5 mile. The map site is in the SW1/4 of sec. 4, T. 22 S., R. 10 W., of the Fairbanks Meridian. This is location 36 of Cox and others, 1989; location D-22 of Balen (1990: OFR 34-90).

Commodities:

Main: Ag, Au, Cu

Other: Pb, Sn, Zn

Ore minerals: Chalcopyrite, galena, sphalerite

Gangue minerals: Quartz

Geologic description:

The area of the Honolulu prospect is underlain by Lower Cretaceous to Upper Jurassic graywacke and argillite cut by Tertiary granites. The deposit is in highly altered granitic rock and consists of sulfide-rich quartz veinlets (Balen and others, 1991). The sulfide minerals are chalcopyrite, galena, and sphalerite. High tin assays suggest that cassiterite also is present. One channel sample collected across a 60-foot exposure of altered granite contained 1.09 ounce of silver per ton, 0.03 ounce of gold per ton, 1.5% copper, and 250 ppm tin. The highest grade samples contained 141 ounces of silver per ton, 0.05 ounce of gold per ton, 2.3% copper, 6.3% lead, 6% zinc, and 795 ppm tin (Balen, 1990: OFR 34-90; Balen and others, 1991).

In 2016, Honolulu Prospect Corp. conducted a multi-phase exploration program on their Honolulu project. Select hand samples include: sheeted arsenopyrite veins from Tiki Chute with 0.17 ounce of gold per ton and 1.35 ounces of silver per ton; disseminated arsenopyrite in drusy quartz from Bertram Gulch with 0.03 ounce of gold per ton and 7.3 ounces of silver per ton; and oxidized sulfide veins from Tempest with 8.26 percent lead, 6.47 percent zinc, and 223.8 ounces of silver per ton. Honolulu Prospect Corp. is planning a significant drilling campaign in 2017, along with geochemical and geophysical surveys and geologic mapping (Athey and Werdon, 2017).

Alteration:

Extensive silicification and phyllic alteration.

Age of mineralization:

The sulfide minerals are in altered Tertiary granite.

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
22c

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Surface workings, and two shallow Winkie holes drilled in the mid-1970s (unpublished report for the New Alaska Syndicate, 1976). One channel sample collected across a 60-foot exposure of altered granite contained 1.09 ounce of silver per ton, 0.03 ounce of gold per ton, 1.5% copper, and 250 ppm tin. The highest grade samples contained 141 ounces of silver per ton, 0.05 ounce of gold per ton, 2.3% copper, 6.3% lead, 6% zinc, and 795 ppm tin (Balen, 1990: OFR 34-90; Balen and others, 1991).

In 2016, Honolulu Prospect Corp. conducted a multi-phase exploration program on their Honolulu project, which included 16 drill holes, collecting 1,505 sediment and 124 rock samples, defining a 1,000-foot strike length and up to 200-foot-wide mineralized structural zone with multiple mineralized fault splays containing continuous high-grade mineralization, and identification of four new areas with anomalous silver, copper, and gold. The 16 holes were drilled from 5 pads for a total of 8,645 feet. Select hand samples include: sheeted arsenopyrite veins from Tiki Chute with 0.17 ounce of gold per ton and 1.35 ounces of silver per ton; disseminated arsenopyrite in drusy quartz from Bertram Gulch with 0.03 ounce of gold per ton and 7.3 ounces of silver per ton; and oxidized sulfide veins from Tempest with 8.26 percent lead, 6.47 percent zinc, and 223.8 ounces of silver per ton. Honolulu Prospect Corp. is planning a significant drilling campaign in 2017, along with geochemical and geophysical surveys and geologic mapping (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Balen, M.D., 1990, Geochemical sampling results from the Bureau of Mines investigations in the Valdez Creek mining district, Alaska: U.S. Bureau of Mines Open-File Report 34-90, 218 p., 2 plates, scale 1:250,000.

Balen, M.D., and others, 1991, Executive summary of the Bureau of Mines investigations in the Valdez Creek mining district, Alaska: U.S. Bureau of Mines Special Publication, 43 p.

Cox, D.P., Light, T.D., Csejtey, Bela, Jr., and Campbell, D.L., 1989, Mineral resource assessment map of the Healy quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map, MF-2058-A, 1 sheet, scale 1:250,000.

Primary Reference: Balen and others, 1991

Reporter(s): N. Van Wyck (Stevens Exploration Management Corporation); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Unnamed (near summit of Gold Hill)

Site type:

ARDF no.: HE171

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

When this record was initially compiled there was little information on this deposit and another nearby prospect. Subsequent exploration and drilling has blurred the distinction between the two, expanded the area of the property to encompass both of them and added much new information on the property that is now the 'Gold Hill, Su', ARDF site HE172. The data that was in this record has been integrated into that record. The ARDF number in this record has been preserved only for accounting purposes.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-03-04

Site name(s): Gold Hill; Su

Site type: Prospects

ARDF no.: HE172

Latitude: 63.0985 **Quadrangle:** HE A-2

Longitude: 147.745

Location description and accuracy:

The Gold Hill prospects extend southwest for about a half mile from the high point of ridge at the northeast end of the prospects, which is locally called Gold Hill. It is about 3.5 miles northwest of the junction of Wickersham and Butte Creeks. The center of these prospects is about 0.4 mile northeast of the center of section 16,T. 21 S., R. 1 W., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Au, Cu, Mo

Other: As

Ore minerals: Arsenopyrite, chalcopyrite, enargite?, gold, molybdenite, pyrite, pyrrhotite

Gangue minerals: Quartz

Geologic description:

The Gold Hill prospect was first located in 1972 by the New Alaska Syndicate, who carried out considerable geochemical surveys, trenching, and sampling; they also drilled 22 diamond-drill holes (Friberg, 2004) . Dome Mines continued the work in 1977, followed by several other companies, including Stevens Exploration Management, GCO Minerals, Amax Exploration, and Hemlo Mines. At the end of this activity in 1996, the work included 27 diamond drill holes that totaled 9,588 feet, 21 reverse-circulation holes totaling 5,885 feet, several geochemical surveys and much rock sampling, and both ground and airborne geophysical surveys. In 2004, MAX Resource Corp. acquired the property that then consisted of a large block of claims.

The rocks in the vicinity of this prospect are deformed Jurassic and Cretaceous metasedimentary and metavolcanic rocks of the Maclaren Metamorphic Belt that have been intruded by dikes and stocks of Early Tertiary quartz monzonite and hornblende diorite (Wilson and others, 1998; Smith and others, 1975).

The mineralization occurs mainly in and at the periphery of the intrusions, and locally along shears and fractures. It consists of quartz veins, stockworks, veinlets, and disseminations, The ore minerals include various combinations of pyrite, pyrrhotite, arsenopyrite, chalcopyrite, possibly enargite, molybdenite, and gold. The rocks are hornfelsed near the intrusion and there are several zones of propylitic and argillic alteration associated with the mineralization. Four distinct target areas are spread along about a half mile were defined by the soil surveys and geophysics.

Most of the drilling prior to 2004 was for gold, numerous intercepts contained more than 1 part per million (ppm) gold. Some notable intercepts are 3.5 feet that contained 54.3 ppm gold, 5 feet that contained 3.96 ppm gold, 5 feet that contained 6.36 ppm gold, 5 feet that contained 15.94 ppm gold, 5 feet that contained 8.02 ppm gold, and 5 feet that contained 22.90 ppm gold.

In 2007, MAX drilled 4 holes, primarily to test the molybdenum potential of the prospect. The best intercepts were 250 feet of 0.048 percent molybdenum, 750 feet of 0.044 percent molybdenum, 250 feet of 0.0361 percent molybdenum, and 352 feet of 0.0434 percent molybdenum. They drilled another 10 holes that totaled 7,664 feet in 2008 (Max Resource Corporation, 2009). The best hole cut quartz-pyrite-molybdenite mineralization for 536 feet that averaged 0.048 percent molybdenum. Copper varied from 0.009 to 0.0425 percent in the holes.

Alteration:

Silicification, propylitic and argillic alteration, hornfelsing near the intrusion.

Age of mineralization:

Tertiary based on the age of the intrusion that is apparently the source of the mineralization.

Generic deposit model:

Deposit model:

Porphyry Cu-Mo-Au (Cox and Singer, 1986; model 20c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c

Production Status: None

Site Status: Active

Workings/exploration:

The Gold Hill prospect was first located in 1972 by the New Alaska Syndicate, who carried out considerable geochemical surveys, trenching, and sampling; they also drilled 22 diamond-drill holes (Friberg, 2004). Dome Mines continued the work in 1977, followed by several other companies, including Stevens Exploration Management, GCO Minerals, Amax Exploration, and Hemlo Mines. At the end of this activity in 1996, the work included 27 diamond drill holes that totaled 9,588 feet, 21 reverse-circulation holes totaling 5,885 feet, several geochemical surveys and much rock sampling, and both ground and airborne geophysical surveys. In 2004, MAX Resource Corp. acquired the property that then consisted of a large block of claims. In 2007, MAX drilled 4 holes, primarily to test the molybdenum potential of the prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Balen, M.D., 1990, Geochemical sampling results from the Bureau of Mines investigations in the Valdez Creek mining district, Alaska: U.S. Bureau of Mines Open-File Report 34-90, 218 p., 2 plates, scale 1:250,000.

Balen, M.D., and others, 1991, Executive summary of the Bureau of Mines investigations in the Valdez Creek mining district, Alaska: U.S. Bureau of Mines Special Publication, 43 p.

Friberg, R.S., 2004, Project Summary, Gold Hill Project: Technical Report for Max Resource Corp, 94 p. (posted on www.sedar.com, August 6, 2004).

Kurtak, J.M., Southworth, D.D., Balen, M.D., and Clautice, K.H., 1992, Mineral investigations in the Valdez Creek mining district, south-central Alaska: U.S. Bureau of Mines Open-File Report 1-92, 659 p., 2 plates, scale 1:250,000.

MAX Resource Corporation, 2009, MAX intercepts 50 feet of 0.121% Mo at Gold Hill molybdenum/copper, gold project in Alaska : News release dated Feb 2, 2009. (http://www.maxresource.com/s/NewsReleases.asp?ReportID=336557&_Type=News-Releases&_Title=MAX-intercepts-50-feet-of-0.1212-Mo-100-feet-of-0.0712-Mo-at-Gold-Hill-moly...)

Smith, T.E., Kline, G.L., Kline, J.T., and Coursey, N.D., 1975, Analyses of rock and stream-sediment samples, Healy A-2 quadrangle, south-central Alaska: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF69, 2 sheets, scale 1:63,360.

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: Friberg, 2004

Reporter(s): N. Van Wyck (Stevens Exploration Management Corporation); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Caribou Dome; Denali Copper

Site type: Prospect

ARDF no.: HE191

Latitude: 63.1385 **Quadrangle:** HE A-1

Longitude: 147.1444

Location description and accuracy:

The Caribou Dome prospect is at an elevation of about 4,500 feet in the Clearwater Mountains on the northwest side of the pass between Windy Creek and the South Fork of Pass Creek. The location is at the massive sulfide outcrop known as Lense 6 or Number 6 and is near the center of section 34, T. 20 S., R. 3 E., of the Fairbanks Meridian.

Commodities:

Main: Cu

Other: Ag, Zn

Ore minerals: Azurite, bornite, chalcocite, chalcopyrite, malachite, native copper, pyrite, sphalerite

Gangue minerals: Calcite, quartz

Geologic description:

The Caribou Dome prospect is near the upper contact of the Nikolai Greenstone, a thick sequence of Upper Triassic marine andesite and basalt, and subordinate clastic and carbonate units (Stevens, 1971; Wilson, and others, 1998). At the prospect, the strata dip up to 80 degrees northwest and strike northeast. About a mile northwest of the prospect, the Nikolai Greenstone is intruded by a strongly fractionated pluton dated by K-Ar methods at 130 to 143 Ma (Smith, 1981).

The prospect consists of delicately-layered to massive beds of chalcopyrite and pyrite in black argillaceous limestone and black calcareous argillite (Stevens, 1971, 2008). The massive, dominantly chalcopyrite beds are up to 12 inches thick and assay up to 12 percent copper. Pyrite commonly occurs as framboids. Minor bornite, chalcocite, and native copper, and sparse sphalerite occur locally. Gossan overlies the sulfide bodies and contains malachite, azurite, chalcocite, and minor chalcopyrite. A prominent gossan consisting of a jet-black earthy residue with relict bedding overlies the highest-grade portions of the sulfide horizons (D. L. Stevens, personal observation). The rocks in this region were regionally metamorphosed to prehnite-pumpellyite facies (Stevens, 1971, 2008), but the very fine-grained sulfide minerals in the deposit were not recrystallized, as shown by chalcopyrite grains as small as 1 micron. Several major northeast-trending, strike-slip faults traverse the area. The most important occurs in the footwall just south of the main sulfide horizon; it is marked by a zone of fault gouge 20 to 50 feet wide. Movement along this fault has developed drag-folds with amplitudes of up to 50 feet in the steeply-dipping sulfide horizon. Northwest-dipping thrust faults were encountered underground on the 4630-level adit. These faults offset the main horizon about 30 feet (Stevens, 1971). Regional mapping also shows a major southeast-dipping thrust fault that strikes northeast.

The main sulfide horizon, on which most of the exploration effort has occurred is up to 400 feet long and 30 feet wide; it extends at least 1,000 feet below the surface outcrop as confirmed by drilling. The sulfide horizons are characterized by pinching and swelling along strike as well as down dip. As one horizon pinches, other horizons may swell. One of the holes of the 2009 drilling had a 7-foot intercept in a new zone of mineralization; the intercept averaged 1.83 percent copper. A 6.8 foot interval in the other hole averaged 0.51 percent copper in what was probably the extension of one of the mineralized horizons. The prospect remains open at depth and along strike both to the northeast and southwest on at least four of the known ore

horizons. The 2010 trenching revealed numerous intervals with greater than 0.5 percent copper, including a one meter interval that contained 8.92 percent copper and many intervals 2 to 7 meters in length that contained over 2 percent copper and up to 27.6 grams of silver per tonne. Seven of the 2011 drill holes cut mineralization (Caribou King Resources, 2011). The best intercept was 3.4 meters with 3.36 percent copper and 5.54 grams of silver per tonne.

This sulfide prospect is interpreted to have formed in a reducing or euxinic marine basin with abundant organic matter and sulfate-reducing bacteria (Stevens, 1971, 2008). Sulfur isotope ratio analyses of the chalcopyrite and pyrite averaged -28.35 permil with a standard deviation range of only 1.01 permil (Stevens, 1971, 2008). These values confirm the biogenic reduction of sea water sulfate to produce the sulfide ion and suggest the possibility of a closed system. The copper was probably derived by weathering of the subaerial copper-rich volcanic rocks adjacent to the marine basin.

Coventry Resources Ltd.’s 2016 program at the sediment-hosted Caribou Dome copper project included 22 drill holes for a total of 6,520 m. Near-surface, high-grade mineralization was extended for greater than 120 meters along strike and to greater than 300 meters depth to the northeast. Coventry better defined the extents of very-high-grade, shallow mineralization and identified an area for a potential starter open-pit mine (Athey and Werdon, 2017).

Alteration:

There is no hydrothermal alteration associated with the sulfide mineralization (Stevens, 1971; Roberts and Stevens, 2015).

Age of mineralization:

Syngenetic in Late Triassic rocks (Stevens, 1971; Wilson, and others, 1998).

Generic deposit model:

Deposit model:

Basaltic Cu (Cox and Singer, 1986; model 23).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

23

Production Status: None

Site Status: Active

Workings/exploration:

The Caribou Dome prospect (formerly the Denali Copper prospect) was discovered by M. A. Kaufman in 1963 while mapping for the State of Alaska Division of Mines and Minerals (Stevens, 2008). It subsequently was staked by prospectors working for Leo Mark Anthony. From 1964 through 1968, exploration consisted of trenching, geologic mapping, geochemical and geophysical surveys, and diamond core drilling.

In 1969, a 1,400-foot-long adit was driven from a portal at an elevation of 4,630 feet (Stevens, 2008). This adit was driven to intersect and follow the drill-indicated trend of the widest known part of the deposit, which was informally called the main horizon. A crosscut was driven into the hanging wall approximately orthogonal to the main ore horizon to provide drill stations to intersect the down-dip extension. Slightly inclined percussion drill holes from this adit tested the adjacent areas out to about 100 feet. Surface diamond drilling tested the other four or five known ore horizons.

In 1970, an 1,800 foot long, minus-15-degree spiral decline was driven to provide drill stations for deep intercepts of the mineralized horizon, and to obtain bulk samples of the deposit. The main horizon has been tested by drilling as deep as 1,000 feet below outcrop. Drill testing of the other ore horizons has rarely been deeper than 300 feet. Bulk samples for metallurgical testing were collected in 1969 and 1970 as part of the underground exploration program. In 1999, Ahtna Resources Ltd. optioned the property; their work included geochemical and geophysical surveys, three core holes, detailed geologic mapping, and additional

metallurgical testing.

The Caribou Dome prospect was acquired by Caribou Copper Resources Ltd. (formerly YOW Capital Management) in 2008 (Caribou Copper Resources, Ltd., 2010). They drilled two holes from the surface in 2009 that totaled 2,038 feet (Caribou Copper Resources Ltd., 2009). In the summer of 2010, they dug 9 trenches and collected numerous samples (Caribou Copper Resources, Ltd., 2010b). In 2011, Caribou King Copper drilled 9 holes from 7 locations to test mineralization found in the 2010 trenching.

In 2014 geologic mapping and sampling was completed for Hatcher Resources Inc. Over 5 days, 18 rock and 27 stream sediment samples were collected on the Caribou Dome prospect (Roberts and Stevens, 2015).

Coventry Resources completed a three-dimensional induced polarization (3DIP) geophysical survey and diamond drilling at Caribou Dome in 2015. The 3DIP survey covered 1500 meters along strike of mineralization and found a strong, continuous 500 meter long anomaly coinciding with known mineralization (Coventry Resources, 2015a). Over ten drill holes were completed in order to verify historic drill results and to target under-explored targets. Initial drill assay highlights include 10.1 meters with 7.1 percent copper and 12.2 meters with 3.2 percent copper (Coventry Resources, 2015b).

Coventry Resources Ltd.’s 2016 program at the sediment-hosted Caribou Dome copper project included 22 drill holes for a total of 6,520 m. Near-surface, high-grade mineralization was extended for greater than 120 meters along strike and to greater than 300 meters depth to the northeast. Coventry better defined the extents of very-high-grade, shallow mineralization and identified an area for a potential starter open-pit mine. Coventry delineated multiple new high-priority induced-potential targets over 7 kilometers of strike. Soil sampling defined a new, 5-kilometer-long, copper-in-soil anomaly at the Senator prospect, located 11 kilometers from the Caribou Dome deposit, and follow-up rock-chip sampling revealed sediment-hosted copper mineralization with assays up to 12.1 percent copper. Coventry also conducted a metallurgy test for Lense 4/5/6 and Lense 7/8, which indicates greater than 99 percent recoveries; concentrates grading greater than 27.4 percent Cu were achieved. An economic assessment and scoping study are scheduled for completion in early 2017 (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

R.H. Seraphim (unpublished report, 1970, cited in Stevens, 2008) estimated the drill-indicated reserves of the main horizon as 550,000 tons that contain an average of 5.84 percent copper, 0.3 ounce of silver per ton, and a trace of gold.

Additional comments:

References:

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Caribou Copper Resources, 2010b, Results from trenching program: http://www.cariboucopper.com/newsitem.cfm?ID=17 (News release, August 5, 2010).

Caribou King Resources, 2011, Caribou cuts 3.4 meters pf 3.36% Cu and 5.54 g/t Ag from 2011 drilling at the Caribou Dome Project, Alaska; exploration to continue: http://www.caribouking.com/index.php?page=news&article=1097 (News release, October 20, 2011).

Coventry Resources, 2015a, Immediate drilling success at the Caribou Dome Copper Project: http:

//coventryres.com/editor/articles/getfile.php?productindex=567&mode=1 (News release on July 21, 2015, as of August 3, 2015).

Coventry Resources, 2015b, 10.1 metres @ 7.1% copper in the first new holes drilled at the Caribou Dome Project: http://coventryres.com/editor/articles/getfile.php?productindex=568&mode=1 (News release on July 29, 2015, as of August 3, 2015).

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Smith, T.E., 1981, Geology of the Clearwater Mountains, south-central Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 60, 72 p., 3 sheets, scale 1:63,360. http://dggs.alaska.gov/pubs/id/406

Stevens, D.L, 1971, Geology and geochemistry of the Denali Prospect, Clearwater Mountains, Alaska: Fairbanks, University of Alaska, Ph.D. dissertation, 81 p.

Stevens, D.L., 2008, Caribou Dome copper prospect, Clearwater Mountains, south-central Alaska: Technical report for YOW Capital Corporation, 64 p.

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000. http://pubs.usgs.gov/of/1998/of98-133-a/

Primary Reference: Roberts and Stevens, 2015

Reporter(s): D.L. Stevens (Stevens Exploration Management Corporation); D.J. Grybeck (Contractor, USGS); N.V. King (Alaska Earth Sciences); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Gold Hill; Accident

Site type: Prospect

ARDF no.: HE209

Latitude: 63.1902 **Quadrangle:** HE A-1

Longitude: 147.2809

Location description and accuracy:

The Gold Hill prospect is at an elevation of about 4,800 feet, just west of the summit of Gold Hill between Lucky Gulch and White Creek. It is about 0.4 mile south of the center of section 12, T. 20 S., R. 3 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Fe, Pb, Sb, Zn

Other:

Ore minerals: Arsenopyrite, chalcopyrite, galena, gold, pyrite, pyrrhotite, sphalerite, stibnite

Gangue minerals: Ankerite, quartz

Geologic description:

The Gold Hill prospect is one of four deposits that was explored by CanAlaska Resources Ltd. from 1983 to at least 1996 in the Rainbow Hill project. It and the nearby Lucky Top (HE210), Lucky Saddle (HE215), and TMC (HE211) prospects share a similar origin and general characteristics. The Rainbow Hill project is described in considerable detail by Adams (1996) and Freeman (2002) and most of what follows is based on their work.

The rocks in the area consist of folded Jurassic to Cretaceous argillite, graywacke, siltstone, and mafic tuff that were intruded by small stocks and dikes of Tertiary and Cretaceous gabbro and diorite. The rocks underwent lower-greenschist- to amphibolite-grade metamorphism in the Cretaceous and early Tertiary. Airborne geophysical data suggest that the Gold Hill/Lucky Top area that roughly coincides with the Rainbow project is underlain by a shallow, structurally deformed meta-igneous complex. The regional structure is dominated by a set of east-trending thrust faults and cross-cutting high-angle faults. A set of northwest-trending, high-angle faults and dikes associated with the mineralization is offset by northwest- and northeast-trending faults.

The mineralization in the Rainbow project consists of zones of stacked, sulfide-bearing, ankerite-quartz veins and stockworks that strike east and dip variably to the north and south. The sulfides in the veins and stockworks are mainly pyrite and arsenopyrite; minor amounts of pyrrhotite, chalcopyrite, galena, stibnite, and sphalerite occur widely, as does visible gold. Abundant sulfides usually indicates high gold values. The auriferous zones typically have a central area of intense silicification, sericitization, and carbonatization, that weakens outward. Sericite from the veins has been dated at 57.6 to 63.1 Ma by argon-argon methods.

Although there had been some earlier work on the gold veins in the Gold Hill/Lucky Top area (Moffit, 1912; Ross, 1933; Tuck, 1938), the first extensive exploration in the area was in 1983 when CanAlaska began a program of surface mapping, outcrop sampling, soil geochemical surveys, trenching, and ground geophysical surveys. The work identified numerous zones of hornfels alteration and diorite dikes. In 1996, they drilled 5 holes totaling 1,400 feet on the Gold Hill prospect. The drilling intersected numerous diorite dikes and breccia zones. Most of the holes ware in pervasive sericite-carbonate-quartz and tourmaline alteration; numerous sections of the holes intersected persistent anomalous gold values up to 1,950 parts per billion. The drilling did not penetrate the Gold Hill diorite stock which is exposed on the surface less than

1,000 feet west of the drill sites; the stock was considered an attractive target.

Alteration:

The mineralization is associated with pervasive sericite-carbonate-quartz alteration; local hornfelsing and tourmalinization.

Age of mineralization:

About 60 Ma based on the age of sericite from the quartz veins.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

Although there had been some earlier work on the gold veins in the Gold Hill/Lucky Top area (Moffit, 1912; Ross, 1933; Tuck, 1938), the first extensive exploration in the area was in 1983, when CanAlaska began surface mapping, sampling, and trenching. In 1996, they drilled 5 holes totaling 1,400 feet on the Gold Hill prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Adams, D.D., 1996, A report on the Rainbox Hill claims: Unpublished Technical Report for CanAlaska Uranium Ltd., 72 p. (posted on www.sedar.com, May 6, 2008).

Freeman, Curtis, 2002, Addendum to the report prepared by David D. Adams on the Rainbox Hill property: Unpublished Technical Report for CanAlaska Uranium Ltd., 8 p. (posted on www.sedar.com, May 6, 2008).

Moffit, F.H., 1912, Headwater regions of Gulkana and Susitna Rivers, Alaska: U.S. Geological Survey Bulletin 498, 82 p.

Ross, C.P., 1933, The Valdez Creek mining district, Alaska: U.S. Geological Survey Bulletin 849-E, p. 289-333.

Smith, T.E., 1981, Geology of the Clearwater Mountains, southcentral Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 60, 72 p., 3 sheets, scale 1:63,360.

Tuck, Ralph, 1938, The Valdez Creek mining district, Alaska, in 1936: U.S. Geological Survey Bulletin

897-B, p. 109-131.

Primary Reference: Adams, 1996

Reporter(s): D.L. Stevens (Stevens Exploration Management Corporation), D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Lucky Top

Site type: Prospect

ARDF no.: HE210

Latitude: 63.1889

Quadrangle: HE A-1

Longitude: 147.2498

Location description and accuracy:

The Lucky Top prospect is at an elevation of about 5,000 feet about 0.2 mile northwest of the top of Lucky Hill. It is about 0.5 mile south-southwest of the center of section 7, T. 20 S., R. 3 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Fe, Pb, Sb, Zn

Other:

Ore minerals: Arsenopyrite, chalcopyrite, galena, gold, pyrite, pyrrhotite, stibnite, sphalerite

Gangue minerals: Ankerite, quartz

Geologic description:

The Lucky Top prospect is one of four deposits that was explored by CanAlaska Resources Ltd. from 1983 to at least 1996 as the Rainbow Hill project. It and the nearby Gold Hill (HE209) Lucky Saddle (HE215), and TMC (HE211) prospects share a similar origin and general characteristics. The Rainbow Hill project is described in considerable detail by Adams (1996) and Freeman (2002) and most of what follows is based on their work.

The rocks in the area consist of folded Jurassic to Cretaceous argillite, graywacke, siltstone, and mafic tuff that were intruded by Tertiary and Cretaceous gabbro and diorite in small stocks and dikes (Smith, 1981). The rocks underwent lower-greenschist- to amphibolite-grade metamorphism in the Cretaceous and early Tertiary. The airborne geophysical data suggest that the Gold Hill/Lucky Top area that roughly coincides with the Rainbow Hill project is underlain by a shallow, structurally deformed meta-igneous complex. The regional structure is dominated by a set of east-trending thrust faults and cross-cutting high-angle faults. A set of northwest trending, high-angle faults and dikes associated with the mineralization is offset by northwest- and northeast-trending faults.

The mineralization in the Rainbow Hill project consists of zones of stacked sulfide-bearing, ankerite-quartz veins and stockworks that strike east and dip variably to the north and south. The sulfides in the veins and stockworks are mainly pyrite and arsenopyrite; minor amounts of pyrrhotite, chalcopyrite, galena, stibnite, and sphalerite occur widely as does visible gold. Abundant sulfides usually indicate high gold values. The auriferous zones typically have a central area of intense silicification, sericitization, and carbonatization, that weakens outward. Sericite from the veins has been dated at 57.6 to 63.1 Ma by argon-argon methods.

Although there had been some earlier work on the gold veins in the Gold Hill/Lucky Top area (Moffit, 1912; Ross, 1933; Tuck, 1938), the first extensive exploration in the area was in 1983 when CanAlaska began a program of surface mapping, outcrop sampling, soil geochemical surveys, trenching, and ground geophysical surveys.

The mineralization at the Lucky Top prospect consists of tourmaline-carbonate-quartz breccia with sparse sulfides; it is near the contact of a metamorphosed diorite intrusion. Grab samples from an old dump contained up to 0.11 ounce of gold per ton.

Alteration:

Age of mineralization:

About 60 Ma based on the age of sericite from the quartz veins.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

There was some early work on on the gold veins in the Gold Hill/Lucky Top area, notably a short adit on the Lucky Top prospect (Moffit, 1912; Ross, 1933; Tuck, 1938). But the first extensive exploration in the area was in 1983 when CanAlaska began a program of surface mapping, outcrop sampling, soil geochemical surveys, trenching, and ground geophysical surveys. Some surface work was done on the Lucky Top prospect but no drilling.

Production notes:

None.

Reserves:

None.

Additional comments:

This vein is the probable source area of the placer gold and large nuggets in Lucky Gulch (HE207) below it.

References:

Adams, D.D., 1996, A report on the Rainbox Hill claims: Unpublished Technical Report for CanAlaska Uranium Ltd., 72 p. (posted on www.sedar.com, May 6, 2008)

Clark, A.L., and Cobb, E.H., 1972, Metallic mineral resources map of the Healy quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-394, 1 sheet, scale 1:250,000.

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Ross, C.P., 1933, The Valdez Creek mining district, Alaska: U.S. Geological Survey Bulletin 849-E, p. 289-333.

Smith, T.E., 1981, Geology of the Clearwater Mountains, southcentral Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 60, 72 p., 3 sheets, scale 1:63,360.

Tuck, Ralph, 1938, The Valdez Creek mining district, Alaska, in 1936: U.S. Geological Survey Bulletin 897-B, p. 109-131.

Wiltse, M.A., and Reger, R.D., 1989, Geologic map of Gold Hill and Lucky Hill, Valdez Creek mining district, Healy A-1 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Public-Data File 89-5, scale 1:12,000, 1 sheet.

Primary Reference: Adams, 1996

Reporter(s): D.L. Stevens (Stevens Exploration Management Corporation), D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): TMC

Site type: Prospect

ARDF no.: HE211

Latitude: 63.1786 **Quadrangle:** HE A-1

Longitude: 147.2483

Location description and accuracy:

This prospect is about 0.5 mile south of the top of Lucky Hill between Roosevelt Creek and White Creek south of upper Valdez Creek.. The prospect is about 0.2 mile south of the center of section 18, T. 20 S., R. 3 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Fe, Pb, Sb, Zn

Other:

Ore minerals:

Gangue minerals: Ankerite, quartz

Geologic description:

The TMC prospect is one of four deposits that was explored by CanAlaska Resources Ltd. from 1983 to at least 1996 as the Rainbow Hill project. It and the nearby Gold Hill (HE209), Lucky Top (HE210), and Lucky Saddle (HE215) prospects share a similar origin and general characteristics. The Rainbow Hill project is described in considerable detail by Adams (1996) and Freeman (2002) and most of what follows is based on their work.

The rocks in the area consist of folded Jurassic to Cretaceous argillite, graywacke, siltstone, and mafic tuff that were intruded by small stocks and dikes of Tertiary and Cretaceous gabbro and diorite. The rocks underwent lower-greenschist- to amphibolite-grade metamorphism in the Cretaceous and early Tertiary. Airborne geophysical data suggest that the Gold Hill/Lucky Top area that roughly coincides with the Rainbow project is underlain by a shallow, structurally deformed meta-igneous complex. The regional structure is dominated by a set of east-trending thrust faults and cross-cutting high-angle faults. A set of northwest-trending, high-angle faults and dikes associated with the mineralization is offset by northwest- and northeast-trending faults.

The mineralization in the Rainbow project consists of zones of stacked, sulfide-bearing, ankerite-quartz veins and stockworks that strike east and dip variably to the north and south. The sulfides in the veins and stockworks are mainly pyrite and arsenopyrite; minor amounts of pyrrhotite, chalcopyrite, galena, stibnite, and sphalerite occur widely, as does visible gold. Abundant sulfides usually indicate high gold values. The auriferous zones typically have a central area of intense silicification, sericitization, and carbonatization, that weakens outward. Sericite from the veins has been dated at 57.6 to 63.1 Ma by argon-argon methods.

Although there had been some earlier work on the gold veins in the Gold Hill/Lucky Top area (Moffit, 1912; Ross, 1933; Tuck, 1938), the first extensive exploration in the area was in 1983 when CanAlaska began a program of surface mapping, outcrop sampling, soil geochemical surveys, trenching, and ground geophysical surveys. The TMC zone was discovered a few years later. In 1989, CanAlaska drilled 7 holes on it that totaled 1,507 feet, and in 1990 they drilled 45 holes that totaled 14,772 feet. The drilling defined a series of stacked gold-bearing zones that were intersected over a vertical distance 600 feet. The drilling indicated that the mineralization continued along strike for about 1,000 feet, to a depth of 200 feet. They estimated that the total 'drill-inferred gold resource in 5 blocks of the TMC zone contained an estimated 90,285 ounces of gold with an average grade of 0.21 ounce of gold per ton' (at a cut-off grade of 0.03 ounce

of gold per ton). The average true width of the mineralization is 17 feet; segments up to 70 feet in length averaged 0.475 ounce of gold per ton. Geophysical evidence suggests that the mineralization continues for another 1,000 feet along strike and at least 500 feet down dip.

Alteration:

The mineralization is associate with pervasive sericite-carbonate-quartz alteration; local hornfelsing and tourmalinization.

Age of mineralization:

About 60 Ma based on the age of sericite from the quartz veins.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

Although there had been some earlier work on the gold veins in the Gold Hill/Lucky Top area (Moffit, 1912; Ross, 1933; Tuck, 1938), the first extensive exploration in the area was in 1983 when CanAlaska began a program of surface mapping, outcrop sampling, soil geochemical surveys, trenching, and ground geophysical surveys. The TMC zone was discovered a few years later. In 1989, they drilled 7 holes on it that totaled 1507 feet; in 1990, they drilled 45 holes that totaled 14,772 feet.

Production notes:

None.

Reserves:

Based on 52 drill holes and considerable surface exploration, CanAlaska estimated that the total 'drill-inferred gold resource in 5 blocks of the TMC zone contained an estimated 90,285 ounces of gold with an average grade of 0.21 ounce of gold per ton' (at a cut-off grade of 0.03 ounce of gold per ton. The average true width of the mineralization is 17 feet; segments up to 70 feet long averaged 0.475 ounce of gold per ton.

Additional comments:

References:

Adams, D.D., 1996, A report on the Rainbox Hill claims: Unpublished Technical Report for CanAlaska Uranium Ltd., 72 p. (posted on www.sedar.com, May 6, 2008)

Freeman, Curtis, 2002, Addendum to the report prepared by David D. Adams on the Rainbox Hill property: Unpublished Technical Report for CanAlaska Uranium Ltd., 8 p. (posted on www.sedar.com, May 6, 2008)

Moffit, F.H., 1912, Headwater regions of Gulkana and Susitna Rivers, Alaska: U.S. Geological Survey Bulletin 498, 82 p.

Ross, C.P., 1933, The Valdez Creek mining district, Alaska: U.S. Geological Survey Bulletin 849-E, p.

289-333.

Smith, T.E., 1981, Geology of the Clearwater Mountains, southcentral Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 60, 72 p., 3 sheets, scale 1:63,360.

Tuck, Ralph, 1938, The Valdez Creek mining district, Alaska, in 1936: U.S. Geological Survey Bulletin 897-B, p. 109-131.

Wiltse, M.A., and Reger, R.D., 1989, Geologic map of Gold Hill and Lucky Hill, Valdez Creek mining district, Healy A-1 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Public-Data File 89-5, scale 1:12,000, 1 sheet.

Primary Reference: Adams, 1996

Reporter(s): D.L. Stevens (Stevens Exploration Management Corporation), D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Lucky Saddle

Site type: Prospect

ARDF no.: HE215

Latitude: 63.1827 **Quadrangle:** HE A-1

Longitude: 147.2476

Location description and accuracy:

The Lucky Saddle prospect is about 0.3 mile south of the top of Lucky Hill between Roosevelt Creek and White Creek. It is about 0.2 mile north-north west of the center of section 18, T. 20 S., R. 3 E. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Fe, Hg, Pb, Sb, Zn

Other:

Ore minerals: Arsenopyrite, chalcopyrite, galena, gold, pyrite, pyrrhotite, sphalerite, stibnite

Gangue minerals: Ankerite, quartz

Geologic description:

The Lucky Saddle prospect is one of four deposits that was explored by CanAlaska Resources Ltd. from 1983 to at least 1996 as the Rainbow Hill project. It and the nearby Gold Hill (HE209), Lucky Top (HE210), and TMC (HE211) prospects share a similar origin and general characteristics. The Rainbow Hill project is described in considerable detail by Adams (1996) and Freeman (2002); most of what follows is based on their work.

The rocks in the area consist of Jurassic to Cretaceous, argillite, graywacke, siltstone, and mafic tuff intruded by small stocks and dikes of Tertiary and Cretaceous gabbro and diorite (Smith, 1981). The rocks were subject to lower-greenschist-grade to amphibolite-grade metamorphism in the Cretaceous and early Tertiary. Airborne geophysical data suggest that the Gold Hill/Lucky Top area that roughly coincides with the Rainbow project is underlain by a shallow, structurally deformed, metamorphosed igneous complex. The regional structure is dominated by a set of east-west trending thrust faults and by cross-cutting high-angle faults. A set of northwest trending, high-angle faults and dikes associated with the mineralization is offset by northwest- and northeast-trending faults.

The mineralization in the Rainbow Hill area consists of zones of stacked sulfide-bearing, ankerite-quartz veins and stockworks that strike east and dip variably to the north and south. The sulfides in the veins and stockworks are mainly pyrite and arsenopyrite; minor amounts of pyrrhotite, chalcopyrite, galena, stibnite, and sphalerite occur widely, as does visible gold. Abundant sulfides usually indicate high gold values. The auriferous zones typically have a central area of intense silicification, sericitization, and carbonatization that weakens outward. Sericite from the veins has been dated at 57.6 to 63.1 Ma by argon-argon methods.

Although there had been some earlier work on the gold veins in the Gold Hill/Lucky Top area (Moffit, 1912; Ross, 1933; Tuck, 1938), the first intensive exploration in the area began in 1983 when CanAlaska began a program of surface mapping, outcrop sampling, soil geochemical surveys, trenching, and ground geophysical surveys. The work resulted in the discovery of the Lucky Saddle prospect on a northeast-trending soil anomaly in gold, about 3,400 feet long and 800 feet wide. Trenches dug across the prospect in 1989 exposed metamorphosed hornfels and diorite dikes cut by a shear zone about 200 feet wide. Chip samples in the trenches contained 0.415 ounce of gold per ton across 5 feet and 0.05 ounce of gold per ton across 20 feet. The samples were also highly anomalous in arsenic, lead, and zinc, and contained some antimony, silver, and mercury.

Alteration:

Age of mineralization:

About 60 Ma based on the age of sericite from the quartz veins.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

Although there had been some earlier work on the gold veins in the Gold Hill/Lucky Top area (Moffit, 1912; Ross, 1933; Tuck, 1938), the first extensive exploration in the area started in 1983 with a program of surface mapping, outcrop sampling, soil geochemical surveys, trenching, and ground geophysical surveys by CanAlaska. The work resulted in the discovery of the Lucky Saddle prospect on a northeast-trending soil anomaly in gold. Several trenches were dug on the mineralization in 1989.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Adams, D.D., 1996, A report on the Rainbox Hill claims: Unpublished Technical Report for CanAlaska Uranium Ltd., 72 p. (posted on www.sedar.com, May 6, 2008)

Freeman, Curtis, 2002, Addendum to the report prepared by David D. Adams on the Rainbox Hill property: Unpublished Technical Report for CanAlaska Uranium Ltd., 8 p. (posted on www.sedar.com, May 6, 2008)

Moffit, F.H., 1912, Headwater regions of Gulkana and Susitna Rivers, Alaska: U.S. Geological Survey Bulletin 498, 82 p.

Ross, C.P., 1933, The Valdez Creek mining district, Alaska: U.S. Geological Survey Bulletin 849-E, p. 289-333.

Smith, T.E., 1981, Geology of the Clearwater Mountains, southcentral Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 60, 72 p., 3 sheets, scale 1:63,360.

Tuck, Ralph, 1938, The Valdez Creek mining district, Alaska, in 1936: U.S. Geological Survey Bulletin 897-B, p. 109-131.

Primary Reference: Adams, 1996

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Cohio

Site type: Prospect

ARDF no.: HE216

Latitude: 63.1304 **Quadrangle:** HE A-6

Longitude: 149.7626

Location description and accuracy:

The Cohio prospect is along the ridge about 1.3 miles north of VABM 5048 'Copeland' and and about 5.5 miles north-northwest of the junction of Copeland Creek and Ohio Creek. It is about 0.5 mile north of the center of section 1, T.21 S., R. 12 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

The Cohio prospect was found by Hidefield Gold PLC in 2006 (Alix Resources Corp., 2011). Three consecutive grab samples collected along 1 kilometer of the ridge contained 9.7, 15.0, and 111 parts per million gold. The rocks along the ridge in the prospect area are part of a northeast-trending band of Devonian andesitic tuffs and flows that interfinger with several long lenses of serpentine and silica-carbonate rock of unknown age (Kerr and Loveday, 2011).

Alteration:

Not noted.

Age of mineralization:

Little basis to assign; however Alix (2011) suggests that this mineralization here may be the extension of the belt of deposits that extend northeast to the Golden Zone Mine (HE043) where the mineralization is 65-70 Ma.

Generic deposit model:

Deposit model:

Insufficient evidence to assign.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Only a few samples collected at the surface.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Alix Resources Corp., 2011, Golden Zone, Alaska (Gold): http://www.alixresources.com/index.php?page=project&project=6 (as of Feb. 17, 2012)

Kerr, S.R., and Loveday, Derek, 2011, Technical report, Golden Zone property, Alaska, USA: Technical report for Alix Resources Corporation, 115 p. (posted on www.sedar.com, Jan 18, 2011).

Primary Reference: Alix Resources Corp., 2011

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Salmon River

Site type: Mine

ARDF no.: HG012

Latitude: 58.9205 **Quadrangle:** HG D-6

Longitude: 161.715

Location description and accuracy:

This placer mine is along the Salmon River, which is the main drainage on the east side of Red Mountain. Its mouth is on Kuskokwim Bay is about 10 miles south of the community of Platinum. Dredge mining took place from the mouth of Boulder Creek (HG026), downstream for about five miles to within 11/4 mile of the mouth of the river. The map site is at the approximate midpoint of the dredge tailings near the center of section 36, T. 14 S, R. 75 W.

Commodities:

Main: Au, PGE

Other: Cr, diamond, Hg

Ore minerals: Chromite, cinnabar, diamond, gold, ilmenite, iron-platinum alloy with 8 to 30 percent Fe, iron-platinum alloy with minor osmiridium inclusions, magnetite, mercury, osmiridium, sperrylite, tetraferroplatinum

Gangue minerals:

Geologic description:

This placer mine is located in the present valley of Salmon River. Dredge mining took place from the mouth of Boulder Creek (HG026), a west tributary, downstream about five miles to within 11/4 mile of the mouth of the river. The dredge tailings commonly are a few hundred feet wide and confined to the active drainage. The pay streak was 300 to 450 feet wide, except near the mouth of Platinum Creek (HG014) where it was up to 600 feet wide (Mertie, 1969). Overburden gravel, sand, and silt deposits vary from 30 to 80 feet thick and do not change systematically in thickness. The gravels are mostly well-rounded pebbles and cobbles up to 2 feet across interbedded with sand and silt; clay is not present. The pay is on an uneven, non-weathered bedrock surface that is locally incised up to 20 feet; in the overlying 2 feet of gravels; and in 2 feet of fractured bedrock. The tenor of the worked pay streak was 0.002 to 0.026 ounce of platinum group metals (PGM) per cubic yard (Fechner, 1988). PGM grains become smaller southward through the Salmon-River pay streak, from 0.2 to less than 0.002 inch in diameter. Four samples of tailings from this mine contained up to 0.0037 ounce of PGM per cubic yard (Fechner, 1988, p. 190, 193). PGM grains from Salmon River valley and bench tailings contain 0.6 to 1.1 percent rhenium, 0.4 to 0.7 percent ruthenium, 60.3 to 85.5 percent platinum, 3.8 to 25.6 percent iridium, 1.2 to 6.3 percent osmium, and 5.9 to 8.9 percent iron (Fechner, 1988). The PGM-bearing phases identified in these samples included iron-platinum alloy containing 8 to 30 percent iron; iron-platinum alloy with minor osmiridium inclusions; and osmiridium, sperrylite, and tetraferroplatinum (Fechner, 1988). Small amounts of cinnabar and traces of native mercury have been identified in dredge concentrates (Mertie, 1976). Two small diamonds were identified in the nondissolved residue from 8 PGM granules (Mertie, 1976). The Salmon River placer is continuous with the placer in Platinum Creek (HG014) and with the placers in some of its other west tributaries. The pay streak apparently ends or becomes uneconomic at the south end of the mine workings. The workings there are all below 150 feet in elevation and their proximity to the coastline and low elevation suggests that Quaternary sea level changes could have influenced placer development.

XP Platinum Ltd. purchased the property which consisted of 1,531 Federal placer mining claims and 42

Federal lode mining claims in 2007 and by 2008 all permits had been approved to begin mining (Amarant Mining, 2011, 2012). In 2009, XP Platinum Ltd. began a sampling program of the tailings. Watts, Griffis, and McQuat collected samples with a 10-inch drill and operated a 300-ton-per-hour processing plant from July to October (Szumigala and others, 2010). In 2011, a recovery plant with a single production line capable of producing 1,700 ounces of platinum group metals (per season?) was in operation and produced an unstated but probably substantial amount of PGMs. As of November, 2011, Amarant Mining Ltd. has taken control of XP Platinum by ownership of more than 50 percent of its stock (Amarant Mining, 2011, 2012).

Amarant Mining (2011, 2012) estimates the resources of their ground on the Salmon River and its tributaries as 65 million of material with an average grade of 0.0258 ounce of PGM per ton, i.e, 1,677,000 ounces of PGM. About 45 million tons of the resources are in the old dredge tailings; the other 20 million tons are in virgin ground.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

PGM-gold placer (Cox and Singer, 1986; model 39b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39b

Production Status: Yes; medium

Site Status: Active

Workings/exploration:

The Salmon River valley paystreak was worked by dredge starting in 1937, and several parallel channels that total about 15 to 20 miles of workings up to 60 feet deep have been made. Considerable exploration drilling was completed to delineate the paystreak. In 2009, XP Platinum Ltd. began a sampling program of the tailings. Watts, Griffis, and McOuat collected samples with a 10-inch drill and operated a 300-ton-per-hour processing plant from July to October (Szumigala and others, 2010). In 2011, a recovery plant with a single production line capable of producing 1,700 ounces of platinum group metals (per season?) was in operation and produced an unstated but probably substantial amount of PGMs.

Production notes:

A large part of the 650,000 ounces of PGM and 15,600 ounces of Au produced from the Salmon River area was recovered from the Salmon River. In 2009, XP Platinum Ltd. began a sampling program of the tailings. Watts, Griffis, and McQuat collected samples with a 10-inches drill and operated a 300-ton-per-hour processing plant from July to October. An unknown amount of platinum-group metals was recovered. In 2011, a recovery plant with a single production line capable of producing 1,700 ounces of platinum group metals was in operation and produced an unstated but probably substantial amount of PGMs.

Reserves:

Fechner (1988) concluded that since the dredge recovered only about 60 percent of the PGMs that went through it, the mine tailings were a low-grade resource. He estimated that over 40 million cubic yards of tailings were present that could contain 0.0013 to 0.017 ounce of PGM per cubic yard.

Amarant Mining (2011, 2012) estimates the resources of their ground on the Salmon River and its tributaries as 65 million of material with an average grade of 0.0258 ounce of PGM per ton, i.e, 1,677,000

ounces of PGM. About 45 million tons of the resources are in the old dredge tailings; the other 20 million tons are in virgin ground.

Additional comments:

References:

Amarant Mining, 2011, Corporate presentation (December 2011): http://www.amarantmining.com/uploads/9/2/3/2/9232883/amarant_mining_corporate_presentation_dec_2011_reduced.pdf

Amarant Mining, 2012, XS Platinum: http://www.amarantmining.com/xs-platinum.html (as of Feb 23, 2012).

Cobb, E.H., 1972, Metallic mineral resources map of the Hagemeister Island quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-362, 1 sheet, scale 1:250,000.

Cobb, E.H., 1980, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in fifteen quadrangles in southwestern and west-central Alaska: U.S. Geological Survey Open-File Report 80-909, 103 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Fechner, S.A., 1988, Bureau of Mines mineral investigation of the Goodnews Bay mining district, Alaska: U.S. Bureau of Mines Open-File Report 1-88, 230 p., 3 sheets.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Mertie, J.B., Jr., 1969, Economic geology of platinum minerals: U.S. Geological Survey Professional Paper 630, 120 p.

Mertie, J.B., Jr., 1976, Platinum deposits in the Goodnews Bay district, Alaska: U.S. Geological Survey Professional Paper 938, 42 p.

Szumigala, D.J., Harbo, L.A., and Hughes, R.A., 2010, Alaska's mineral industry 2009: Alaska Division of

Primary Reference: Amarant, 2012

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Suzie Mountain

Site type: Prospect

ARDF no.: HG016

Latitude: 58.96 **Quadrangle:** HG D-5

Longitude: 161.652

Location description and accuracy:

This prospect is on the west ridge of Suzie Mountain and along the west side of Suzie Creek. The site is on the ridge crest at an elevation of about 900 feet and about 3.5 miles northeast of Goodnews Mining Camp. It is in the NE1/4 of section 20, T. 14 S., R. 74 W., of the Seward Meridian. The prospect is accurately located. Cobb's locality number 2 (1972 [MF 362]; 1980 [OF 80-909]) appears to be at this location.

Commodities:

Main: Pt

Other: Cu

Ore minerals:

Gangue minerals:

Geologic description:

This prospect is on the west ridge of the Suzie Mountain ultramafic complex, a composite dunite, peridotite, and clinopyroxenite pluton that is inferred to be Jurassic in age (Hoare and Coonrad, 1978; Alaska Earth Sciences, 2000). A geochemical survey in the area of this prospect in 2000 defined 700-meter-long and up to 100-meter-wide soil anomaly that averages 130 parts per billion platinum; the maximum platinum value in the anomaly is 345 ppb Pt (Alaska Earth Sciences, 2000). The anomaly extends northwest from Suzie Creek across the ridge crest at this locality.

In 2004, the Calista Corporation did extensive rock and soil sampling over the prospect and did detailed total field , magnetic susceptibility, and resistivity surveys (Calista Corp., 2004). One rock sample contained 2.5 part per million platinum and many of the soil samples were anomalous in platinum. A coherent zone of ore grade mineralization could not be defined at the surface but the data suggest the potential for deeper mineralization.

A. L. Clark (Cobb, 1972; Cobb, 1980) noted that copper minerals had been found at this locality. Alaska Earth Science (2000) noted that in the Salmon River area traces of chalcopyrite, pyrite, or pyrrhotite are common in surface outcrops of hornblende-bearing rocks in marginal parts of the ultramafic complexes.

Alteration:

Age of mineralization:

Jurassic, the inferred age of the ultramafic plutons in the area (Hoare and Coonrad, 1978).

Generic deposit model:

Deposit model:

Alaskan PGE (Cox and Singer, 1986; model 9).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
9

Production Status: None

Site Status: Active

Workings/exploration:
There has been surface soil and rock sampling at this location (Alaska Earth Sciences, 2000). An aeromagnetic survey was flown over the Salmon River area in 1994, a gravity survey has been completed, and some controlled-source audio magneto-telluric lines have been run over selected parts of the ultramafic complexes (Alaska Earth Sciences, 2000). In 2004, the Calista Corporation did extensive rock and soil sampling over the prospect and did detailed total field , magnetic susceptibility, and resistivity surveys.

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Alaska Earth Sciences, 2000, The Goodnews Bay ultramafic complexes: Unpublished data, http://aes.alaska.com/UMAF/FIGURES/page4.html

Calista Corp., 2004, Geochemical and geophysical investigation, southwest ridge of Susie Mountain, Good Bay platinum project:: (http://www.calistacorp.com/docs/reports/2004_Goodnew_Bay_Report.pdf.

Cobb, E.H., 1972, Metallic mineral resources map of the Hagemeister Island quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-362, 1 sheet, scale 1:250,000.

Cobb, E.H., 1980, Summaries of data and lists of references to metallic and selected nonmetallic mineral deposits in fifteen quadrangles in southwestern and west-central Alaska: U.S. Geological Survey Open-File Report 80-909, 103 p.

Hoare, J.M., and Coonrad, W.L., 1978, Geologic map of the Goodnews and Hagemeister Island quadrangles region, southwestern Alaska: U.S. Geological Survey Open-File Report 78-9-B, 2 sheets, scale 1:250,000.

Primary Reference: Alaska Earth Sciences, 2000; this record

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Drenchwater-East

Site type: Prospect

ARDF no.: HW002

Latitude: 68.5694 **Quadrangle:** H C-5

Longitude: 158.6833

Location description and accuracy:

The Drenchwater-East prospect is near the southwest corner of section 15, T. 10 S., R. 29 W., about 3.3 miles southwest of the junction of Wager Creek and Drenchwater Creek. It is part of a belt of similar mineralization that extends for about a mile to the northwest (also see HW003 and HW004).

Commodities:

Main: Pb, Zn

Other: Ag, As, Ba, Cu, Sb

Ore minerals: Barite, galena, marcasite, pyrite, sphalerite

Gangue minerals: Fluorite, quartz

Geologic description:

The Drenchwater deposits were found in 1975 by the U.S. Geological Survey and several comprehensive studies were done by the USGS and the U.S. Bureau of Mines from 1977 to 1992 that included detailed mapping, geochemical and geophysical surveys, and much sampling (Jansons and Baggs,1980; Jansons, 1982; Nokleberg and Winkler, 1978,1982; Kurtak and others, 1995). Anaconda Exploration explored the deposits in 1980 and in 1993 the Arctic Slope Regional Corporation and Kennecott Exploration applied for a permit to drill. The permit was turned down by the Bureau of Land Management because the area was part of the National Petroleum Reserve that is closed to exploration and mining.

The Drenchwater-East deposit is one of three similar deposits that form a belt about 1.2 miles long (see also Drenchwater Creek (HW004) and Drenchwater-West (HW003)). The deposits are in the Drenchwater Fenster, where the Key Creek sequence consists of the Kuna, Siksikpuk, Otuk and Okpkkruak Formations of Mississippian to Cretaceous age. The structure of the area is dominated by a series of south-dipping thrust faults that intensely deformed the rocks. The stratiform mineralization is mostly in carbonaceous shale and silicified mudstone, associated with altered volcanic rocks, mainly submarine felsic tuffs, and lesser mafic volcanics including trachyte, trachyandesite, and basalt. The mineralization is associated with silicification of the shale, mudstone, and volcanic rocks.

There are four types of mineralization: semi-massive; disseminated; layered diagenetic; and breccia-cemented. Sphalerite is the dominant sulfide; variable amounts of pyrite, marcasite, and galena occur; there are rare fluorite and barite; and anomalous silver, arsenic, and antimony show up in assays of the ore. Samples contained up to 23 percent zinc, 5.1 percent lead, 1,150 parts per million (ppm) copper and 15 ppm silver. Biotite from volcanic rocks interbedded with the mineralization has K-Ar ages of 319+10 and 330+17 Ma. A sample of galena has a Pb-isotope model age of 200 Ma. Most of those who have studied the deposits interpret them to be volcanogenic massive-sulfide deposits.

Alteration:

Widespread silicification of shale and volcanic host rocks.

Age of mineralization:

Biotite from volcanic rocks interbedded with the mineralization has K-Ar ages of 319+10 and 330+17 Ma.

A sample of galena has a Pb-isotope model age of 200 Ma.

Generic deposit model:

Deposit model:

Volcanogenic lead-zinc massive sulfide deposit (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Inactive

Workings/exploration:

Several detailed studies of the prospect from 1975 to 1992 by the U.S. Geological Survey and the U.S. Bureau of Mines included geological mapping, geochemical and geophysical surveys, and considerable sampling. Explored by Anaconda Exploration in 1980.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS number 0020200002.

References:

Churkin, M., Jr., Mayfield, C.F., Theobald, P.K., Barton, Harlan, Nokleberg, W.J., Winkler, G.R., and Huie, Carl, 1978, Geological and geochemical appraisal of metallic mineral resources, southern National Petroleum Reserve in Alaska: U.S. Geological Survey Open-File Report 78-70A, 82 p., 6 sheets, scale 1:500,000.

Jansons, Uldis, 1982, Zinc-lead occurrences in and near the National Petroleum Reserve in Alaska: U.S. Bureau of Mines Mineral Land Assessment 121-82, 55 p.

Jansons, Uldis, and Baggs, D.W., 1980, Mineral investigations of the Misheguk Mountain and Howard Pass quadrangles, National Petroleum Reserve, Alaska: U.S. Bureau of Mines Open-File Report 38-80, 76 p.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Mayfield, C.F., Curtis, S.M., Ellersieck, I., and Tailleur, I.L., 1979, The Ginny Creek zinc-lead-silver and Nimiuktuk barite deposits, northwestern Brooks Range, Alaska: U.S. Geological Survey Circular 804-B, p. B11-B12.

Nokleberg, W.J., and Winkler, G.R., 1978, Stratiform zinc-lead mineralization, Drenchwater Creek area, Howard Pass quadrangle, western Brooks Range, Alaska: U.S. Geological Survey Circular 772-B, p. B17-B19.

Nokleberg, W.J., and Winkler, G.R., 1982, Stratiform zinc-lead deposits in the Drenchwater Creek area,

Howard Pass quadrangle, northwestern Brooks Range, Alaska: U.S. Geological Survey Professional Paper 1209, 22 p., 2 plates, scale 1:19,800.

Primary Reference: Nokleberg and Winkler, 1982

Reporter(s): M.T. Powers, D.F. Huber, J.M. Schmidt and J.H. Dover (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Drenchwater-West

Site type: Prospect

ARDF no.: HW003

Latitude: 68.5746 **Quadrangle:** H C-5

Longitude: 158.704

Location description and accuracy:

The Drenchwater-West prospect is near the center of section 16, T. 10 S., R. 29 W., about 3.3 miles southwest of the junction of Wager Creek and Drenchwater Creek.

Commodities:

Main: Pb, Zn

Other: Ag, As, Ba, Cu, Sb

Ore minerals:

Gangue minerals: Fluorite, quartz

Geologic description:

The Drenchwater deposits were found in 1975 by the U.S. Geological Survey and several detailed studies were done by the USGS and the U.S. Bureau of Mines from 1977 to 1992 that included detailed mapping, geochemical and geophysical surveys, and much sampling (Jansons and Baggs, 1980; Jansons, 1982; Nokleberg and Winkler, 1978 and 1982; Kurtak and others, 1995). Anaconda Exploration explored the deposits in 1980 and in 1993 the Arctic Slope Regional Corporation and Kennecott Exploration applied for a permit to drill. The permit was turned down by the Bureau of Land Management because the area was part of the National Petroleum Reserve that is closed to exploration and mining.

The Drenchwater-West deposit is one of three similar deposits that form a belt about 1.2 miles long (see also Drenchwater Creek (HW004) and Drenchwater-East (HW002)). The deposits are in the Drenchwater Fenster where the Key Creek sequence consists of the Kuna, Siksikpuk, Otuk and Okpkkruak Formations of Mississippian to Cretaceous age. The structure of the area is dominated by a series of south-dipping thrust faults that intensely deformed the rocks. The stratiform mineralization is mostly in carbonaceous shale and silicified mudstone, associated with altered volcanic rocks, mainly submarine felsic tuffs, with lesser mafic volcanics including trachyte, trachyandesite, and basalt. The mineralization is associated with silicification of the shale, mudstone, and volcanic rocks.

There are four types of mineralization: semi-massive; disseminated; layered diagenetic; and breccia-cemented. Sphalerite is the dominant sulfide; variable amounts of pyrite, marcasite, and galena occur; there is rare fluorite and barite. Anomalous silver, arsenic, and antimony show up in assays of the ore. Samples contained up to 23 percent zinc, 5.1 percent lead, 1,150 parts per million (ppm) copper and 15 ppm silver. Biotite from volcanic rocks interbedded with the mineralization has K-Ar ages of 319+10 and 330+17 Ma; a sample of galena has a Pb-isotope model age of 200 Ma. Most of those who have studied the deposits interpret them as volcanogenic massive-sulfide deposits.

Alteration:

Age of mineralization:

Biotite from volcanic rocks interbedded with the mineralization has K-Ar ages of 319+10 and 330+17 Ma. A sample of galena has a Pb-isotope model age of 200 Ma.

Generic deposit model:

Deposit model:
Volcanogenic lead-zinc massive sulfide deposit (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
28a

Production Status: None

Site Status: Inactive

Workings/exploration:
Several detailed studies of the prospect from 1975 to 1992 by the U.S. Geological Survey and the U.S. Bureau of Mines included geological mapping, geochemical and geophysical surveys, and considerable sampling. Explored by Anaconda Exploration in 1980.

Production notes:
None.

Reserves:
None.

Additional comments:
MAS number 0020200002.

References:

Churkin, M., Jr., Mayfield, C.F., Theobald, P.K., Barton, Harlan, Nokleberg, W.J., Winkler, G.R., and Huie, Carl, 1978, Geological and geochemical appraisal of metallic mineral resources, southern National Petroleum Reserve in Alaska: U.S. Geological Survey Open-File Report 78-70A, 82 p., 6 sheets, scale 1:500,000.

Jansons, Uldis, 1982, Zinc-lead occurrences in and near the National Petroleum Reserve in Alaska: U.S. Bureau of Mines Mineral Land Assessment 121-82, 55 p.

Jansons, Uldis, and Baggs, D.W., 1980, Mineral investigations of the Misheguk Mountain and Howard Pass quadrangles, National Petroleum Reserve, Alaska: U.S. Bureau of Mines Open-File Report 38-80, 76 p.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Mayfield, C.F., Curtis, S.M., Ellersieck, I., and Tailleur, I.L., 1979, The Ginny Creek zinc-lead-silver and Nimiuktuk barite deposits, northwestern Brooks Range, Alaska: U.S. Geological Survey Circular 804-B, p. B11-B12.

Nokleberg, W.J., and Winkler, G.R., 1978, Stratiform zinc-lead mineralization, Drenchwater Creek area, Howard Pass quadrangle, western Brooks Range, Alaska: U.S. Geological Survey Circular 772-B, p. B17-B19.

Nokleberg, W.J., and Winkler, G.R., 1982, Stratiform zinc-lead deposits in the Drenchwater Creek area, Howard Pass quadrangle, northwestern Brooks Range, Alaska: U.S. Geological Survey Professional Paper 1209, 22 p., 2 plates, scale 1:19,800.

Primary Reference: Nokleberg and Winkler, 1982

Reporter(s): J.H. Dover (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Drenchwater Creek

Site type: Prospect

ARDF no.: HW004

Latitude: 68.5788 **Quadrangle:** H C-5

Longitude: 158.7242

Location description and accuracy:

The Denchwater prospect is exposed along the west bank of Drenchwater Creek about 3.9 miles above the mouth of Wager Creek; it is about 0.6 mile west-northwest of the center of section 16, T. 10 S., R. 29 W.

Commodities:

Main: Pb, Zn

Other: Ag, As, Ba, Cu, Sb

Ore minerals:

Gangue minerals: Fluorite, quartz

Geologic description:

The Drenchwater deposits were found in 1975 by the U.S. Geological Survey and several comprehensive detailed studies were done by the USGS and the U.S. Bureau of Mines from 1977 to 1992 that included detailed mapping, geochemical and geophysical surveys, and much sampling (Jansons and Baggs, 1980; Jansons, 1982; Nokleberg and Winkler, 1978 and 1982; Kurtak and others, 1995). Anaconda Exploration explored the deposits in 1980 and in 1993 the Arctic Slope Regional Corporation and Kennecott Exploration applied for a permit to drill. The permit was turned down by the Bureau of Land Management because the area was part of the National Petroleum Reserve that is closed to exploration and mining.

The Drenchwater deposit is one of three similar deposits that form a belt about 1.2 miles long (see also Drenchwater-West (HW003) and Drenchwater-East (HW002)). The deposits are in the Drenchwater Fenster where the Key Creek sequence consists of the Kuna, Siksikpuk, Otuk and Okpkkruak Formations of Mississippian to Cretaceous age. The structure of the area is dominated by a series of south-dipping thrust faults that intensely deformed the rocks. The stratiform mineralization is mostly in carbonaceous shale and silicified mudstone and associated with altered volcanic rocks, mainly submarine felsic tuffs, with lesser mafic volcanics including trachyte, trachyandesite, and basalt. The mineralization is associated with silicification of the shale, mudstone, and volcanic rocks.

There are four types of mineralization: semi-massive; disseminated; layered diagenetic; and breccia-cemented. Sphalerite is the dominant sulfide; variable amounts of pyrite, marcasite, and galena occur; there is rare fluorite and barite. Anomalous silver, arsenic, and antimony show up in assays of the ore. Samples contain up to 23 percent zinc, 5.1 percent lead, 1,150 parts per million (ppm) copper and 15 ppm silver. Biotite from volcanic rocks interbedded with the mineralization has K-Ar ages of 319+10 and 330+17 Ma. A sample of galena has a Pb-isotope model age of 200 Ma. Most of those who have studied the deposits interpret them as volcanogenic massive-sulfide deposits.

Alteration:

Age of mineralization:

Biotite from volcanic rocks interbedded with the mineralization has K-Ar ages of 319+10 and 330+17 Ma. A sample of galena has a Pb-isotope model age of 200 Ma.

Generic deposit model:

Deposit model:
Volcanogenic lead-zinc massive sulfide deposit (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
28a

Production Status: None

Site Status: Inactive

Workings/exploration:
Several detailed studies of the prospect from 1975 to 1992 by the U.S. Geological Survey and the U.S. Bureau of Mines included geological mapping, geochemical and geophysical surveys, and considerable sampling. Explored by Anaconda Exploration in 1980.

Production notes:
None.

Reserves:
None.

Additional comments:
MAS number 0020200002.

References:

Churkin, M., Jr., Mayfield, C.F., Theobald, P.K., Barton, Harlan, Nokleberg, W.J., Winkler, G.R., and Huie, Carl, 1978, Geological and geochemical appraisal of metallic mineral resources, southern National Petroleum Reserve in Alaska: U.S. Geological Survey Open-File Report 78-70A, 82 p., 6 sheets, scale 1:500,000.

Jansons, Uldis, 1982, Zinc-lead occurrences in and near the National Petroleum Reserve in Alaska: U.S. Bureau of Mines Mineral Land Assessment 121-82, 55 p.

Jansons, Uldis, and Baggs, D.W., 1980, Mineral investigations of the Misheguk Mountain and Howard Pass quadrangles, National Petroleum Reserve, Alaska: U.S. Bureau of Mines Open-File Report 38-80, 76 p.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Mayfield, C.F., Curtis, S.M., Ellersieck, I., and Tailleur, I.L., 1979, The Ginny Creek zinc-lead-silver and Nimiuktuk barite deposits, northwestern Brooks Range, Alaska: U.S. Geological Survey Circular 804-B, p. B11-B12.

Nokleberg, W.J., and Winkler, G.R., 1978, Stratiform zinc-lead mineralization, Drenchwater Creek area, Howard Pass quadrangle, western Brooks Range, Alaska: U.S. Geological Survey Circular 772-B, p. B17-B19.

Nokleberg, W.J., and Winkler, G.R., 1982, Stratiform zinc-lead deposits in the Drenchwater Creek area, Howard Pass quadrangle, northwestern Brooks Range, Alaska: U.S. Geological Survey Professional Paper 1209, 22 p., 2 plates, scale 1:19,800.

Primary Reference: Nokleberg and Winkler, 1982

Reporter(s): J.H. Dover (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Story Creek

Site type: Prospect

ARDF no.: HW015

Latitude: 68.3829 **Quadrangle:** H B-4

Longitude: 157.9374

Location description and accuracy:

The Story Creek prospect is at the head of several, north-flowing tributaries to Story Creek. The most extensive mineralization is about 1.6 miles north of peak 1272 (in meters), about 0.5 mile southwest of the center of section 23, T. 12 S., R. 26 W.

Commodities:

Main: Pb, Zn

Other: Ag, Au, Cu

Ore minerals: Anglesite, barite, cerussite, chalcopyrite, galena, hematite, hydrozincite?, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The Story Creek prospect was found in 1978 by the U.S. Bureau of Mines and was studied by them and the U.S. Geological Survey at various times through 1995 (Ellersieck and others, 1982; Kurtak and others, 1995). Anaconda Minerals, the Arctic Slope Regional Corporation, and Kennecott Exploration explored the deposit from 1980 to 1992. This work included geologic mapping in the area, extensive geochemical and geophysical surveys, and much sampling. The work included beneficiation tests of a bulk sample by the U.S. Bureau of Mines.

The mineralization is largely confined to the Lower Mississippian Isikut Formation, which is overlain by the Mississippian Kayak Shale and underlain by the the Struver Member of the Upper Devonian Kanayut Conglomerate (Ellersieck and others, 1982; Kurtak and others, 1995). The Isikut Formation is thrust over younger rocks and as a result is intensely deformed into an imbricate stack of overturned folds. Numerous minor thrust faults separate the folds. The mineralization occurs as a series of elongate bodies that generally parallel the axes of the folds in the area; the bodies trend about N55E. The bodies vary from 5 to more than 60 meters wide and are irregularly aligned for about 2,000 meters along strike. Most of the mineralization is seen in float and rubblecrop; there is only minor outcrop. The mineralized zones may once have been continuous but have been displaced by northwest-trending high-angle faults. The numerous mineralized bodies are scattered over a east-northeast-trending area about 1,000 meters wide by 2,000 meters long. The largest body is about 400 meters long and about 100 meters wide.

The mineralization occurs as quartz veinlets, banded massive-sulfide veins, and quartz-sulfide breccia. Sphalerite and galena are the dominant ore minerals (Ellersieck and others, 1982; Kurtak and others, 1995). Less abundant are chalcopyrite and pyrite; barite, hematite, cerussite, anglesite, and hydrozincite(?) are present. The mineralization is associated with widespread silicification. The sulfide veins consist mainly of massive sphalerite with lesser galena and quartz. The breccia mineralization generally consists of sphalerite and galena as interstitial cement to the broken host rock; some of the breccia consists of sphalerite clasts rimmed with galena. Open-space-filling textures and the low degree of alteration indicates that the mineralization is epigenetic. Some of the more notable samples include: 1) samples of banded, vein-type mineralization contained 30 percent lead, 696 grams of silver per tonne, 55.6 percent zinc, and 775 parts per billion (ppb) gold; 2) a series of continuous chip samples across 8.5 meters of rubblecrop averaged 14.2 percent zinc, 3.9 percent lead, 159 grams of silver per ton, and 111 ppb gold. Lead isotope analyses of

galena give a late Mississippian model age for the lead of about 310-320 Ma.

In an unpublished report (cited in Kurtak and others, 1995), Kennecott Minerals estimated an indicated resource of 1.05 million tonnes with a grade of 8.1 percent zinc, 12.4 percent lead, and 1,028 grams of silver per ton; they estimated an addition inferred resource of 11 million tonnes. The U.S. Bureau of Mines estimated an inferred resource of 2.9 million tonnes with a grade of 14.2 percent zinc, 3.9 percent lead, and 159 grams of silver per tonne (Kurtak and other, 1995).

Alteration:

Mineralization is accompanied by widespread silicification.

Age of mineralization:

Mississippian or younger based on the age of the host rock and Mississippian based on lead-isotope analyses of galena.

Generic deposit model:

Deposit model:

Epigenetic, sediment-hosted vein and brecciated Pb-Zn-Ag deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

The Story Creek prospect was found in 1978 by the U.S. Bureau of Mines and was studied by them and the U.S. Geological Survey at various times through 1995. Anaconda Minerals, the Arctic Slope Regional Corporation, and Kennecott Exploration explored the deposit from 1980 to 1992. This work included geologic mapping in the area, extensive geochemical and geophysical surveys, and much sampling. The work included beneficiation tests of a bulk sample by the U.S. Bureau of Mines.

Production notes:

None.

Reserves:

In an unpublished report (cited in Kurtak and others, 1995), Kennecott Minerals estimated an indicated resource of 1.05 million tonnes with a grade of 8.1 percent zinc, 12.4 percent lead, and 1,028 grams of silver per tonne; they estimated an additional inferred resource of 11 million tonnes. The U.S. Bureau of Mines estimated an inferred resource of 2.9 million tonnes with a grade of 14.2 percent zinc, 3.9 percent lead, and 159 grams of silver per ton (Kurtak and other, 1995).

Additional comments:

MAS number 0020200022.

References:

Cobb, E.H., Mayfield, C.F., and Brosgé, W.P., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in eleven quadrangles in northern Alaska (Arctic, Baird Mountains, Chandler Lake, DeLong Mountains, Demarcation Point, Howard Pass, Misheguk Mountain, Mount Michelson, Noatak, Point Lay, and Table Mountain); Supplement to Open-File Report 75-628; Part A, Summaries of data to January 1, 1981: U.S. Geological Survey Open-File Report 81-767-A, 25 p.

Ellersieck, I.F., Jansons, Uldis, Mayfield, C.F., and Tailleur, I.L., 1982. The Story Creek and Whoopee Creek lead-zinc-silver occurrences, western Brooks Range, Alaska, in Coonrad, W.L., ed., The United States Geological Survey in Alaska--Accomplishments during 1980: U.S. Geological Survey Circular 844, p. 35-38.

Jansons, Uldis, 1982, Zinc-lead occurrences in and near the National Petroleum Reserve in Alaska: U.S. Bureau of Mines Mineral Land Assessment 121-82, 55 p.

Jansons, Uldis, and Parke, M.A., 1981, 1978 mineral investigations in the Misheguk Mountain and Howard Pass quadrangles: U.S. Bureau of Mines Open-File Report 26-81, 195 p., 1 sheet.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Lueck, L., 1986, Petrologic and geochemical characteristics of the Red Dog and other base-metal sulfide and barite deposits in the De Long Mountains, western Brooks Range, Alaska: University of Alaska, Mineral Industry Research Laboratory Report 71, 105 p.

Mayfield, C.F., Curtis, S.M., Ellersieck, I.F., and Tailleur, I.L., 1979, Reconnaissance geology of the Ginny Creek zinc-lead-silver and Nimiuktuk barite deposits, northwestern Brooks Range, Alaska: U.S. Geological Survey Open-File Report 79-1092, 20 p., 2 sheets.

Meyer, M.P., and Kurtak, J.M., 1992, Results of the 1991 U.S. Bureau of Mines Colville mining district study: U.S. Bureau of Mines Open-File Report 75-92, 101 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): M.T. Powers, D.F. Huber, J.M. Schmidt, and J.H. Dover (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (west end of Koiyaktot Mountain)

Site type: Occurrence

ARDF no.: HW017

Latitude: 68.2169 **Quadrangle:** H A-1

Longitude: 156.2926

Location description and accuracy:

This occurrence is plotted near the center of a north-trending area about 0.7 mile long in the west portion of Koiyaktot Mountain; it is about 4.4 mile northeast of Inyorurak Pass near the center of section 34, T. 33 N., R. 11 E.

Commodities:

Main: Ag, Pb, Zn

Other: Au, Cu

Ore minerals: Galena, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks in the area consist of northwest-trending, southwest-dipping Upper Devonian to Lower Mississippian, Kanayut Conglomerate and Noatak Sandstone that are repeated by thrust faults. Four small, separate zones of mineralization occur along a north-trending zone about 0.7 mile long (Kurtak and others, 1995). The mineralization is in sandstone and consists of quartz-cemented breccia with sphalerite and galena. Samples from one area about 15 meters by 90 meters in size contained 43.9 percent zinc, 3.27 percent lead, and 404 parts per million (ppm) copper. About 950 meters to the north, samples from another area about 15 meters by 152 meters in size contained up to 16.2 percent zinc, 64.4 grams of silver per tonne, and 336 parts per billion gold.

Alteration:

Not noted.

Age of mineralization:

Possibly Mississippian by analogy with other lead-zinc deposits in the western Brooks Range.

Generic deposit model:

Deposit model:

Remobilized, lead-zinc sandstone deposit?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only sampling and mapping by the U.S. Bureau of Mines.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS number 0020200015.

References:

Jansons, Uldis, and Parke, M.A., 1981, 1978 mineral investigations in the Misheguk Mountain and Howard Pass quadrangles: U.S. Bureau of Mines Open-File Report 26-81, 195 p., 1 sheet.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Meyer, M.P., and Kurtak, J.M., 1992, Results of the 1991 U.S. Bureau of Mines Colville mining district study: U.S. Bureau of Mines Open-File Report 75-92, 101 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): J.M. Schmidt; J.H. Dover (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (east end of Koiyaktot Mountain)

Site type: Occurrence

ARDF no.: HW018

Latitude: 68.1891 **Quadrangle:** H A-1

Longitude: 156.1382

Location description and accuracy:

This occurrence is at the east end of Koiyaktot Mountain about 0.9 mile southeast of peak 1302 (in meters). It is near the center of section 9, T. 32 N., R. 12 E.

Commodities:

Main: Ag, Pb, Zn

Other: Cu, Sb

Ore minerals:

Gangue minerals: Quartz

Geologic description:

The rocks in the area are northwest-trending, southwest-dipping Upper Devonian to Lower Mississippian Kanayut Conglomerate and Noatak Sandstone that are repeated by thrust faults. Quartz veins and breccia with sphalerite and galena occur in siltstone of the Noatak Sandstone (Kurtak and others, 1995). The mineralization occurs in float and rubblecrop of unknown extent along a north-trending zone. Samples contained up to 39.9 percent lead, 23.9 percent zinc, 1,404 parts per million (ppm) cadmium, and 1,838 grams of silver per tonne. A breccia sample contained 1,3756 ppm copper and one sample of sphalerite and galena contained more than 2,000 ppm antimony.

Alteration:

Age of mineralization:

Possibly Mississippian by analogy with other lead-zinc deposits in the western Brooks Range.

Generic deposit model:

Deposit model:

Remobilized, lead-zinc sandstone deposit?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only sampling and mapping by the U.S. Bureau of Mines.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS number 0020200014.

References:

Jansons, Uldis, and Parke, M.A., 1981, 1978 mineral investigations in the Misheguk Mountain and Howard Pass quadrangles: U.S. Bureau of Mines Open-File Report 26-81, 195 p., 1 sheet.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Meyer, M.P., and Kurtak, J.M., 1992, Results of the 1991 U.S. Bureau of Mines Colville mining district study: U.S. Bureau of Mines Open-File Report 75-92, 101 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): J.M. Schmidt (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Kivliktort Mountain--West

Site type:

ARDF no.: HW019

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

This is most likely a duplicate of HW020 about a mile to the south. In any event, Kurtak and others (1995) only spot one Kivliktort-West site and that is at HW020.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): J.H. Dover (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (west of Kivliktort Mountain)

Site type: Occurrence

ARDF no.: HW020

Latitude: 68.3002 **Quadrangle:** H B-2

Longitude: 156.6432

Location description and accuracy:

This occurrence is about 3.2 miles west-northwest of the summit of Kivliktort Mountain, near the center of section 31, T. 34 N., R. 10 E.

Commodities:

Main: Ag, Pb, Zn

Other: Ba

Ore minerals: Barite, galena, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks in the area consist of Upper Devonian to Lower Mississippian, Kayayut Conglomerate and Kayak Shale(?). The mineralization is mostly in massive to crossbedded sandstone of the Kanayut Conglomerate but some is in red-brown, carbonate-cemented, interbedded sandstone, siltstone, coal, and shale that may be part of the Kayak Shale, or a lateral equivalent (Kurtak and others, 1995).

The mineralization is along a probable, southeast-dipping, low angle thrust-faulted zone at the base of Kivliktort Mountain (Kurtak and others, 1995). The structure in the area is complex and there are numerous repeated sections of the Kayayut Conglomerate and Kayak Shale. There are four types of mineralization: breccia, vein, replacement, and disseminated. The mineralization is accompanied by silicification and bleaching of the sandstone. Abundant mineralized float with galena and sphalerite extends over a northeast-trending area about 20 meters by 100 meters in size. Breccia along the thrust faults is cemented by quartz, sphalerite, and galena. Disseminated sphalerite occurs in sandstone near the thrust faults and sphalerite replaces coal. Sphalerite veins and late barite veins occur locally. Selected samples contained up to 31.5 percent zinc, 2.8 percent lead, and 26.1 grams of silver per tonne. There is considerable evidence for remobilization of the sulfides from what may have originally been a sandstone-type lead-zinc deposit. Lead isotope values from galena are: Pb 206/204 = 18.632; Pb 207/204 = 15.617, and Pb 208/204 = 38.353. These data suggest a Mississippian to Pennsylvanian model age and remobilization of the sulfides.

Alteration:

Widespread silicification and bleaching of the sandstone.

Age of mineralization:

Probably Mississippian by analogy with other lead-zinc deposits in the western Brooks Range.

Generic deposit model:

Deposit model:

Remobilized, lead-zinc sandstone deposit?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only sampling and mapping by the U.S. Bureau of Mines is documented.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS number 0020200003.

References:

Jansons, Uldis, and Parke, M.A., 1981, 1978 mineral investigations in the Misheguk Mountain and Howard Pass quadrangles: U.S. Bureau of Mines Open-File Report 26-81, 195 p., 1 sheet.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): J.H. Dover (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (east of Kivliktort Mountain)

Site type: Occurrence

ARDF no.: HW021

Latitude: 68.2576 **Quadrangle:** H B-1

Longitude: 156.4527

Location description and accuracy:

This occurrence is about 2.4 miles east-southeast of the summit of Kivliktort Mountain in the headwaters of a small unnamed stream; it is about 0.1 mile southwest of the center of section 13, T. 33 N., R. 10 E.

Commodities:

Main: Ag, Pb, Zn

Other: Cd, Cu

Ore minerals: Galena, malachite, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks in the area are Upper Devonian to Lower Mississippian, Noatak Sandstone overlain by Kanayut Conglomerate. The rocks are thrust faulted and some of the mineralization is along a thrust surface.

Float of mineralized, brecciated, quartz-cemented sandstone occurs along a small creek (Kurtak and others, 1995). A sample contained 19.6 percent zinc, 1,062 parts per million (ppm) cadmium, and 394 ppm copper. At an elevation of about 800 meters along the creek, quartz-cemented sandstone rubble over an area about 5 meters by 15 meters contained up to 4.3 percent lead and 82.6 ounces of silver per ton. A rubble sample of iron-stained conglomerate at the head of the creek contained 0.4 percent zinc.

Alteration:

Probably some silicification in addition to quartz veining.

Age of mineralization:

Late Devonian or younger based on the age of the host rock; possibly Mississippian by analogy with other lead-zinc deposits in the western Brooks Range.

Generic deposit model:

Deposit model:

Sandstone lead-zinc deposit?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only sampling and mapping by the U.S. Bureau of Mines.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS number 0020200014.

References:

Jansons, Uldis, 1982, Zinc-lead occurrences in and near the National Petroleum Reserve in Alaska: U.S. Bureau of Mines Mineral Land Assessment 121-82, 55 p.

Jansons, Uldis, and Parke, M.A., 1981, 1978 mineral investigations in the Misheguk Mountain and Howard Pass quadrangles: U.S. Bureau of Mines Open-File Report 26-81, 195 p., 1 sheet.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): J.H. Dover (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Lakeview

Site type: Occurrence

ARDF no.: HW023

Latitude: 68.6066 **Quadrangle:** H C-3

Longitude: 157.4783

Location description and accuracy:
The Lakeview barite occurrence is about 0.4 mile northeast of lake 573. It is about 0.6 mile east-northeast of the center of section 3, T. 10 S., R. 24 W.

Commodities:

Main: Ba

Other:

Ore minerals: Barite

Gangue minerals:

Geologic description:
The Lakeview barite occurrence is in Lower to Upper Mississippian black chert and minor tuffaceous volcanic rocks of the Lisburne Group (Kurtak and others, 1995). The barite occurs in a single bed 7.6 to 18.3 meters thick that can be traced for about 427 meters. A grab sample contained 95.8 percent barite with a specific gravity of 4.0 The Lakeview occurrence may be part of the same bed exposed at the Longview occurrence (HW034) about 0.7 mile to the north-northeast but the intervening distance is covered by tundra. Kelly and others (1993) estimated that the Lakeview occurrence has an inferred reserve of 3,778,000 metric tons of barite with a specific gravity of 4.13.

Alteration:
Unaltered.

Age of mineralization:
Mississippian.

Generic deposit model:

Deposit model:
Sedimentary barite (Cox and Singer, 1986; model 31b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
31b

Production Status: None

Site Status: Inactive

Workings/exploration:

Only sampling and mapping by government agencies.

Production notes:

None.

Reserves:

Kelly and others (1993) estimated that the Lakeview occurrence has an inferred reserve of 3,778,000 metric tons of barite with a specific gravity of 4.13.

Additional comments:

MAS number 0020200028.

References:

Kelley, J.S., Tailleur, I.L., Morin, R.L., Reed, K.M., Harris, A.G., Schmidt, J.M., Brown, F.M., and Kurtak, J.M., 1993, Barite deposits in the Howard Pass quadrangle and possible relations to barite elsewhere in the northwestern Brooks Range, Alaska: U.S. Geological Survey Open-File Report 93-215, 13 p.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): J.M. Schmidt; J.H. Dover (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Abby Creek

Site type: Occurrence

ARDF no.: HW024

Latitude: 68.5615 **Quadrangle:** H C-3

Longitude: 157.5301

Location description and accuracy:

This barite occurrence is on a small knoll between two minor tributaries in the headwaters of Cutaway Creek. The occurrence is about 1.0 mile north of hill 1064 (in meters) about 0.3 mile east-northeast of the center of section 21, T. 10 S., R. 24 W.

Commodities:

Main: Ba

Other:

Ore minerals:

Gangue minerals: Calcite

Geologic description:

This barite occurrence is in black siliceous mudstone and chert of the Mississippian Lisburne Group in an area of imbricate thrust faulting (Kelly and others, 1993; Kurtak and others, 1995). The barite is exposed in rubble crops and float over an area about 64 by 155 meters in size; the barite probably forms a lens about 30 meters thick. Kelly and others (1993) estimate that the deposit has an inferred resource of about 406,000 tonnes with a grade of 95.1 percent barite.

Alteration:

Age of mineralization:

Syngenetic deposit in Mississippian rocks.

Generic deposit model:

Deposit model:

Sedimentary barite (Cox and Singer, 1986; model 31b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

31b

Production Status: None

Site Status: Inactive

Workings/exploration:

Only sampling by the U.S. Bureau of Mines and the U.S. Geological Survey.

Production notes:

None.

Reserves:

Kelly and others (1993) estimate that the deposit has an inferred resource of about 406,000 tonnes with a grade of 95.1 percent barite.

Additional comments:

MAS number 0020200019.

References:

Kelley, J.S., Tailleur, I.L., Morin, R.L., Reed, K.M., Harris, A.G., Schmidt, J.M., Brown, F.M., and Kurtak, J.M., 1993, Barite deposits in the Howard Pass quadrangle and possible relations to barite elsewhere in the northwestern Brooks Range, Alaska: U.S. Geological Survey Open-File Report 93-215, 13 p.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kelley and others, 1993; Kurtak and others, 1995

Reporter(s): J.M. Schmidt, J.H. Dover (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Bion

Site type: Occurrence

ARDF no.: HW025

Latitude: 68.6034 **Quadrangle:** H C-3

Longitude: 157.5932

Location description and accuracy:

The Bion occurrence is about 2.4 miles west of Lake 573 between the two main headwater forks of Cutaway Creek. It is about 0.5 mile west of the center of section 5, T. 10 S., R. 24 W. The location is accurate.

Commodities:

Main: Ba

Other:

Ore minerals:

Gangue minerals:

Geologic description:

The rocks in the vicinity of the Bion barite occurrence are chert, organic shale, and petroliferous limestone of the Upper Mississippian or Lower Pennsylvanian, Lisburne Group (Kelly and others, 1993; Kurtak and others, 1995). The occurrence is a series of mounds of barite rubblecrop about 70 meters by 130 meters in size. Kurtak and others (1995) estimate that the largest barite body is at least 41 meters thick and is intermittently exposed for about 343 meters along strike. At the largest mound, the barite is interbedded with shale, chert, and limestone. It is uncertain whether there are separate lenses of barite or a single body repeated by thrusting. A 1.2 mGal gravity anomaly coincides with the western part of the barite body. Kelly and others (1993) estimate that the occurrence has an inferred resource of about 10,051,000 tonnes of barite.

Alteration:

Age of mineralization:

Bedded deposit in Late Mississippian or Early Pennsylvanian sedimentary rocks.

Generic deposit model:

Deposit model:

Bedded barite (Cox and Singer, 1986; model 31b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

31b

Production Status: None

Site Status: Inactive

Workings/exploration:

Only sampling by government agencies.

Production notes:

None.

Reserves:

Kelly and others (1993) estimate that the occurrence has an inferred resource of about 10,051,000 metric tons of barite.

Additional comments:

MAS number 0020200020.

References:

Kelley, J.S., Tailleur, I.L., Morin, R.L., Reed, K.M., Harris, A.G., Schmidt, J.M., Brown, F.M., and Kurtak, J.M., 1993, Barite deposits in the Howard Pass quadrangle and possible relations to barite elsewhere in the northwestern Brooks Range, Alaska: U.S. Geological Survey Open-File Report 93-215, 13 p.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kelley and others, 1993

Reporter(s): J.M. Schmidt and J.H. Dover (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Stack

Site type: Occurrence

ARDF no.: HW026

Latitude: 68.6001 **Quadrangle:** H C-3

Longitude: 157.5012

Location description and accuracy:

The Stack barite occurrence is near a limestone monolith (the Stack) just south of lake 573 which is about 3.1 mile northwest of Rim Butte. The occurrence is about 0.5 mile southwest of the center of section 3, T. 10 S., R. 24 W.

Commodities:

Main: Ba

Other:

Ore minerals:

Gangue minerals: Calcite

Geologic description:

The rocks in the area are part of the Lower to Upper Mississippian Lisburne Group exposed in a fenster (Kelly and others, 1993; Kurtak and others, 1995). The barite is exposed in a series of rubblecrop mounds, interbedded with petroliferous limestone, chert, sandstone, and carbonaceous shale. The rubblecrop exposures suggest that the barite bed is about 30 meters thick and extends along strike for about 136 meters. Grab samples averaged 95.8 percent barite. The barite bed has an indicated resource of 2,900,000 metric tons with a specific gravity of 4.21 (Kurtak and others, 2002).

Alteration:

Unaltered.

Age of mineralization:

Mississippian.

Generic deposit model:

Deposit model:

Sedimentary barite (Cox and Singer, 1986; model 31b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

31b

Production Status: None

Site Status: Inactive

Workings/exploration:

Only sampling and mapping by the U.S. Geological Survey and U.S. Bureau of Mines.

Production notes:

None.

Reserves:

The barite bed has an indicated resource of 2,900,000 metric tons with a specific gravity of 4.21 (Kurtak and others, 2002).

Additional comments:

MAS number 0020200032.

References:

Kelley, J.S., Tailleur, I.L., Morin, R.L., Reed, K.M., Harris, A.G., Schmidt, J.M., Brown, F.M., and Kurtak, J.M., 1993, Barite deposits in the Howard Pass quadrangle and possible relations to barite elsewhere in the northwestern Brooks Range, Alaska: U.S. Geological Survey Open-File Report 93-215, 13 p.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): J.M. Schmidt and J.H. Dover (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Tuck

Site type: Occurrence

ARDF no.: HW027

Latitude: 68.6107 **Quadrangle:** H C-3

Longitude: 157.5009

Location description and accuracy:

The Tuck barite occurrence is on a small bench about 0.6 mile north-northwest of lake 573 (in meters) and about 3.8 mile northwest of Rim Butte. It is about 0.5 mile north-northwest of the center of section 3, T. 10 S., R. 24 W.

Commodities:

Main: Ba

Other:

Ore minerals:

Gangue minerals: Calcite

Geologic description:

The Tuck barite occurrence is exposed in an area of float and rubble crop about 30 meters by 60 meters in size. No other sedimentary rocks are exposed at the occurrence but the rocks in the general area consists of orange-weathering siliceous mudstone and light gray, green, and black chert of the Mississippian Lisburne Limestone (Kelly and others, 1993; Kurtak and others, 1995). Kurtak and others (1995) estimated the deposit has an indicated resource of 155,000 tonnes of barite with a specific gravity of 4.31.

Alteration:

Age of mineralization:

Mississippian.

Generic deposit model:

Deposit model:

Sedimentary barite (Cox and Singer, 1986; model 31b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

31b

Production Status: None

Site Status: Inactive

Workings/exploration:

Only sampling and mapping by the U.S. Geological Survey and U.S. Bureau of Mines.

Production notes:

None.

Reserves:

Kurtak and others (1995) estimated the deposit has an indicated resource of 155,000 tonnes of barite with a specific gravity of 4.31.

Additional comments:

MAS number 0020200031.

References:

Kelley, J.S., Tailleur, I.L., Morin, R.L., Reed, K.M., Harris, A.G., Schmidt, J.M., Brown, F.M., and Kurtak, J.M., 1993, Barite deposits in the Howard Pass quadrangle and possible relations to barite elsewhere in the northwestern Brooks Range, Alaska: U.S. Geological Survey Open-File Report 93-215, 13 p.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): J.H. Dover (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Ekakevik

Site type: Occurrence

ARDF no.: HW028

Latitude: 68.6211 **Quadrangle:** H C-4

Longitude: 156.9482

Location description and accuracy:
The Ekakevik occurrence is in a series of low ridges about 2.6 miles north-northeast of the highest peak of Ekakevik Mountain; it is near the center of section 36, T. 9 S, R. 22 W.

Commodities:

Main: Ba

Other:

Ore minerals: Barite, witherite

Gangue minerals:

Geologic description:
The Ekakevik occurrence consist of barite and minor witherite, interbedded with Mississippian Lisburne Group chert, shale, and limestone (Kelly and others, 1993, Kurtak and others, 1995). Bedding is not exposed but the barite is estimated to be about 20 meters thick and can be traced for about 165 meters along strike. The deposit has an indicated resource of 2,275,000 metric tons of barite with a specific gravity of 3.9.

Alteration:

Age of mineralization:
Mississippian?

Generic deposit model:

Deposit model:
Bedded barite (Singer and Cox, 1986; model 31b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
31b

Production Status: None

Site Status: Inactive

Workings/exploration:
Only sampling by government agencies.

Production notes:

None.

Reserves:

The deposit has an indicated resource of 2,275,000 metric tons of barite with a specific gravity of 3.9.

Additional comments:

MAS number 0020200023.

References:

Kelley, J.S., Tailleur, I.L., Morin, R.L., Reed, K.M., Harris, A.G., Schmidt, J.M., Brown, F.M., and Kurtak, J.M., 1993, Barite deposits in the Howard Pass quadrangle and possible relations to barite elsewhere in the northwestern Brooks Range, Alaska: U.S. Geological Survey Open-File Report 93-215, 13 p.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kelley and others, 1993; Kurtak and others, 1995

Reporter(s): J.H. Dover (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (headwaters of Safari Creek)

Site type: Occurrence

ARDF no.: HW030

Latitude: 68.3498 **Quadrangle:** H B-3

Longitude: 157.7223

Location description and accuracy:

This occurrence is on an unnamed tributary in the headwaters of Safari Creek. It is about 0.9 mile east-northeast of peak 950 and about 0.5 mile northeast of the center of section 16. T. 34 N., R. 5 W.

Commodities:

Main: Ag, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, sphalerite

Gangue minerals:

Geologic description:

This occurrence is at the eastern margin of the Safari Creek Window where Upper Devonian Noatak Sandstone is thrust over Early Mississippian Kayak Shale (Kurtak and others, 1995). The Noatak Sandstone here consists of thick bedded, light gray to white sandstone with numerous quartz veinlets.

A 3-meter-wide zone with massive pods and lenses of galena, sphalerite, and minor chalcopyrite can be traced for 350 meters in float and rubble of silicified Noatak Sandstone. A 1.1-meter-thick chip sample across this zone assayed 25.2 percent lead, 8.5 percent zinc, 178 grams of silver per ton, and 925 parts per million copper. Several faults are present and there is evidence of post-mineralization movement. There is also stringer and disseminated mineralization adjacent to the massive mineralization. A 7.80-meter-wide chip sample averaged 11 percent lead, 7 percent zinc, and 274 grams of silver per ton. A VLF geophysical survey line across the mineralization showed no response.

Lead-isotope values on galena are: Pb 206/204 = 18.281; Pb 207/204 = 15.608; and Pb 208/204 = 38.152. Kurtak and others (1995) suggest that these values could be explained mixing upper crustal lead with lead such as found in Devonian volcanogenic-massive-sulfide deposits in the Ambler District on the south side of the Brooks Range. They also suggest that the mineralization is the result of hydrothermal fluids which flowed along the thrust fault during the Cretaceous, Brooks Range orogeny.

Alteration:

The Noatak Sandstone host rock is silicified.

Age of mineralization:

Younger than the Devonian host rock and probably Cretaceous.

Generic deposit model:

Deposit model:

Epigenetic, galena-sphalerite pods and lenses in Upper Devonian sandstone.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only sampling and examination by government agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS number 0020200021.

References:

Ellersieck, I.F., Tailleur, I.L., and Mull, C.G., 1990, Reconnaissance geologic map of the Story Creek area, National Petroleum Reserve, Alaska: U.S. Geological Survey Open-File Report 90-533, 13 p.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (north of Feniak Lake)

Site type: Occurrence

ARDF no.: HW031

Latitude: 68.3828 **Quadrangle:** H

Longitude: 158.2917

Location description and accuracy:
This occurrence is about 0.6 mile northeast of Triangulation Station Apex and about 7.4 miles north of the north end of Feniak Lake. It is about 0.7 mile southwest of the center of section 20, T. 12 S., R. 27 W.

Commodities:

Main: Cu, Pd, Pt

Other: Ni

Ore minerals: Malachite

Gangue minerals:

Geologic description:
This occurrence is in Jurassic olivine gabbro of the Misheguk Mountain allochthon. During a brief stop, Kurtak and others (1995) sampled gabbro with malachite staining. The sample contained 6,943 parts per million (ppm) copper, 15 parts per billion (ppb) platinum, 8 ppb palladium, and 24 ppm nickel.

Alteration:
None noted.

Age of mineralization:
Magmatic deposit in Jurassic gabbro.

Generic deposit model:

Deposit model:
Copper-platinum-palladium in gabbro (Singer and Cox, 1986, model 5a or 5b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
5a or 5b

Production Status: None

Site Status: Undetermined

Workings/exploration:
Only sampling by the U.S. Bureau of Mines.

Production notes:
None.

Reserves:

None.

Additional comments:

MAS number 0020200033.

References:

Foley, J.Y., Dahlin, D.C., Mardock, C.L., and O'Connor, W.K., 1992, Reconnaissance investigations of chromite deposits and platinum-group metals in the western Brooks Range, northwestern Alaska: U.S. Bureau of Mines Open-File Report 80-92, 689 p.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (near Ipnavik River)

Site type: Occurrences

ARDF no.: HW032

Latitude: 68.3571 **Quadrangle:** H B-3

Longitude: 157.27177

Location description and accuracy:

These occurrences are in a saddle about 3.3 miles south of the mouth of Friendly Creek on the Ipnavik River. They are near the center of section 9, T. 34 N., R. 7E. The location is accurate.

Commodities:

Main: Pb, Zn

Other:

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks in the area consist of undivided, Upper Devonian to Lower Mississippian, Kanayut Conglomerate and Noatak Sandstone, and mafic igneous rocks. Kurtak and others (1995) describe scattered occurrences of disseminated sphalerite with minor galena and pyrite, along a west-northwest, 1000-meter-long trend through a saddle. The sulfides are in a gossanous silicified sandstone that locally contains boxworks structures with sphalerite. Samples contained up to 3.4 percent zinc and 1,920 parts per million lead.

Alteration:

Age of mineralization:

Late Devonian to Early Mississippian or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Sandstone lead-zinc deposit?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Only limited sampling by U.S. Bureau of Mines.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS number 0020200010.

References:

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (near Ipnavik River)

Site type: Occurrences

ARDF no.: HW033

Latitude: 68.3631 **Quadrangle:** H B-3

Longitude: 157.351

Location description and accuracy:

These occurrences are about 0.8 mile east of peak 1143 (in meters) and about 3.7 miles south-southwest of the mouth of Friendly Creek on the Ipnavik River. They are about 0.5 mile northwest of the center of section 7, T. 34 N., R. 7 E.

Commodities:

Main: Ag, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, sphalerite

Gangue minerals:

Geologic description:

The rocks in the area are Upper Devonian to Lower Mississippian, Kanayut Conglomerate, Noatak Sandstone, and Kayak Shale that are in both stratigraphic and fault contact. The rocks have been folded into a southwest plunging anticline that is exposed in a window through a thrust fault whose upper plate is Noatak Sandstone and Kanayut Conglomerate.

At the most prominent area of mineralization, massive layers, stringers, and disseminated galena and minor sphalerite and chalcopyrite occur in silicified and brecciated Noatak(?) sandstone just above a siltstone that may be part of the Kayak Shale or Noatak Sandstone (Kurtak and others, 1995). Near the mineralization, the sandstone is brecciated and silicified, giving the rocks a bleached appearance. Samples from an area about 3 meters by 92 meters in size contained up to 36 percent lead, 4 percent zinc, and 439 grams of silver per tonne. A representative chip sample across a 2-meter-wide zone of rubblecrop contained 9.5 percent lead and 140 grams of silver per tonne. A sample of apparently barren, silicified sandstone about 10 meters from the sulfide-bearing sandstone contained 1,466 parts per million (ppm) lead and 1,526 ppm zinc. Several other samples of bleached sandstone collected in an area about a mile long also contained anomalous lead and zinc. An isotopic analysis of galena gave the following values: Pb 206/204 = 18.482; Pb 207/204 = 15.586, and Pb 208/204 = 38.233. These values indicate a Mississippian model age which is comparable to other Mississippian shale-hosted deposits and vein occurrences in Devonian sandstone and conglomerate in the western Brooks Range.

Alteration:

The sandstone near the mineralization is silicified, brecciated, and bleached.

Age of mineralization:

Probably Mississippian based on lead isotope analyses.

Generic deposit model:

Deposit model:

Sandstone lead-zinc deposit?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Only sampling by the U.S. Bureau of Mines.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS number 0020200024.

References:

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Longview

Site type: Occurrence

ARDF no.: HW034

Latitude: 68.6159 **Quadrangle:** H C-3

Longitude: 157.4548

Location description and accuracy:

The Longview barite occurrence is about 1.4 miles north-northeast of lake 573. It is near the center of section 35, T. 9 S., R. 24 W.

Commodities:

Main: Ba

Other:

Ore minerals: Barite

Gangue minerals:

Geologic description:

The Longview barite occurrence is underlain by orange-weathering siliceous mudstone and is overlain by light gray, green, and black chert (Kelly and others, 1993; Kurtak and others, 1995). The sedimentary rocks are part of the Mississippian Lisburne Limestone. The barite occurrence is a tabular body that is along or parallels imbricate thrust sheets. The barite body strikes about N35E and dips 65SE; it is estimated to be about 27 meters thick and is intermittently exposed for about 686 feet. A chip sample across 3 meters contained 97.1 percent barite. The Lakeview occurrence (HW023) about a 0.7 mile to the south-southwest may be part of the same bed but the intervening distance is covered by tundra. The Longview barite bed is estimated to have an inferred reserve of 29,5000 tonnes of barite with a specific gravity of 4.13 (Kelly and others, 1993; Kurtak and others, 1995).

Alteration:

Unaltered.

Age of mineralization:

Mississippian.

Generic deposit model:

Deposit model:

Sedimentary barite (Cox and Singer, 1986; model 31b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

31b

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Only sampling and mapping by the U.S. Geological Survey and U.S. Bureau of Mines.

Production notes:

None.

Reserves:

The Longview barite bed is estimated to have an inferred reserve of 29,5000 tonnes of barite with a specific gravity of 4.13 (Kelly and others, 1993; Kurtak and others, 1995).

Additional comments:

MAS number 00220200030.

References:

Kelley, J.S., Tailleur, I.L., Morin, R.L., Reed, K.M., Harris, A.G., Schmidt, J.M., Brown, F.M., and Kurtak, J.M., 1993, Barite deposits in the Howard Pass quadrangle and possible relations to barite elsewhere in the northwestern Brooks Range, Alaska: U.S. Geological Survey Open-File Report 93-215, 13 p.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (in tributary to Memorial Creek)

Site type: Occurrence

ARDF no.: HW035

Latitude: 68.345 **Quadrangle:** H B-3

Longitude: 157.4439

Location description and accuracy:
This unnamed occurrence is in one of the small tributaries at the head of Memorial Creek, about a mile south of peak 1305 (in meters). It is about 0.5 mile east of the center of section 15, T. 34 N., R. 6 E.

Commodities:

Main: Ba, Pb, Zn

Other: Sr

Ore minerals: Sphalerite

Gangue minerals:

Geologic description:
The rocks in the area are interbedded sandstone, siltstone, and shale of the Upper Devonian or Lower Mississippian, Kanayut Conglomerate (Kurtak and others, 1995). In following up a geochemical anomaly, samples were collected from rubblecrop of red-brown siltstone; they contained 9,423 parts per million (ppm) zinc, 1,122 ppm barium, and more than 2,000 ppm strontium. No sulfides were identified but the high zinc content indicates fine-grained sphalerite. Not enough work was done to determine the extent of the mineralization.

Alteration:
Not noted.

Age of mineralization:
Possibly Devonian or Mississippian based on the age of the host rock and by analogy to other zinc deposits in the western Brooks Range.

Generic deposit model:

Deposit model:
Zinc sandstone deposit?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:
Only sampling and mapping by the U.S. Bureau of Mines is documented.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS number 0020200016.

References:

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (in headwaters of Tukuto Creek)

Site type: Occurrence

ARDF no.: HW036

Latitude: 68.3651 **Quadrangle:** H B-2

Longitude: 157.1652

Location description and accuracy:

There are some inconsistencies in the location given in Kurtak and others (1995) but this occurrence probably is about 0.8 mile northeast of hill 809 (in meters) in the headwaters of Tukuto Creek. This location is accurate to within a half mile and the occurrence is probably in the northwest quarter of section 12, T. 34 N., R. 7 E.

Commodities:

Main: Pb, Zn

Other:

Ore minerals: Galena?, sphalerite?

Gangue minerals:

Geologic description:

Kurtak and others (1995) briefly examined this site and collected a sample of iron-stained lithic tuff that contained 1,838 parts per million (ppm) zinc and 1,686 ppm lead. No ore minerals were visible in the sample but the values are distinctly anomalous and suggest a continuation of the mineralization they discovered several miles to the west (HW032 and HW033). Most of the rocks in the area are Lower Mississippian Kayak Shale.

Alteration:

None noted.

Age of mineralization:

Insufficient data.

Generic deposit model:

Deposit model:

Zinc and lead mineralization in lithic tuff.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Only sampling by the U.S. Bureau of Mines.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS number 0020200034.

References:

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Tolstoi

Site type: Prospect

ARDF no.: ID008

Latitude: 62.91543 **Quadrangle:** ID D-2

Longitude: 156.98975

Location description and accuracy:

The Tolstoi prospect is at an elevation of about 3,400 feet on a steep saddle at the head of one of the headwater tributaries of Tolstoi Creek. It is about 0.5 mile south-southeast of peak 3970 and 0.1 mile northwest of the southeast corner of section 26, T. 33 N., R. 41 W., of the Seward Meridian. The location is accurate.

Commodities:

Main: Ag, As, Cu

Other: Au, Be, Bi, Cd, Pb, Sb, Sn, Te

Ore minerals: Arsenopyrite, boulangerite, chalcopyrite, galena, pyrite, stromeyerite

Gangue minerals: Axinite, fluorite, quartz, tourmaline, white mica

Geologic description:

The Tolstoi prospect consists of several tabular-to-pipe- shaped, sulfide-bearing, tourmaline-quartz breccia zones in a cupola of the 70.3 Ma, Beaver Mountains stock (Bundtzen and Laird, 1982; Bundtzen and Miller, 1997; Miller, Bundtzen, and Gray, 2005). The tourmaline-axinite-quartz breccia bodies are 6 to 65 feet thick and contain 1 to 8 percent arsenopyrite, chalcopyrite, and pyrite. Stromeryite and boulangerite, possibly the source of the high silver values in samples, have been identified in polished sections. The Tolstoi prospect is similar to a nearby unnamed prospect (ID006) although the sulfides at the Tolstoi prospect are more disseminated and the boron metasomatism in the form of tourmaline and axinite is more extensive. Grab samples of the mineralization at the Tolstoi prospect contained up to 10.0 percent copper, 500 parts per million (ppm) silver, 2.0 percent arsenic, more than 2.0 percent lead, 2.0 percent zinc, 1.0 percent antimony, 1,400 parts per billion (ppb) gold, 39 ppm bismuth, 200 ppm cadmium, and 200 ppm tin (McGimsey and others, 1988; Bundtzen and Laird, 1982). Grab samples collected by Battle Mountain Mining Company in 1990 contained up to 1,137 ppb gold, 86.1 ppm silver, 2.03 percent lead, more than 2.00 percent arsenic, and 81 ppm tin (Szumigala, 1993).

In 2007, Alaska Ventures, Inc. (Bundtzen, 2008) staked 84 Alaska mining claims that covered much of the north-central Beaver Mountains and most of the high-grade copper-silver-gold(-tin) prospects and occurrences in the area. Two high-grade samples were analyzed that came from veinlets in the Tolstoi deposit. They contained 3.09 to 4.43 grams of silver per ton, 5.91 to 87.3 grams of bismuth per ton, and 0.13 to 7.17 grams of tellurium per ton. The high bismuth and tellurium values suggest silver-rich zones in the deposit.

Alteration:

Extensive greisen development marked by tourmaline, quartz, white mica, and fluorite.

Age of mineralization:

Undated; may be related to emplacement of the Beaver Mountains stock, which has been dated at 70.3 Ma. (Bundtzen and Laird, 1982).

Generic deposit model:

Deposit model:

Sn-polymetallic veins (Cox and Singer, 1986; model 20b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20b

Production Status: None

Site Status: Active

Workings/exploration:

The prospect was mapped and sampled by the Alaska Division of Geological and Geophysical Surveys and the U.S. Geological Survey from 1979 to 1986. Anaconda Minerals Company sampled and mapped the prospect in 1981 (D. Obolewicz, oral communication, 1981). Noranda Exploration examined the property in 1983 (John Dunbier, oral communication, 1983). The prospect was studied by Battle Mountain Mining Company in 1990 (Szumigala, 1993,1996). In 2007, Alaska Ventures, Inc. (Bundtzen, 2008) staked 84 Alaska mining claims that covered much of the north-central Beaver Mountains and most of the high-grade copper-silver-gold(-tin) prospects and occurrences in the area, including the Tolstoi deposit.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Miller, M.L., Bundtzen, T.K., and Gray, J.E., 2005, Mineral resource assessment of the Iditarod quadrangle, west-central Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2219-B, 2 sheets, scale 1:250,000, and 96 p. pamphlet.

Szumigala, D.J., 1993, Gold mineralization related to Cretaceous-Tertiary magmatism in the Kuskokwim Mountains of west-central and southwestern Alaska: Los Angeles, University of California Ph.D.

dissertation, 300 p.

Szumigala, D.J., 1996, Gold mineralization related to Cretaceous-Tertiary magmatism in west-central Alaska-A geochemical model and prospecting guide for the Kuskokwim region: Geological Society of Nevada Symposium Proceedings, p. 1317-1340.

Primary Reference: Miller, Bundtzen, and Gray, 2005

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting, Inc.), M.L. Miller (U.S. Geological Survey); C.C. Hawley (Hawley Resource Group); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Cirque

Site type: Prospect

ARDF no.: ID009

Latitude: 62.8425 **Quadrangle:** ID D-2

Longitude: 156.9798

Location description and accuracy:

The Cirque prospect is on the west-facing, steep headwall of a cirque at the head of a fork of Billy Goat Creek. The prospect is at an elevation of about 3,000 feet about 0.5 mile south-southwest of the center of section 21, T. 32 N., R 41 W., of the Seward Meridian. The location is accurate.

Commodities:

Main: Ag, As, Cu, Pb

Other: Au, Bi, Cd, Sb, Se, Sn, Te, W, Zn

Ore minerals: Boulangerite, chalcopyrite, galena, hessite, pyrite, sphalerite, stromeyerite, weibullite

Gangue minerals: Axinite, fluorite, quartz, tourmaline

Geologic description:

The Cirque prospect consists of a series of parallel, tourmaline-axinite- quartz-sulfide fracture fillings and breccia bodies in monzonite and quartz syenite of the Beaver Mountains stock. The major fractures strike N75E and dip steeply to vertically; they are discontinuously exposed for about 2 miles. An unnamed deposit about a mile to the northeast may be an easterly extension of this mineralized zone. The Cirque prospect is one of the best-exposed lode deposits in the Iditarod quadrangle.

The most extensive zone of mineralization lies along the side of a steep cirque headwall where nearly massive chalcopyrite-tourmaline pods up to 6 feet wide are exposed for almost 65 feet along strike. Lesser amounts of galena, pyrite, sphalerite, and bismuth-antimony sulfosalts, including boulangerite and stromeyerite, are in a gangue of tourmaline, fluorite, and quartz. Axinite alteration is conspicuous in the walls of the deposit. Excellent exposures allow for a three-dimensional estimate of the size of the main zone; it is about 500 feet long, 10 feet thick, and extends for about 800 feet vertically. Szumigala (1993) placed the Cirque prospect in the center of a large mineralized area he called the 'south quartz zone'. Samples contained up to 21.0 percent copper, 1,108 parts per million (ppm) silver, 1,400 parts per billion (ppb) gold, more than 2,000 ppm arsenic, 570 ppm bismuth, 60 ppm cadmium, more than 2.00 percent lead, 0.70 percent antimony, 200 ppm tin, 100 ppm tungsten, and 0.50 percent zinc (Bundtzen and Laird, 1982; Bundtzen and Miller, 1997; McGimsey and others, 1988; Miller, Bundtzen, and Gray, 2005).

Systematic surface sampling and excellent exposure suggests an inferred resource of 190,000 tons of material with an average grade of 3.50 percent copper and 445 ppm silver in the main mineralized zone at the Cirque prospect (Bundtzen and Miller, 1997; Miller, Bundtzen, and Gray, 2005).

In 2007, Alaska Ventures, Inc. (Bundtzen, 2008) staked 84 Alaska mining claims that covered much of the north-central Beaver Mountains and most of the high-grade copper-silver-gold(-tin) prospects and occurrences there. Four high-grade samples were analyzed that came from veinlets at the Cirque deposit. They contained 2.67 to 47.80 grams of silver per ton, 38.6 to 464 grams of bismuth per ton, and 0.47 to 88.1 grams of tellurium per ton. The high bismuth and tellurium values suggest silver-rich zones in the deposit and the minerals hessite (Ag2S) and weibullite (Pb6Bi8(S,Se)18) were identified in the samples by microprobe.

Alteration:

Greisenization marked by tourmaline, quartz, and white mica in the mineralized zone, and by axinite in the wall rocks.

Age of mineralization:

Undated; may be related to emplacement of the Beaver Mountains stock that has been dated at 70.3 Ma (Bundtzen and Laird, 1982).

Generic deposit model:

Deposit model:

Sn-polymetallic veins (Cox and Singer, 1986; model 20b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20b

Production Status: None

Site Status: Active

Workings/exploration:

Several groups have conducted surface sampling at the Cirque prospect. The U.S. Geological Survey and Alaska Division of Geological and Geophysical Surveys sampled the prospect between 1981 and 1986. Anaconda Minerals sampled the property in 1981. Noranda Exploration sampled the prospect in 1983 (John Dunbier, oral communication, 1983). Battle Mountain Mining Company sampled the prospect in 1990 (Szumigala, 1993). In 2007, Alaska Ventures, Inc. (Bundtzen, 2008) staked 84 Alaska mining claims that covered much of the north-central Beaver Mountains and most of the high-grade copper-silver-gold(-tin) prospects and occurrences in the area, including the Cirque deposit.

Production notes:

None.

Reserves:

The systematic surface sampling and excellent exposure suggests an inferred resource of 175,000 tonnes of material with an average grade of 3.50 percent copper and 445 ppm silver for the main mineralized zone at the Cirque prospect (Bundtzen and Miller, 1997; Miller, Bundtzen, and Gray, 2005).

Additional comments:

References:

Bundtzen, T.K., 2008, Tolstoi-A Promising copper-silver-polymetallic project ready for exploration and drill testing in 2008: Unpublished report for Alaska Ventures, Inc. by Pacific Rim Geological Consulting, Inc., Fairbanks, Alaska, 7 pages.

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Miller, M.L., Bundtzen, T.K., and Gray, J.E., 2005, Mineral resource assessment of the Iditarod quadrangle, west-central Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2219-B, 2

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Szumigala, D.J., 1993, Gold mineralization related to Cretaceous-Tertiary magmatism in the Kuskokwim Mountains of west-central and southwestern Alaska: Los Angeles, University of California Ph.D. dissertation, 300 p.

Primary Reference: Miller, Bundtzen, and Gray, 2005

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting, Inc.), M.L. Miller (U.S. Geological Survey); and C.C. Hawley (Hawley Resource Group); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Ganes Creek

Site type: Mine

ARDF no.: ID022

Latitude: 62.9673 **Quadrangle:** ID D-2

Longitude: 156.5226

Location description and accuracy:

The Ganes Creek placer extends along the valley bottom and on benches for about 6 miles in the Iditarod quadrangle. It extends about the same distance in the Ophir quadrangle to its mouth on the Innoko River which is about 5 miles southeast of Ophir. Most of the mining has taken place in the Iditarod quadrangle but much of the information of record cannot be assigned to one quadrangle. For this record, the site is placed near the mouth of Six Gulch in section 8, T. 33 N., R. 38 W., near the Discovery claim. The location is accurate.

Commodities:

Main: Au

Other: Ag, Cr, Sb, W

Ore minerals: Arsenopyrite, gold, ilmenite, magnesiochromite, pyrite, scheelite, stibnite

Gangue minerals:

Geologic description:

Ganes Creek rises in the Beaver Mountains and flows northeasterly for more than 50 miles into the Innoko River. Upper Ganes Creek formerly flowed north into the Beaver Creek drainage from a point near the mouth of Last Chance Creek about 4 miles above the mouth of Spaulding Creek. At some time in the Pleistocene, headwater erosion captured the upper drainage of Ganes and Beaver Creeks. Prior to that time, ancestral Ganes Creek eroded sedimentary rocks of the Upper Cretaceous Kuskokwim Group and the igneous rocks intruded into them; the older bench gravels deposited during this time lack glacial material. Subsequent to capture, glacial debris from the Beaver Mountains entered lower Ganes Creek (Mertie, 1936; Bundtzen, 1980 [GR 63]).

The placer gold and associated heavy minerals in the Ganes Creek placer were probably liberated from bedrock prior to stream capture of upper Ganes Creek. Paleochannels that formed before capture contain rich gold deposits that in part were eroded into present Ganes Creek. The flood plain of Ganes Creek is composed mainly of coarse-grained, cobble gravels and sand with clasts of plutonic and volcanic rocks derived from the glaciated Beaver Mountains. The coarse gravels in the Ganes Creek flood plain are glacial outwash deposits of Late Pleistocene and early Holocene age (Mertie, 1936, Bundtzen, 1980 [GR 63]; Bundtzen and Miller, 1997). Although diluted with barren material, Ganes Creek was rich enough to support a dredge that mined a flood plain at least 500 feet wide (Mertie, 1936). The dredge encountered shallow bedrock at a depth of about 6 to 20 feet. Most of the pay was on slate bedrock; relatively fine gold, with a few nuggets to about 1.5 ounces, were accompanied by abundant black sand. Most alluvial gravels on the flood plain of Ganes Creek are thawed; tributary gulches contain some frozen ground.

At least two levels of ancestral paleochannels or terraces occur on the northwest and southeast flanks of Ganes Creek. Paleochannels are well exposed below the mouth of Spaulding Creek. All the clasts in these older fluvial paleochannels are of local origin and the older channels formed prior to the beheading of upper Beaver Creek in mid-to-Late Pleistocene time. The paleochannels are well known sources of coarse placer gold. The Baumeister Bench has produced gold-quartz nuggets that weighed up to 122 ounces. In 2002, gold nuggets that weighed up to 5.0 ounces were found by handheld metal detectors in Ganes Creek near the

present Ganes Creek mining camp. The coarse gold nuggets, often with significant intergrown coxcomb quartz attached to them, suggest an epithermal lode source.

The Ganes Creek placer gold varies from 817 to 874 fine, and averages 846 (Bundtzen, Cox, and Veach, 1987; Bundtzen and Miller, 1997). The heavy minerals also include magnesiochromite, scheelite, stibnite, and arsenopyrite. Most of the placer gold on Ganes Creek is believed to be derived from the mineralized sedimentary rocks and the igneous rocks along the northeast-trending Ganes-Yankee Creek fault (Bundtzen and Laird, 1982; Bundtzen and Miller, 1997). However, some placer gold in Late Quaternary alluvial deposits of Ganes Creek could be derived from gold lodes in the Beaver Mountains, (i.e., ID005; ID006, ID008, and ID012), as suggested by Szumigala (1993).

Placer gold was discovered on Ganes Creek during the summer of 1906 by Thomas Gane, F.C.H. Spencer, Mike Roke, and John Maki in gravel bars below the mouth of Ganes Creek (Maddren, 1910). In September 1906, the Discovery claim was located about 9 miles upstream near the mouth of Last Chance Gulch (now Six Gulch). The entire length of Ganes Creek was staked from source to mouth until it was found that gold-bearing gravel did not continue more than a mile upstream from the mouth of Spaulding Creek. Claims were numbered from 83 Above Discovery to 58 Below Discovery (Mertie, 1936).

Early mining was mainly from open cuts dug by horse-drawn scrapers, and the rich terraces such as the Baumeister Bench (ID027) were the first to be exploited (Eakin, 1914). Gold in the main valley proved more difficult to mine because the wet, thawed ground precluded simple open-cut mining.

The valley was later successfully mined by bucket line dredges. The first dredge, constructed by the Innoko Dredging Company and freighted in from Greenstone Creek in the Ruby district began operations during 1923 and mainly mined gravel upstream of Number 5 above Discovery. In 1926, the Guinan and Ames flume dredge, which formerly operated on the Seward Peninsula, was freighted into Ganes Creek and began operations on 13 Above Discovery (Mertie, 1936). Both dredges operated intermittently through World War II; the Innoko Dredging Company dredge was rebuilt by Warren Magnuson in 1955, and operated until 1965.

Mechanized, open cut mining began in the 1930s. Toivo Rosander, Neal Beaton, and Frank Molitor mined with bulldozer and dragline on Ganes Creek during the 1940s and early 1950s. Magnuson Mining Company operated mechanized placer mines on Ganes Creek nearly continuously from 1955 to 1990. The Clark-Wiltz partnership acquired the Magnuson claims in 1993 and in 1994 began mining with mechanized equipment. In 2010, Ganes Creek was still being mined from a conventional open pit by Clark-Wiltz Mining (Szumigala and others 2011). As of early 2012, the property consisted of 90 patented mining claims and 238 Alaska state mining claims.

Since 2002, Ganes Creek has also supported a recreational mine for clients with emphasis on metal detectors (Clark-Wiltz Mining, 2012). Yearly production information is not available for the conventional mine but the recreational mining which began in 2002 has been notably productive of large gold nuggets. Since 2002, 6 nuggets have been found that weighed from 20.1 to 88 ounces and in 2006, 120 ounces of gold were found during the recreational mining. As of early 2012, the property consisted of 90 patented mining claims and 238 Alaska state mining claims.

Continual mining suggests that upper Ganes Creek still has placer gold resources but they are not a matter of public record. Unidentified resources of placer gold probably exist on lower Ganes Creek; it has been drilled in recent years by Magnuson Mining Company and the Clark-Wiltz partnership but the results are not available.

Alteration:

Age of mineralization:

Paleochannel placer deposits probably formed in Pleistocene time prior to the capture of upper Ganes Creek. Older deposits were eroded and reconcentrated in the later Pleistocene (?) and Holocene.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au deposit (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Active

Workings/exploration:

Placer gold was discovered on Ganes Creek during the summer of 1906 by Thomas Gane, F.C.H. Spencer, Mike Roke, and John Maki in gravel bars below the mouth of Ganes Creek (Maddren, 1910). In September 1906, the Discovery claim was located about 9 miles upstream near Last Chance Gulch (now Six Gulch). The entire length of Ganes Creek was staked from source to mouth until it was found that gold-bearing gravel did not exist above a point about 1 mile upstream from the mouth of Spaulding Creek. Claims were numbered from 83 Above Discovery to 58 Below Discovery (Mertie, 1936).

During the first period of activity, mining was mainly from open cuts dug by horse-drawn scrapers, and the rich terraces such as the Baumeister Bench (ID027) were the first to be exploited (Eakin, 1914). Gold in the main valley proved more difficult to mine because the wet, thawed ground precluded simple open-cut mining.

The valley was later successfully mined by bucket line dredges. The first dredge, constructed by the Innoko Dredging Company and freighted in from Greenstone Creek in the Ruby district began operations during 1923 and mainly mined gravel upstream of Number 5 above Discovery. In 1926, the Guinan and Ames dredge, which formerly operated on the Seward Peninsula, was freighted into Ganes Creek and began operations on 13 Above Discovery (Mertie, 1936). Both dredges operated intermittently through World War II; the Innoko Dredging Company dredge was rebuilt by Warren Maguson in 1955, and operated until 1965. The remains of the old Guinan and Ames flume dredge can be found along the Ophir road.

Mechanized, open cut mining began in the 1930s. Toivo Rosander, Neal Beaton, and Frank Molitor mined with bulldozer and dragline on Ganes Creek during the 1940s and early 1950s. Magnuson Mining Company operated mechanized placer mines on Ganes Creek nearly continuously from 1955 to 1990. The Clark-Wiltz partnership acquired the Magnuson claims in 1993 and have operated mechanized placer mines on Ganes Creek and tributaries since 1994. In 2002, recreational miners recovered nuggets of coarse gold from tailings piles.

Ganes Creek is the largest producer of placer gold in the Innoko Mining District. From 1906 to 2002, Ganes Creek and its tributaries produced 104,000 ounces of gold and 13,318 ounces of silver from fluvial paystreaks in the Iditarod quadrangle; addition production has come from lower Ganes Creek in the Ophir quadrangle. The gold-bearing paystreaks can be traced for at least 7 miles in the Iditarod quadrangle and an additional 6 miles in the Ophir quadrangle, making it one of the longest gold placers in southwest Alaska (Bundtzen, 1980 [MIRL]; Bundtzen and Miller, 1997).

Production notes:

Ganes Creek is the largest producer of placer gold in the Innoko Mining District. From 1906 to 2002, Ganes Creek and its tributaries produced 104,000 ounces of gold and 13,318 ounces of silver from fluvial paystreaks in the Iditarod quadrangle; addition production has come from lower Ganes Creek in the Ophir quadrangle. The gold-bearing paystreaks can be traced for at least 7 miles in the Iditarod quadrangle and an additional 6 miles in the Ophir quadrangle, making it one of the longest gold placers in southwest Alaska (Bundtzen, 1980 [MIRL]; Bundtzen and Miller, 1997).

Reserves:

Continual mining suggests that upper Ganes Creek still has placer gold resources but they are not a matter of public record. Unidentified resources of placer gold probably exist on lower Ganes Creek; it has been drilled in recent years by Magnuson Mining Company and the Clark-Wiltz partnership but the results are not available.

Additional comments:

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Szumigala, D.J., Harbo, L.A., and Adleman, J.N., 2011, Alaska's mineral industry 2010: Alaska Division of

Geology and Geophysical Surveys Special Report 65, 83 p.

Primary Reference: Mertie, 1936; Miller and others, 2005

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting, Inc.), M.L. Miller (U.S. Geological Survey), C.C. Hawley (Hawley Resource Group); D.J. Grybeck (Contractor, USGS))

Last report date: 2012-04-01

Site name(s): Independence Mine

Site type: Mine

ARDF no.: ID031

Latitude: 62.9442 **Quadrangle:** ID D-1

Longitude: 156.4772

Location description and accuracy:

The Independence Mine is on a northwest-trending ridge about 2.2 miles southwest of the junction of Ganes Creek and Six Gulch. It is at an elevation of about 1740 feet near the southwest corner of section 15, T. 33 N., R. 38 W., of the Seward Meridian. The mine is accurately located.

Commodities:

Main: Au

Other: Ag, As, Hg, Pb, Sb, Sn

Ore minerals: Arsenopyrite, chalcocite, chalcopyrite, cinnabar, gold, magnetite, pyrite, stephanite, stibnite

Gangue minerals: Quartz, siderite

Geologic description:

The deposit at the Independence Mine as a quartz-carbonate-sulfide vein about 1.5 to 3 feet thick on the hanging wall of an altered composite andesite-granite porphyry dike. According to Eakin (1914) the vein exposed in underground workings averaged about 2 feet thick. The dike strikes N55-70E and dips steeply SE. The granite porphyry which may be dominant phase averages about 32 feet thick and can be traced in rubble for about 1,000 feet. The altered andesite phase is exposed in trenches above the underground workings (Bundtzen and Laird, 1982).

About 1 to 5 percent sulfides, principally arsenopyrite, pyrite, and stibnite and minor cinnabar and stephanite, are disseminated in the vein and adjacent dike rock. Gold occurs in iron-stained crevices and vugs in quartz. Eakin (1914) reported microscopic native gold embedded in magnetite in vein material. Grab samples of the vein reported by McGimsey and others (1988) and Bundtzen and Miller (1997) contained up to 180.0 parts per million (ppm) gold, 13.0 ppm silver, 2.10 percent arsenic, 20 ppm bismuth, 0.56 percent antimony, more than 10.0 ppm mercury, 1,500 ppm lead, and 300 ppm tin.

The vein was developed by an adit and possibly several hundred feet of inclined and level workings. About 470 tonnes of ore mined in 1911 and 1912 produced 479 ounces of gold.

The Independence deposit is similar to other gold-polymetallic veins along the Ganes-Yankee Creek fault and dike swarm (Miller and Bundtzen, 1994; Bundtzen and Miller, 1997). Anomalous tin is present at the Independence Mine, and is known elsewhere in the region in rocks about 70 Ma, for example in felsic plutonic rocks at Donlin Creek prospect (ID167). Mineralization at the Independence and nearby deposits along the Ganes-Yankee Creek fault and dike swarm has been compared to the Donlin Creek mineralization by Miller and Bundtzen (1988) and Bundtzen and Miller (1997).

Warren Magnuson explored the mine area with trenches and open cuts in the 1960s and 1970s. Westgold explored the area in the early 1990s. Placer Dome Exploration conducted a detailed soil survey over the Independence Mine and drilled two core holes totaling about 500 feet in 1996-97 (St. George, 1998). Although the full details of the Placer Dome Exploration exploration are not available, gold-bearing veins are known to have been intersected below the mine workings.

In early 2010, the property was owned and operated by Clark-Winze Mining (Grady, 2009). In 2007 and 2008, Great Basin Gold Ltd. explored the property after compiling the work from the six exploration groups who had worked on the property since 1988. Their work consists of more than 32,000 meters of trenching

and continuous chip sampling of the trenches, as well as 83.6 line miles of IP, TMF, and HLEM ground geophysical surveys.

As described by Grady (2009), the Independence Mine and a newly discovered prospect on Potosi Ridge (ID181), are in the cores of major northeast-striking antiforms in Cretaceous Kuskokwim Group flysch. The hinges of the antiforms are thickened and marked by chevron folding and high angle faulting. In some cases, the cores of the some of the antiforms are deformed into brittle melange. The prospects are associated with northeast-striking swarms of mafic to granitic dikes and older biotite granodiorite to aplite sills. The dike swarms have been offset by numerous north-northwest high-angle faults and joints and often have marginal dip-slip faults.

The mineralization is marked by quartz-carbonate veins along fractures. The veins typically have early quartz-carbonate margins and later cores of clear to white quartz and carbonates. Occasionally, the veins contain late-stage gold and quartz, with iron carbonate and sericite. Sparse pyrite and arsenopyrite occur in the veins and wall rock. Rare, chalcopyrite, galena, and chalcocite are present in the high-grade veins. Samples from a 2-inch-wide quartz vein that extends for 6 meters along dip at the mine contained 592 to 2,140 ppm gold.

3D modeling of gridded IP surveys show that anomalies are associated with high copper, nickel, lead, and zinc values. Resistivity data outlines the the dike swarms; ground magnetic highs correspond to felsic intrusives and magnetic lows outline silicification and brecciation.

Alteration:

Local silicification and development of siderite and other carbonate minerals in an altered dike; secondary oxidation.

Age of mineralization:

The granite-porphyry dike at the Independence Mine has been dated at 70.4 Ma (T.K. Bundtzen, unpublished data, 1998).

Generic deposit model:

Deposit model:

Low sulfide gold-quartz vein (Singer and Cox (1986) model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes

Site Status: Active

Workings/exploration:

According to Eakin (1913), the underground work during 1912 consisted of a 60-foot adit, a 60-foot winze driven at the end of the adit, and two drifts about 30 and 50 feet long. The equipment at the mine site included a 12-horsepower engine and a Little Giant crusher and stamp mill. In 1979, the portal's entrance had caved and exposed the winze. Remnants of the stamp mill are about 650 feet south of the underground workings in a unnamed gulch.

Warren Magnuson explored the mine with trenches and open cuts in the 1960s and 1970s. Westgold explored the area in the early 1990s. Placer Dome Exploration conducted a detailed soil survey over the Independence Mine and drilled two core holes totaling about 500 feet in 1996-97 (St. George, 1998).

In early 2010, the property was owned and operated by Clark-Winze Mining (Grady, 2009). In 2007 and 2008, Great Basin Gold Ltd. explored the property after compiling the work from the six exploration groups who had worked on the property since 1988. Their work consists of more than 32,000 meters of trenching and continuous chip sampling of the trenches, as well as 83.6 line miles of ground IP, TMF, and HLEM geophysical surveys.

Production notes:

The only production was in 1911 and 1912 when the Carter Creek Mining Company produced 479 ounces of gold from the underground workings.

Reserves:

None published.

Additional comments:

References:

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St. George, P., 1998, Progress report for 1997, Ganes Creek project A326, southwest Alaska: Anchorage, Alaska, unpublished Placer Dome Exploration report, 13 pages, plus plates and appendices.

Primary Reference: Grady, 2009

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting, Inc.), M.L. Miller (U.S. Geological Survey); C.C. Hawley (Hawley Resource Group); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Broken Shovel

Site type: Prospect

ARDF no.: ID081

Latitude: 62.6148 **Quadrangle:** ID C-3

Longitude: 157.1711

Location description and accuracy:

The Broken Shovel prospect is about 0.3 mile southeast of hill 2225 and 1.2 mile northwest of the Moore Creek placer mine (ID084). It is at an elevation of about 1,700 feet, about 0.3 mile southwest of the center of section 9, T. 29 N., R. 42 W., of the Seward Meridian. The location is accurate. Work in 2007 nearby identified nearby mineralization in the Spring and Troy Zones.

Commodities:

Main: Ag, Au

Other: As, Cu, Pb, Sb, Zn

Ore minerals: Arsenopyrite, gold, lead-antimony sulfosalts, scheelite, tetrahedrite

Gangue minerals: Dolomite, quartz, tourmaline

Geologic description:

The Broken Shovel prospect is a N20E-trending, steeply dipping quartz-dolomite-sulfide vein in medium-grained monzonite of the Upper Cretaceous, Moore Creek pluton (Bundtzen, Laird, and Lockwood, 1988; Miller, Bundtzen, and Gray, in press). The pluton has been dated at 68.9 Ma (Miller, Bundtzen, and Gray, 2005) The Broken Shovel vein, as defined in prospect trenches and rubble, is about 5 feet thick and can be traced along strike for about 650 feet. Both walls of the vein are sericitized and a pocket of tourmaline is exposed near the its southwest end (Bundtzen, Laird, and Lockwood, 1988). Grab and chip-channel samples contained up to 555 parts per million (ppm) silver, 1,600 parts per billion (ppb) gold, 4,860 ppm copper, 1,430 ppm lead, 760 ppm zinc, 5,500 ppm arsenic, and 2,400 ppm antimony (Bundtzen, Laird, and Lockwood, 1988; McGimsey and others, 1988). Arsenopyrite, scheelite, visible gold, and lead-antimony sulfosalts have been identified in both hand specimen and by microprobe analysis; gold and tungsten values may be understated in the chemical analyses of the samples.

The Broken Shovel prospect has been investigated intermittently since the 1930s by placer miners from Moore Creek, notably Elmer Keturi and Jules Stuver, who prospected the lode in the 1940s and 1950s (Don Harris, oral communication, 1983). When the prospect was examined in 1983 by the Alaska Division of Geological and Geophysical Surveys, it had been explored both by modern bulldozer cuts and much older hand-dug prospect pits (Bundtzen, Laird, and Lockwood, 1988).

On the basis of numerous chip-channel surface samples, Bundtzen, Laird, and Lockwood, (1988) estimated that the Broken Shovel prospect contains an inferred resource of about 16,000 tons of material that contained about 150.0 ppm silver, and about 1.0 percent combined base metals. The average gold grade was not determined.

In early 2008, Full Metals and Highbury Projects, Inc. were jointly exploring the area under a letter of agreement (Full Metal Minerals, 2008, Moore Creek; 2008, Trenching) . They dug numerous trenches and identified three zones with multiple types of mineralization. In the Spring Zone, sheeted quartz-tourmaline veins contain coarse gold and disseminated sulfides. Several notable samples across widths of from 4.0 to 11.0 meters contained 2.17 to 8.86 grams of gold per ton. The mineralization in the Troy Zone consists of gold-quartz veins in a wider zone of lower grade gold mineralization. Notable samples of the veins included 0.2 meters with 88.5 grams of gold per ton and 0.2 meters with 36.0 grams of gold per ton; these occur

within a 3.0-meter-long channel sample that averaged 7.6 grams of gold per ton. The Broken Shovel zone is a steeply dipping quartz vein; twelve samples contained from a trace to 3.84 grams of gold per ton and 2.0 to 1,105 grams of silver per ton, along with anomalous bismuth, arsenic, and mercury.

Alteration:

The rocks adjacent to the vein have been altered to sericite, dolomite, and tourmaline.

Age of mineralization:

Unknown; the Moore Creek pluton that hosts some of the mineralization is 68.9 Ma (Bundtzen, Laird, and Lockwood, 1988).

Generic deposit model:

Deposit model:

Gold-silver-quartz veins with sulfides.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The Broken Shovel prospect has been investigated intermittently since the 1930s by placer miners from Moore Creek, notably Elmer Keturi and Jules Stuver, who prospected the lode in the 1940s and 1950s (Don Harris, oral communication, 1983). When the prospect was examined in 1983 by the Alaska Division of Geological and Geophysical Surveys, it had been explored both by modern bulldozer cuts and by much older hand-dug prospect pits (Bundtzen, Laird, and Lockwood, 1988). The U.S. Geological Survey also investigated the prospect in 1985 (McGimsey and others, 1988). In early 2008, Full Metals and Highbury Projects, Inc. were jointly exploring the area under a letter of agreement (Full Metal Minerals, 2008, Moore Creek, 2008). They dug numerous trenches and identified three zones with multiple types of mineralization: the Spring, Troy, and Broken Shovel zones.

Production notes:

None.

Reserves:

Based on numerous chip-channel surface samples, Bundtzen, Laird, and Lockwood, (1988) estimated that the Broken Shovel prospect contains an inferred resource of about 16,000 tons of material with about 150.0 ppm silver, and about 1.0 percent combined base metals. The average gold grade was not determined.

Additional comments:

References:

Bundtzen, T.K., Laird, G.M., and Lockwood, M.S., 1988, Geologic map of the Iditarod C-3 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 96, 13 p., 1 sheet, scale 1:63,360.

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Full Metal Minerals, 2008 (Trenching), Moore Creek Project, 2007 trenching program: http://www.

fullmetalminerals.com/i/common/featurepics/August-2007-Trenching-Map.jpg (as of March 4, 2008).

McGimsey, R.G., Miller, M.L., and Arbogast, B.F., 1988, Paper version of analytical results, and sample locality map for rock samples from the Iditarod quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-421-A, 110 p., 1 sheet, scale 1:250,000.

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Primary Reference: Full Metal Minerals, 2008 (Moore Creek)

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting, Inc.), M.L. Miller (U.S. Geological Survey); and C.C. Hawley (Hawley Resource Group); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (southwest of upper Granite Creek)

Site type: Prospect

ARDF no.: ID135

Latitude: 62.3645 **Quadrangle:** ID B-2

Longitude: 156.9514

Location description and accuracy:

This prospect is at an elevation of about 1,100 feet on a flat terrace east of the head of Granite Creek. It is about 0.7 mile southwest of hill 1235, near the center of the north boundary of section 7, T. 26 N., R. 41 W., of the Seward Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Hg, Sb

Ore minerals: Stibnite

Gangue minerals: Calcite, quartz

Geologic description:

This prospect consists of a series of shear zones associated with thin quartz-sulfide veinlets in a light-colored granitic rock of alaskite composition and quartz-calcite veins in sandstone (Bundtzen, Miller, and Laird, 1986; Miller and Bundtzen, 1994, and Miller, Bundtzen, and Gray, 2005). The alaskite forms two dikes, each about 30 feet thick; they contain thin, 0.4- to 1-inch-thick quartz-sulfide veins on fractures and joints. The dikes strike N82-88E and are vertical. Quartz-calcite veins occur in sandstone adjacent to the dike rocks. The dikes are part of the same dike swarm that hosts gold-antimony mineralization at the Wyrick lode nearby (ID133). Grab samples of mineralization contained 500 parts per billion (ppb) silver, 48 parts per million (ppm) antimony, 560 ppb mercury, and 40 ppm arsenic. Although gold was not detected in these samples, fine gold was panned from an exploration trench (L.E. Wyrick, oral communication, 1986; Bundtzen, Miller, and Laird, 1986).

Alteration:

Age of mineralization:

Unknown; a nearby intrusion has a 40K/40Ar age of 71.1 Ma (Miller and Bundtzen, 1994).

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

Prospect pits were sunk on the property sometime before 1984. In 1985, L.E. Wyrick cut a 160-feet-long trench, which was sampled by Bundtzen, Miller, and Laird (1986). Battle Mountain Mining Company explored the area in the 1980s (Szumigala, 1993).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bundtzen, T.K., and Miller, M.L., 1997, Precious metals associated with Late Cretaceous-early Tertiary igneous rocks of southwestern Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 242-286.

McGimsey, R.G., Miller, M.L., and Arbogast, B.F., 1988, Paper version of analytical results, and sample locality map for rock samples from the Iditarod quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-421-A, 110 p., 1 sheet, scale 1:250,000.

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Miller, M.L., Bundtzen, T.K., and Gray, J.E., 2005, Mineral resource assessment of the Iditarod quadrangle, west-central Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2219-B, 2 sheets, scale 1:250,000, and 96 p. pamphlet.

Primary Reference: Miller and others, 2005

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting, Inc.), M.L. Miller (U.S. Geological Survey); and C.C. Hawley (Hawley Resource Group); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Unnamed (south of hill 1735)

Site type: Prospect

ARDF no.: ID139

Latitude: 62.366 **Quadrangle:** ID B-2

Longitude: 156.9318

Location description and accuracy:

This prospect is about 0.3 mile south of hill 1735, near the divide between head of Granite Creek and the Little East Fork of George River. The occurrence is at an elevation of about 1,400 feet, near the southwest corner of section 5, T. 26 N., R. 41 W., of the Seward Meridian. The location is accurate.

Commodities:

Main: Ag, Au, Sn

Other: As, B, Cu, Hg, Pb, Sb, Zn

Ore minerals: Gold, pyrite, stibnite

Gangue minerals: Quartz, sericite, tourmaline

Geologic description:

This deposit was originally described as a quartz breccia zone with limonite and tourmaline in hornfelsed sandstone of the Upper Cretaceous, Kuskokwim Group (Bundtzen, Miller, and Laird, 1986; Miller and Bundtzen, 1994; Miller, Bundtzen, and Gray, 2005). The zone is adjacent to a small body of biotite quartz monzonite. The mineralized breccia covers an area about 160 by 500 feet in size that is oriented northeast. The monzonite contains a stockwork of numerous small quartz-tourmaline-sericite veins. The quartz monzonite is undated, but a similar intrusive body exposed about 0.3 mile to the south has a 40K/40Ar age of 71.1 Ma . Grab samples of mineralization contained up to 1,000 parts per million (ppm) tin, 1,000 parts per billion (ppb) silver, 500 ppm copper, 350 ppm zinc, 100 ppm lead, 160 ppm arsenic, 54 ppm antimony, and 1,200 ppb mercury (McGimsey and others, 1988).

Battle Mountain Mining Company explored the property in the late 1980s and diamond drilled two holes; the results were not released. Placer Dome USA flew an aeromagnetic survey over the Upper Granite Creek area but that survey has not been made public (L.E. Wyrick, oral communication, 2003).

In 2008, Full Metals Minerals (2008) negotiated an exploration agreement on this property. The claims probably include another nearby unnamed property (ID135) with similar mineralization. They cite multiple styles of mineralization including granitic stocks with hornfelsed contact zones cut by sheeted quartz-tourmaline veins; swarms of altered rhyolite dikes and sills with disseminated sulfides; and gold-stibnite-pyrite veins along northeast-trending faults. Two samples of quartz-stibnite veins collected by Placer Dome in the mid-1990s contained 10.5 and 17.5 grams of gold per tonne, and four channel samples across an antimony-rich shear zone contained from 343 to 686 ppb gold.

Alteration:

Development of quartz-tourmaline-sericite greisen in quartz monzonite pluton and hornfels.

Age of mineralization:

Possibly related to a nearby quartz monzonite intrusion that has a 40K/40Ar age of 71.1 Ma.

Generic deposit model:

Deposit model:

Several styles of polymetallic gold-antimony(-tin) mineralization related to a small Cretaceous granitic stock.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Samples were collected by the U.S. Geological Survey and Alaska Division of Geological and Geophysical Surveys in the 1980s (McGimsey and others, 1988). Battle Mountain Mining Company explored the occurrence in the late 1980s and drilled two holes. Placer Dome U S flew an aeromagnetic survey over the Upper Granite Creek area but that survey has not been made public (L.E. Wyrick, oral communication, 2003). In 2008, held by Full Metals Minerals, who did at least some work on the property.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bundtzen, T.K., and Miller, M.L., 1997, Precious metals associated with Late Cretaceous-early Tertiary igneous rocks of southwestern Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 242-286.

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Full Metal Minerals, 2008, Full Metal acquires Granite Creek gold property, Alaska: http://www.fullmetalminerals.com/s/NewsReleases.asp?ReportID=301696&_Type=News&_Title=Full-Metal-Acquires-Granite-Creek-Gold-Property-Alaska (News Release, May 15, 2008)

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Miller, M.L., Bundtzen, T.K., and Gray, J.E., 2005, Mineral resource assessment of the Iditarod quadrangle, west-central Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2219-B, 2 sheets, scale 1:250,000, and 96 p. pamphlet..

Szumigala, D.J., 1993, Gold mineralization related to Cretaceous-Tertiary magmatism in the Kuskokwim Mountains of west-central and southwestern Alaska: Los Angeles, University of California Ph.D. dissertation, 300 p.

Primary Reference: Miller, Bundtzen, and Gray, 2005

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting, Inc.), M.L. Miller (U.S. Geological Survey); and C.C. Hawley (Hawley Resource Group); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Donlin Creek

Site type: Prospect

ARDF no.: ID167

Latitude: 62.0434 **Quadrangle:** ID A-5

Longitude: 158.209

Location description and accuracy:

The Donlin Creek prospect is a large mineralized area about 3.5 by 2 kilometers in size that has been extensively drilled and is being developed as an open-pit mine. The center of the area is about 1.4 miles east of the junction of American Creek and Crooked Creek and about 0.3 mile north of the center of section 35, T. 23 N., R. 49 W., of the Seward Meridian. The location is accurate within a few hundreds of feet.

Commodities:

Main: Au

Other: Ag, As, Be, Cd, Cu, Hg, Mo, Pb, Se, Sb, Sn, Te, W, Zn

Ore minerals: Arsenopyrite, bornite, boulangerite, cassiterite, chalcocite, chalcopyrite, cinnabar, covellite, galena, marcasite, millerite, molybdenite, native arsenic, native copper, pyrite, pyrrhotite, realgar, stibnite, scheelite, sphalerite, tennantite, tetrahedrite

Gangue minerals: Carbonate minerals, garnet, quartz

Geologic description:

The Donlin Creek prospect is a large porphyry-gold deposit about 3.5 by 2 km in size that has been extensively drilled and studied since 2001 as a joint venture between NovaGold Resources Alaska Inc. and the Barrick Gold Corporation (NovaGold, 2010). In early 2010, the work had outlined a potential open pit mine that could ultimately cover a northeast-trending area about 2 by 3 kilometers in size. A second-generation feasibility plan was completed in 2009 (Hanson and others, 2009).

Placer gold was discovered in the area in 1909 and placer mining continues nearby (see ARDF sites ID162 to ID166 and ID168). The modern search for the lode source of the placer gold began in 1974 when Resource Associates of Alaska sampled a soil grid and dug three trenches on mineralization (McCoy and others, 1997; Szumigala and others, 2000; Hanson and others, 2009). The Calista Corporation, Cominco Alaska, Kennecott Exploration, and Lyman Resources then worked in the area from 1984 to 1987, mostly through limited surface sampling and auger drilling. From 1988 to 1989, Western Gold Exploration and Mining Company did an airborne geophysical survey and soil sampled a large area. They cut 13,525 meters of trench, drilled 3,106 meters of core hole, and 404 meters of auger drilling, and 10,423 meters of reverse circulation drilling. They identified seven areas of mineralization and prepared the first mineral-resource estimate. Teck Exploration Ltd. trenched and sampled soils in 1993. From 1995 to 2000, Placer Dome U.S. Inc. drilled 87,383 meters of core hole, drilled 11,909 meters of reverse-circulation holes, and did 8,493 meters of trenching. In 2001, NovaGold began working at the property and in early 2010 continued to develop the property under the joint agreement with Barrick Gold (NovaGold, 2010).

Approximately 1,676 exploration and development holes were drilled from 1988 to 2007; 88 percent are core holes and 12 percent are reverse-circulation holes (Hanson and others, 2009). About half were drilled in 2006 and 2007. In 2008, another 109 core holes were drilled to explore pit expansion and potential satellite deposits and for facility and geotechnical studies.

The rocks in the area are Cretaceous sedimentary rocks intruded by a swarm of 65 to 74 Ma dikes, sills, and small stocks. The sedimentary rocks are part of the Cretaceous Kuskokwim Group, mostly graywacke on the north side of the area and shaly rocks on the south side (Cady and others, 1955). The sedimentary

rocks are generally monoclinal to the north and form a broad, open, east-trending fold to the south. There are two main types of igneous rocks (Szumigala and others, 2000; Hanson and others, 2009). The oldest are 74 to 72 Ma, mafic sills and dikes; they are not abundant. The more voluminous are 70 to 65 Ma granite porphyry or rhyodacite dikes and sills, a few feet to 60 meters wide, that form a northeast-trending belt 8 kilometers long and 3 kilometers wide. Five varieties of rhyodacite dikes are distinguished by their textures; they are the 'fine grained porphyry'; 'crowded porphyry'; 'lath rich porphyry'; aphanitic porphyry'; and 'blue porphyry'. There is little alteration of the sedimentary rocks adjacent to the dikes and sills.

The Donlin prospect is between two regional-scale northeast-trending faults; the immediate area has numerous north-northeast to east-northeast and northwest to west-northwest lineaments that probably represent steeply-dipping strike-slip faults (Szumigala and others, 2000; Hanson and others, 2009). These faults offset many of the dikes and sills. The mineralization is strongly controlled by the north-northeast-trending faults, especially in competent host rocks. The mineralization is best developed in the igneous rocks but also does occur in the sedimentary rocks.

There are two distinct styles of mineralization: the ACMA-Lewis style and the Dome-Duqum style (McCoy and others, 1997, Szumigala and others, 2000; Hanson and others, 2009). (The names are based on specific centers of mineralization within the the prospect.) The ACMA-Lewis style, which is the main type, consists mainly of sheeted quartz, quartz-carbonate and sulfide (only) veins characterized by abundant arsenopyrite and pyrite. Disseminated arsenopyrite occurs widely. Most of the gold is in the lattice structure of the arsenopyrite. Stibnite, realgar, and native arsenic are common, but are associated with relatively little gold compared to the arsenopyrite veins. The ACMA-Lewis-style mineralization was deposited by a late, low-temperature, low-sulfidation epithermal system. The Dome-Duqum mineralization is an earlier higher-temperature, porphyry-style of mineralization characterized by quartz veins that contain various proportions of copper, zinc, bismuth, silver, tellurium, selenium and native gold. The Dome-Duqum mineralization is not included in the 2008 resource/reserve estimates by Hanson and others (2009).

The main ore minerals in the deposit are pyrite, stibnite, and gold-bearing arsenopyrite. Native gold is rare, minor hydrothermal pyrrhotite and marcasite are present. Copper, lead, and zinc minerals are rare, but chalcopyrite, chalcocite, covellite, tennantite, tetrahedrite, bornite, native copper, galena, sphalerite, boulangerite, molybdenite, and millerite have been identified. Microscopic cinnabar is generally absent or exceedingly rare.

There have been several generations of resource estimates as the drilling has proceeded. The latest in early 2010 was by Hanson and other (2009). They estimate that on December 31, 2008, the Donlin Creek deposits contained: 1) 1.2 million tonnes of measured resources with an average grade of 2.19 grams of gold per tonne; 2) 93.4 million tonnes of indicated resources with an average grade of 1.98 grams of gold per tonne; 3) 8.4 million tonnes of proven reserves with a grade of 2.59 grams of gold per tonne; and 4) 375.4 million tonnes of probable reserves with a grade of 2.37 grams of gold per tonne.

Alteration:

The alteration is marked by sericite, illite, kaolinite. dickite, carbonate minerals, and pyrite (Szumigala, Dodd, and Arribas, 2000); there is little alteration of the sedimentary rocks adjacent to the igneous rocks.

Age of mineralization:

The felsic intrusions which predate the mineralization have 40K/40Ar ages of from 65.1 to 70.9 Ma (Miller and Bundtzen, 1994).

Generic deposit model:

Deposit model:

Mostly epithermal gold-arsenopyrite-quartz veins and disseminated auriferous arsenopyrite; earlier, higher temperature polymetallic porphyry-style mineralization (Cox and Singer, 1986; model 22c, 25).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c, 25

Production Status: None

Site Status: Active

Workings/exploration:

The Donlin Creek prospect is a large porphyry-gold deposit that has been extensively drilled and studied since 2001 as a joint venture between NovaGold Resources Alaska Inc. and the Barrick Gold Corporation (NovaGold, 2010). In early 2010, the work had outlined a potential open pit mine that could ultimately cover a northeast-trending area about 2 by 3 kilometers in size. A second-generation feasibility plan was completed in 2009 (Hanson and others, 2009).

Placer gold was discovered in the area in 1909 and placer mining continues nearby (see ARDF sites ID162 through ID166 and ID168. The modern search for the lode source of the placer gold began in 1974 when Resource Associates of Alaska sampled a soil grid and dug three trenches on mineralization (McCoy and others, 1997; Szumigala and others, 2000; Hanson and others, 2009). The Calista Corporation, Cominco Alaska, Kennecott Exploration, and Lyman Resources then worked in the area from 1984 to 1987, mostly through limited surface sampling and auger drilling. From 1988 to 1989, Western Gold Exploration and Mining Company did an airborne geophysical survey and soil sampled a large area. They cut 13,525 meters of trench, drilled 3,106 meters of core hole, and 404 meters of auger drilling, and 10,423 meters of reverse circulation drilling. They identified 7 areas of mineralization and prepared the first mineral-resource estimate. Teck Exploration Ltd. trenched and sampled soils in 1993. From 1995 to 2000, Placer Dome U.S. Inc. drilled 87,383 meters of core hole, drilled 11,909 meters of reverse-circulation holes, and did 8,493 meters of trenching. In 2001, NovaGold began working at the property and in early 2010 continued to develop the property under the joint agreement with Barrick Gold (NovaGold, 2010).

Approximately 1,676 exploration and development holes were drilled from 1988 to 2007; 88 percent are core holes and 12 percent are reverse-circulation holes (Hanson and others, 2009). About half were drilled in 2006 and 2007. In 2008, another 109 core holes were drilled to explore pit expansion and potential satellite deposits and for facility and geotechnical studies.

Production notes:

None.

Reserves:

There have been several generations of resource estimates as the drilling has proceeded. The early 2010 update was by Hanson and other (2009). They estimate that on December 31, 2008, the Donlin Creek deposits contained: 1) 1.2 million tonnes of measured resources with an average grade of 2.19 grams of gold per tonne; 2) 93.4 million tonnes of indicated resources with an average grade of 1.98 grams of gold per tonne; 3) 8.4 million tonnes of proven reserves with a grade of 2.59 grams of gold per tonne; and 4) 375.4 million tonnes of probable reserves with a grade of 2.37 grams of gold per tonne.

In early 2012, an updated 43-101 report by Lipiec (2011) estimated that as of July 11, 2011, the Donlin Creek deposits contained 1) 7.7 million tonnes of measured resources with an average grade of 2.52 grams of gold per tonne; 2) 533.6 million tonnes of indicated resources with an average grade of 2.24 grams of gold per tonne; 3) 92.2 million tonnes of inferred resources with an average grade of 2.02 grams of gold per tonne.

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Primary Reference: Lipiec and others, 2011

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting, Inc.), M.L. Miller (U.S. Geological Survey); and C.C. Hawley (Hawley Resource Group); D.J. Grybeck (Contractor, U.S. Geological Survey); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Donlin Creek

Site type: Prospect

ARDF no.: ID167

Latitude: 62.0434 **Quadrangle:** ID A-5

Longitude: 158.209

Location description and accuracy:

The Donlin Creek prospect is a large mineralized area about 3.5 by 2 kilometers in size that has been extensively drilled and is being developed as an open-pit mine. The center of the area is about 1.4 miles east of the junction of American Creek and Crooked Creek and about 0.3 mile north of the center of section 35, T. 23 N., R. 49 W., of the Seward Meridian. The location is accurate within a few hundreds of feet.

Commodities:

Main: Au

Other: Ag, As, Be, Cd, Cu, Hg, Mo, Pb, Se, Sb, Sn, Te, W, Zn

Ore minerals:

Gangue minerals: Carbonate minerals, garnet, quartz

Geologic description:

The Donlin Creek prospect is a large porphyry-gold deposit about 3.5 by 2 km in size that has been extensively drilled and studied since 2001 as a joint venture between NovaGold Resources Alaska Inc. and the Barrick Gold Corporation (NovaGold, 2010). In early 2010, the work had outlined a potential open pit mine that could ultimately cover a northeast-trending area about 2 by 3 kilometers in size. A second-generation feasibility plan was completed in 2009 (Hanson and others, 2009).

Placer gold was discovered in the area in 1909 and placer mining continues nearby (see ARDF sites ID162 to ID166 and ID168). The modern search for the lode source of the placer gold began in 1974 when Resource Associates of Alaska sampled a soil grid and dug three trenches on mineralization (McCoy and others, 1997; Szumigala and others, 2000; Hanson and others, 2009). The Calista Corporation, Cominco Alaska, Kennecott Exploration, and Lyman Resources then worked in the area from 1984 to 1987, mostly through limited surface sampling and auger drilling. From 1988 to 1989, Western Gold Exploration and Mining Company did an airborne geophysical survey and soil sampled a large area. They cut 13,525 meters of trench, drilled 3,106 meters of core hole, and 404 meters of auger drilling, and 10,423 meters of reverse circulation drilling. They identified seven areas of mineralization and prepared the first mineral-resource estimate. Teck Exploration Ltd. trenched and sampled soils in 1993. From 1995 to 2000, Placer Dome U.S. Inc. drilled 87,383 meters of core hole, drilled 11,909 meters of reverse-circulation holes, and did 8,493 meters of trenching. In 2001, NovaGold began working at the property and in early 2010 continued to develop the property under the joint agreement with Barrick Gold (NovaGold, 2010).

Approximately 1,676 exploration and development holes were drilled from 1988 to 2007; 88 percent are core holes and 12 percent are reverse-circulation holes (Hanson and others, 2009). About half were drilled in 2006 and 2007. In 2008, another 109 core holes were drilled to explore pit expansion and potential satellite deposits and for facility and geotechnical studies.

The rocks in the area are Cretaceous sedimentary rocks intruded by a swarm of 65 to 74 Ma dikes, sills, and small stocks. The sedimentary rocks are part of the Cretaceous Kuskokwim Group, mostly graywacke on the north side of the area and shaly rocks on the south side (Cady and others, 1955). The sedimentary rocks are generally monoclinal to the north and form a broad, open, east-trending fold to the south. There are two main types of igneous rocks (Szumigala and others, 2000; Hanson and others, 2009). The oldest are

74 to 72 Ma, mafic sills and dikes; they are not abundant. The more voluminous are 70 to 65 Ma granite porphyry or rhyodacite dikes and sills, a few feet to 60 meters wide, that form a northeast-trending belt 8 kilometers long and 3 kilometers wide. Five varieties of rhyodacite dikes are distinguished by their textures; they are the 'fine grained porphyry'; 'crowded porphyry'; 'lath rich porphyry'; aphanitic porphyry'; and 'blue porphyry'. There is little alteration of the sedimentary rocks adjacent to the dikes and sills.

The Donlin prospect is between two regional-scale northeast-trending faults; the immediate area has numerous north-northeast to east-northeast and northwest to west-northwest lineaments that probably represent steeply-dipping strike-slip faults (Szumigala and others, 2000; Hanson and others, 2009). These faults offset many of the dikes and sills. The mineralization is strongly controlled by the north-northeast-trending faults, especially in competent host rocks. The mineralization is best developed in the igneous rocks but also does occur in the sedimentary rocks.

There are two distinct styles of mineralization: the ACMA-Lewis style and the Dome-Duqum style (McCoy and others, 1997, Szumigala and others, 2000; Hanson and others, 2009). (The names are based on specific centers of mineralization within the the prospect.) The ACMA-Lewis style, which is the main type, consists mainly of sheeted quartz, quartz-carbonate and sulfide (only) veins characterized by abundant arsenopyrite and pyrite. Disseminated arsenopyrite occurs widely. Most of the gold is in the lattice structure of the arsenopyrite. Stibnite, realgar, and native arsenic are common, but are associated with relatively little gold compared to the arsenopyrite veins. The ACMA-Lewis-style mineralization was deposited by a late, low-temperature, low-sulfidation epithermal system. The Dome-Duqum mineralization is an earlier higher-temperature, porphyry-style of mineralization characterized by quartz veins that contain various proportions of copper, zinc, bismuth, silver, tellurium, selenium and native gold. The Dome-Duqum mineralization is not included in the 2008 resource/reserve estimates by Hanson and others (2009).

The main ore minerals in the deposit are pyrite, stibnite, and gold-bearing arsenopyrite. Native gold is rare, minor hydrothermal pyrrhotite and marcasite are present. Copper, lead, and zinc minerals are rare, but chalcopyrite, chalcocite, covellite, tennantite, tetrahedrite, bornite, native copper, galena, sphalerite, boulangerite, molybdenite, and millerite have been identified. Microscopic cinnabar is generally absent or exceedingly rare.

There have been several generations of resource estimates as the drilling has proceeded. The latest in early 2010 was by Hanson and other (2009). They estimate that on December 31, 2008, the Donlin Creek deposits contained: 1) 1.2 million tonnes of measured resources with an average grade of 2.19 grams of gold per tonne; 2) 93.4 million tonnes of indicated resources with an average grade of 1.98 grams of gold per tonne; 3) 8.4 million tonnes of proven reserves with a grade of 2.59 grams of gold per tonne; and 4) 375.4 million tonnes of probable reserves with a grade of 2.37 grams of gold per tonne.

The Donlin project is being proposed as a large open-pit gold mine by Donlin Gold, LLC, a 50/50 partnership between Barrick Gold Corp. and NovaGold Resources Inc. Their preferred design for the Donlin project anticipates a throughput of approximately 59,000 tons (53,524 tonnes) per day. Donlin Gold's proposal to power the mine includes a 14-inch-diameter, 315-mile-long natural gas pipeline starting in Beluga, Alaska, passing north through the Alaska Range, and continuing to the mine site. Donlin Gold estimates the project would take 3 to 4 years to construct, with a projected mine life of approximately 27.5 years, and is estimated to produce (on average) approximately one million ounces of gold per year (Lipiec and others, 2012).

In 2016, Donlin Gold’s major milestones included advancement of the permitting and technical work at the Donlin project, including completion of a six-month public comment period on the draft Environmental Impact Statement (EIS) completed by the U.S. Army Corps of Engineers, and completion of public working sessions attended by all cooperating agencies to address comments on key topics and how to address them in the final EIS, which is expected to be completed in early 2018 (Athey and Werdon, 2017).

Alteration:

Age of mineralization:

The felsic intrusions which predate the mineralization have 40K/40Ar ages of from 65.1 to 70.9 Ma (Miller and Bundtzen, 1994).

Generic deposit model:

Deposit model:

Mostly epithermal gold-arsenopyrite-quartz veins and disseminated auriferous arsenopyrite; earlier, higher temperature polymetallic porphyry-style mineralization (Cox and Singer, 1986; model 22c, 25).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c, 25

Production Status: None

Site Status: Active

Workings/exploration:

The Donlin Creek prospect is a large porphyry-gold deposit that has been extensively drilled and studied since 2001 as a joint venture between NovaGold Resources Alaska Inc. and the Barrick Gold Corporation (NovaGold, 2010). In early 2010, the work had outlined a potential open pit mine that could ultimately cover a northeast-trending area about 2 by 3 kilometers in size. A second-generation feasibility plan was completed in 2009 (Hanson and others, 2009).

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Additional comments:

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Primary Reference: Lipiec and others, 2011

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Last report date: 2017-08-26

Site name(s): Unnamed (near Ganes Creek)

Site type: Prospect

ARDF no.: ID181

Latitude: 62.9662 **Quadrangle:** ID D-1

Longitude: 156.4988

Location description and accuracy:

This prospect is along the ridge--locally known as Potosi Ridge--between Six Gulch, a west-flowing tributary to Ganes Creek and the first tributary to the north which is locally called Potosi Creek. The prospect is about 0.7 mile east of the junction of Six Gulch and Ganes Creek, about 0.2 mile north-northwest of the center of section 9. T. 33 N., R. 38 W. The location is accurate.

Commodities:

Main: As, Au, Cu, Pb

Other:

Ore minerals: Arsenopyrite, chalcocite, chalcopyrite, galena, pyrite

Gangue minerals: Carbonates, quartz, sericite

Geologic description:

This deposit was first described by Grady (2009) as a result of recent work in the Ganes Creek area that included the nearby and better-known Independence Mine (ID031). The prospect is in an area that has been explored by at least six companies since 1988, notably Great Basin Gold Ltd. in 2007 and 2008. The total work of these companies included more than 32,000 meters of trenching and continuous chip sampling of the trenches, as well as 83.6 line miles of ground IP, TMF, and HLEM geophysical surveys. In early 2010, the property was owned and operated by Clark-Winze Mining (Grady, 2009).

This prospect and the Independence mine are within the cores of major northeast-striking antiforms in Cretaceous Kuskokwim Group flysch. The hinges of the antiforms are thickened and marked by chevron folding and high angle faulting. In some cases, the cores of the some of the antiforms are deformed into brittle melange. The prospects are associated with northeast-striking swarms of mafic to granitic dikes and older biotite granodiorite to aplite sills. The dike swarms are offset by numerous north-northwest high-angle faults and joints and often have marginal dip-slip faults.

The mineralization in the area is marked by quartz-carbonate veins along fractures. The veins typically have early quartz-carbonate margins with cores of clear to white quartz and carbonates. Occasionally, the veins contains late-stage quartz, iron carbonates, and sericite. Sparse pyrite and arsenopyrite occur in the veins and wall rock. Rare chalcopyrite, galena, and chalcocite are present in the high-grade veins. Two samples contained 14 part per million gold; the sample were taken from quartz-carbonate veins that cut mafic sills and and shear zones.

3D modeling of gridded IP surveys show that geophysical anomalies are associated with high copper, nickel, lead, and zinc values in soils. Resistivity data outlines the the dike swarms; magnetic highs correspond to felsic intrusives and magnetic lows outline silicification and brecciation.

Alteration:

Silicification.

Age of mineralization:

Cretaceous or younger based on the age of the host rock.

Generic deposit model:

Deposit model:
Low-sulfide gold-quartz veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:
This deposit was first described by Grady (2009) in conjunction with recent work in the Ganes Creek area that also included the nearby and better-known Independence Mine (ID031). This prospect is within an area that has been explored by at least six companies since 1988, notably Great Basin Gold Ltd. in 2007 and 2008. Their work included more than 32,000 meters of trenching and continuous chip sampling of the trenches, as well as 83.6 line miles of IP, TMF, and HLEM ground geophysical surveys. In early 2010, the property was owned and operated by Clark-Winze Mining (Grady, 2009).

Production notes:
None.

Reserves:
None.

Additional comments:

References:
Grady, Jesse C., 2009, High-grade structurally controlled gold veins at Ganes Creek, Ophir mining district, southwestern Alaska: Abstracts, Alaska Miners Association, 2009 Annual Convention, p. 15-16. (As of Feb 2, 2010, on the Internet as: http://www.alaskaminers.org/abstracts2009.pdf).

Dashevsky, S., 2004, Ganes Creek Gold project: Qualifying Report for Full Metal Minerals, Inc., 104 p. (posted on www.sedar.com, March 30, 2004).

Primary Reference: Grady, 2009

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): 37 Skarn

Site type: Prospect

ARDF no.: IL002

Latitude: 59.7914 **Quadrangle:** IL D-7

Longitude: 155.5116

Location description and accuracy:

The 37 Skarn prospect is about 0.5 mile south of the Koktuli River at an elevation of about 1,000 feet. The prospect is about 3.8 miles west-northwest of Sharp Mountain and about 0.4 mile north of the center of section 32, T. 4 S., R. 36 W. The location is accurate.

Commodities:

Main: Ag, Au, Cu

Other: As, Pb, Zn

Ore minerals: Chalcopyrite, galena, gold, magnetite, marcasite, pyrrhotite, sphalerite

Gangue minerals: Actinolite/tremolite, dolomite, epidote?, garnet, quartz

Geologic description:

Five holes drilled in 2002 by Northern Dynasty Minerals Ltd. on a copper-gold geochemical anomaly found the first skarn mineralization in the Pebble claim block here (Rebagliati, 2003; Haslinger and others, 2004; Rebagliati and Payne, 2005; Gaunt and others, 2010). The host rocks are fine- to medium-grained basalt, basaltic breccias, and minor interbeds of lithic sandstone, siltstone, and mudstone. The basalts and associated rocks are pervasively altered to actinolite/tremolite, epidote, and chlorite. Most of the mineralization is in fracture-controlled veinlets and veins of epidote, dolomite, light-brown garnet, potassium feldspar, pyrrhotite, chalcopyrite, and magnetite. Sphalerite occurs in minor amounts. Some notable intercepts in the 2002 drilling were: 79 meters with 1.0 grams of gold per tonne and 0.40 percent copper; 2.32 meters with 8.19 grams of gold per tonne, 2.460 percent copper, 446 parts per million (ppm) zinc, and 15.6 grams of silver per tonne; 0.43 meters with 14.81 grams of gold per tonne, 4.430 percent copper, 714 ppm zinc, and 33.8 ppm silver; and 1.86 meters with 9.74 grams of gold per tonne, 3.14 percent copper, 692 ppm zinc, and 46.8 ppm silver.

Two more holes were drilled in 2003 on a strong northeast-trending magnetic anomaly (Haslinger and others, 2004). They encountered altered diorite and gabbro. The propylitic alteration suite is characterized by epidote, calcite, chlorite, and magnetite. The mineralization consists of scattered quartz-calcite-chlorite-marcasite veinlets with chalcopyrite, sphalerite, and galena. The best intercepts in the 2003 drilling were 4.7 meters with 0.61 grams of gold per tonne, 0.37 percent copper, 1,802 ppm zinc, and 7.8 ppm silver; and 0.8 meters with 16.50 grams of gold per tonne, 1.00 percent copper, 660 ppm zinc, 10 ppm silver, and 435 ppm arsenic.

Alteration:

Basalts and associated rocks are pervasively altered to actinolite/tremolite, epidote, and chlorite. Diorite and gabbro are propylitically altered to epidote, calcite, chlorite, and magnetite.

Age of mineralization:

Probably Late Cretaceous, about 90 Ma, by proximity to the nearby Pebble deposit (IL007).

Generic deposit model:

Deposit model:

Copper-gold skarn; probably related to porphyry copper-gold deposit (Cox and Singer, 1986; models 18b and 20c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b, 20c

Production Status: None

Site Status: Active

Workings/exploration:

The area has been covered by extensive geochemical and geophysical surveys beginning in about 1986 as part of the exploration of the Pebble block of claims first by Cominco and through early 2011 by Northern Dynasty Minerals Ltd. Mapped and sampled at the surface. Five holes drilled in 2002 by Northern Dynasty Minerals Ltd. on a copper-gold geochemical anomaly found the first skarn mineralization in the Pebble claim block. Two more holes were drilled in 2003 on a strong northeast-trending magnetic anomaly.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Gaunt, J.D., Rebagliati, C.M., Lang, James, Titley, Eric, Melis, Lawrence, Barratt. Derek, and Hodgson, Stephen, 2010, Technical report on the 2009 program and update on metallurgy, Pebble copper-gold-molybdenum project, Iliamna Lake area, southwestern Alaska, U.S.A: Unpublished Technical Report for Northern Dynasty Minerals Ltd., 195 p. (posted on www.sedar.com, Mar. 18, 2010).

Haslinger, R.J., Payne, J.G., Price, S. and Rebagliati, C.M., 2004, 2003 Summary report on the Pebble Porphyry gold-copper project: Unpublished report for Northern Dynasty Minerals Ltd., 119 p. (posted on www.sedar.com, Jun. 30, 2004).

Rebagliati, C.M., 2003, Summary report on the Pebble copper-gold porphyry project; Unpublished report for Northern Dynasty Minerals Ltd., 94 p. (posted on www.sedar.com, Feb. 13, 2003.)

Rebagliati, C.M., and Payne, J.G. 2005, 2004 summary report on the Pebble gold-copper project: Unpublished report for Northern Dynasty Minerals Ltd., 118 p. (posted on www.sedar.com, Apr. 4, 2005).

Rebagliati, C.M., and Payne, J.G., 2007, 2006 summary report on the Pebble gold-copper-molybdenum project: Unpublished report for Northern Dynasty Minerals Ltd., 119 p. (posted on www.sedar.com, Apr. 2, 2007).

Primary Reference: Haslinger and others, 2004

Reporter(s): C.C. Hawley, Hawley Resource Group, Anchorage, Alaska; D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): 52 Porphyry Zone

Site type: Prospect

ARDF no.: IL003

Latitude: 59.8081 **Quadrangle:** IL D-7

Longitude: 155.5102

Location description and accuracy:
The 52 Porphyry Zone prospect is at an elevation of about 1,400 feet on the side side of a knob about 4.2 miles northwest of Sharp Mountain. The center of the drilling is about 0.5 mile north of the center of section 29, T. 4 S., R. 36 W.

Commodities:

Main: Cu

Other: Ag?, Au?, Mo?

Ore minerals: Chalcopyrite

Gangue minerals: Quartz

Geologic description:
The 52 Porphyry Zone was discovered by drill testing a copper soil-geochemistry anomaly coincident with an IP geophysical anomaly (Rebagliati, 2003). Four holes were drilled in an area about 400 meters long. Surface rubble and drill core indicate that the entire area is underlain by black fine- to medium-grained basalt similar to that found as the '37 Skarn' prospect (IL002) about a mile to the south. The basalt has been weakly propylitically altered to epidote and chlorite. Modest amounts of chalcopyrite occur in fracture fillings with potassium feldspar and chlorite. The prospect has low-grade copper mineralization with porphyry affinities as suggested by the nearby Pebble prospect (IL007) and other prospects in the Pebble claim block.

Alteration:
Weak propylitic and potassium-feldspar alteration.

Age of mineralization:
Probably Late Cretaceous, about 90 Ma, by analogy with the nearby Pebble deposit (IL007).

Generic deposit model:

Deposit model:
Chalcopyrite along fractures in basalt. Probable porphyry copper affinities.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The area has been covered by extensive geochemical and geophysical surveys beginning in about 1986 as part of the exploration of the Pebble block of claims Teck-Cominco, and through early 2011 by Northern Dynasty Minerals Ltd. Considerable mapping and sampling at the surface; 4 holes drilled in 2002.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Gaunt, J.D., Rebagliati, C.M., Lang, James, Titley, Eric, Melis, Lawrence, Barratt. Derek, and Hodgson, Stephen, 2010, Technical report on the 2009 program and update on metallurgy, Pebble copper-gold-molybdenum project, Iliamna Lake area, southwestern Alaska, U.S.A: Unpublished Technical Report for Northern Dynasty Minerals Ltd., 195 p. (posted on www.sedar.com, Mar. 18, 2010).

Rebagliati, C.M., 2003, Summary report on the Pebble copper-gold porphyry project; Unpublished report for Northern Dynasty Minerals Ltd., 94 p. (posted on www.sedar.com, Feb. 13, 2003.)

Primary Reference: Northern Dynasty Minerals, 2003

Reporter(s): C.C. Hawley (Hawley Resource Group); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): 38 Porphyry; 38 Zone

Site type: Prospect

ARDF no.: IL004

Latitude: 59.7981 **Quadrangle:** IL D-7

Longitude: 155.4219

Location description and accuracy:

The center of the 38 Porphyry prospect is about 1.6 miles northwest of Sharp Mountain, near the center of section 26, T. 4 S., R. 36 W., Seward Meridian. The location is accurate.

Commodities:

Main: Cu

Other: Ag, Au, Mo

Ore minerals: Chalcopyrite, galena, molybdenite, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The 38 Porphyry prospect is a classic copper-gold-molybdenum porphyry deposit on the southeast flank of a granodiorite-tonalite batholith of Late Cretaceous (about 90 Ma) age (Detterman and Reed, 1980).

The 38 Porphyry was discovered in 2002 by Northern Dynasty Minerals Ltd. by drilling an IP geophysical anomaly covered with about 25 meters of glacial gravel (Rebagliati, 2003; Haslinger and others, 2004; Rebagliati and Payne, 2005; Gaunt and others, 2010). The main host for the mineralization is porphyritic hornblende quartz monzonite and granodiorite, with a core of granite to quartz monzonite. The deposit has classic porphyry-style alteration. There is a central zone of fracture-controlled, pervasive potassium feldspar alteration. It is succeeded outward by a large zone of secondary biotite alteration that has the best copper values and about 1.5 percent pyrite. Both the potassium feldspar and biotite alteration are overprinted by phyllic or sericitic alteration. There are several phases of mineralization which generally follows the pattern: 1) quartz with potassium feldspar halos; 2) quartz or quartz-pyrite with chalcopyrite and/or molybdenite; 3) quartz-pyrite with quartz-sericite-pyrite halos, 4) calcite; and 5) clay along fractures. Almost all the copper is in chalcopyrite; bornite and tetrahedrite are rare. The chalcopyrite occurs in three principal ways: 1) as pervasive disseminated grains associated with secondary biotite replacement of hornblende phenocrysts; 2) as coatings with pyrite along fracture surfaces; and 3) in the core or along the margins of quartz, quartz-pyrite, and quartz-pyrite-molybdenite veinlets. Native gold is rarely seen under the microscope but there seems to be a consistent ratio of 1 gram of gold per tonne to 1 percent copper. Molybdenite is widespread but sporadic; it typically is in quartz or quartz-pyrite veinlets. Sphalerite and galena are present in few calcite and quartz veinlets.

Northern Dynasty drilled 17 holes in 2002 and 2003. Some of the notable intercepts were: 37.7 meters with 0.40 percent copper, 0.45 gram of gold per tonne, and 0.02 percent molybdenum; 30.5 meters with 0.41 percent copper and 0.31 gram of gold per tonne; 149 meters with 0.42 percent copper, 0.41 gram of gold per tonne, and 0.01 percent molybdenum.

Alteration:

The deposit has classic porphyry-style alteration. There is a central zone of fracture-controlled, pervasive potassium feldspar alteration. It is succeeded outward by a large zone of secondary biotite alteration that has the best copper values and about 1.5 percent pyrite. Both the potassium feldspar and biotite alteration are overprinted by phyllic or sericitic alteration.

Age of mineralization:

Probably Late Cretaceous, approximately 90 Ma, assuming contemporaneity with the nearby Pebble deposit (IL007).

Generic deposit model:

Deposit model:

Porphyry copper-gold-molybdenum deposit (Cox and Singer, 1986; models 20c or 21a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c, 21a

Production Status: None

Site Status: Active

Workings/exploration:

The 38 Porphyry was discovered in 2002 by Northern by Northern Dynasty Minerals Ltd. by drilling an IP geophysical anomaly covered with about 25 meters of glacial gravel. Northern Dynasty drilled 17 holes in 2002 and 2003.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bouley, B.A., St. George, P., and Wetherbee, P.K., 1995, Geology and discovery at Pebble Copper, a copper-gold porphyry system in southwest Alaska: Canadian Insitute of Mining, Metallurgy, and Petroleum, Special Volume 46, p. 422-435.

Detterman, R.L., and Reed, B.L., 1980, Stratigraphy, structure, and economic geology of the Iliamna quadrangle, Alaska: U.S. Geological Survey Bulletin 1368-B, 86 p.

Gaunt, J.D., Rebagliati, C.M., Lang, James, Titley, Eric, Melis, Lawrence, Barratt. Derek, and Hodgson, Stephen, 2010, Technical report on the 2009 program and update on metallurgy, Pebble copper-gold-molybdenum project, Iliamna Lake area, southwestern Alaska, U.S.A: Unpublished Technical Report for Northern Dynasty Minerals Ltd., 195 p. (posted on www.sedar.com, Mar. 18, 2010).

Haslinger, R.J., Payne, J.G., Price, S. and Rebagliati, C.M., 2004, 2003 Summary report on the Pebble Porphyry gold-copper project: Unpublished report for Northern Dynasty Minerals Ltd., 119 p. (posted on www.sedar.com, Jun. 30, 2004).

Rebagliati, C.M., 2003, Summary report on the Pebble copper-gold porphyry project; Unpublished report for Northern Dynasty Minerals Ltd., 94 p. (posted on www.sedar.com, Feb. 13, 2003.)

Rebagliati, C.M., and Payne, J.G. 2005, 2004 summary report on the Pebble gold-copper project: Unpublished report for Northern Dynasty Minerals Ltd., 118 p. (posted on www.sedar.com, Apr. 4, 2005).

Rebagliati, C.M., and Payne, J.G., 2007, 2006 summary report on the Pebble gold-copper-molybdenum

project: Unpublished report for Northern Dynasty Minerals Ltd., 119 p. (posted on www.sedar.com, Apr. 2, 2007).

Primary Reference: Rebagliati, 2003

Reporter(s): C.C. Hawley, Hawley Resource Group, Anchorage, Alaska; D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): 25 Zone; 25 Gold

Site type: Prospect

ARDF no.: IL005

Latitude: 59.8548 **Quadrangle:** IL D-7

Longitude: 155.3289

Location description and accuracy:

At least 15 holes have been drilled at the 25 Zone prospect; the center of the work is about 1.5 miles southwest of the center of lake 943, locally called Frying Pan Lake. The center is about 0.4 mile south-southeast of the center of section 5, T. 4 S., R. 35 W. The drill sites are scattered over much of the southeast corner of section 5. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, gold, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The 25 Zone prospect is associated with a brecciated intrusive complex that covers about 8 square kilometers (Rebagliati, 2003; Haslinger and others, 2004; Rebagliati and Payne, 2005; Gaunt and others, 2010). The complex consists of pyroxenite and gabbro, intruded by irregular bodies and dike swarms of fine-grained monzonite. The mineralization consists of: 1) polymetallic veins and veinlets with gold, sphalerite, galena, chalcopyrite, and minor disseminated chalcopyrite in the wall rocks; 2) zones with 3-8 percent pyrite associated in some place with quartz-carbonate breccia and in others with strong chlorite-epidote alteration; and 3) quartz veins, replacement patches, and breccia with minor pyrite. The alteration is dominated by a chlorite-epidote-calcite-pyrite propylitic assemblage that occurs as disseminations, phenocryst replacements, and rims around breccia clasts. The rocks locally exhibit silica veining, flooding, and brecciation. Skarn-type alteration occurs along the monzonite dikes. The higher-grade gold intervals in the drill holes are associated with the propylitic and skarn alteration that is ubiquitous in the breccia complex. The mineralization is probably about 90 Ma based on its proximity to the Pebble prospect (IL007),

The prospect and surrounding area has been covered by extensive geologic mapping and sampling, and geochemical and geophysical surveys beginning in about 1986 as part of the exploration of the Pebble block of claims, first by Cominco and then by Northern Dynasty Minerals Ltd., the operator as of early 2011 Northern Dynasty drilled least 15 holes in 2002. Some notable intersects are: 6.10 meters with 28.90 grams of gold per tonne and 0.013 percent copper; 0.31 meter with 260.78 grams of gold per tonne and 0.007 percent copper; and 1.74 meters with 19.27 grams of gold per tonne, 0.20 percent copper, more than 1 percent lead and zinc, and 47.0 parts per million silver. Many intercepts contained 1.0 gram of gold per tonne or more.

Alteration:

The alteration is dominated by a chlorite-epidote-calcite-pyrite propylitic assemblage that occurs as disseminations, phenocryst replacements, and rims around breccia clasts. The rocks locally exhibit silica veining, flooding, and brecciation. Skarn-type alteration occurs along the monzonite dikes.

Age of mineralization:

Probably 90 Ma based on its proximity to the nearby Pebble prospect (IL007).

Generic deposit model:

Deposit model:

Polymetallic quartz veins (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

Covered by extensive geochemical and geophysical surveys beginning in about 1986 as part of the exploration of the Pebble block of claims first by Cominco and as of early 2011 by Northern Dynasty Minerals Ltd. Mapped and sampled at the surface; at least 15 holes drilled by 2002.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bouley, B.A., St. George, P., and Wetherbee, P.K., 1995, Geology and discovery at Pebble Copper, a copper-gold porphyry system in southwest Alaska: Canadian Insitute of Mining, Metallurgy, and Petroleum, Special Volume 46, p. 422-435.

Gaunt, J.D., Rebagliati, C.M., Lang, James, Titley, Eric, Melis, Lawrence, Barratt. Derek, and Hodgson, Stephen, 2010, Technical report on the 2009 program and update on metallurgy, Pebble copper-gold-molybdenum project, Iliamna Lake area, southwestern Alaska, U.S.A: Unpublished Technical Report for Northern Dynasty Minerals Ltd., 195 p. (posted on www.sedar.com, Mar. 18, 2010).

Haslinger, R.J., Payne, J.G., Price, S. and Rebagliati, C.M., 2004, 2003 Summary report on the Pebble Porphyry gold-copper project: Unpublished report for Northern Dynasty Minerals Ltd., 119 p. (posted on www.sedar.com, Jun. 30, 2004).

Rebagliati, C.M., 2003, Summary report on the Pebble copper-gold porphyry project; Unpublished report for Northern Dynasty Minerals Ltd., 94 p. (posted on www.sedar.com, Feb. 13, 2003.)

Rebagliati, C.M., and Payne, J.G. 2005, 2004 summary report on the Pebble gold-copper project: Unpublished report for Northern Dynasty Minerals Ltd., 118 p. (posted on www.sedar.com, Apr. 4, 2005).

Rebagliati, C.M., and Payne, J.G., 2007, 2006 summary report on the Pebble gold-copper-molybdenum project: Unpublished report for Northern Dynasty Minerals Ltd., 119 p. (posted on www.sedar.com, Apr. 2, 2007).

Primary Reference: Rebagliati, 2003

Reporter(s): C.C. Hawley, Hawley Resource Group, Anchorage, Alaska; D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Unnamed (near Frying Pan Lake)

Site type: Prospect

ARDF no.: IL006

Latitude: 59.8588 **Quadrangle:** IL D-7

Longitude: 155.3286

Location description and accuracy:

This prospect is centered on hill 1760 about 1.3 miles west of lake 943, locally called Frying Pan Lake. The site is near the center of section 5, T. 4 S., R. 35 W.

Commodities:

Main: Fe

Other: Ti, V

Ore minerals: Ilmenite, magnetite

Gangue minerals:

Geologic description:

This prospect is now mainly of local or historical interest as of 2011 in view of the great amount of exploration that has been done on the Pebble copper prospect (IL007) several miles to the northeast and the drilling on the '25 Zone' prospect (IL005) less than a half mile to the south.

This prospect is a body of breccia that consists of angular, magnetite-bearing pyroxenite fragments in a matrix of Tertiary or Cretaceous granodiorite (Reed and Detterman, 1965). Pyroxenite clasts constitute 50-90 percent of the breccia, and magnetite occurs in crystal aggregates as much as 1 inch across. Sixteen samples of breccia collected by Reed and Detterman (1965) contained 16 to 24 percent FeO, about 1.3 percent TiO2, 0.1 to 3.2 percent P2O5, and 0.1 to 0.15 percent V2O5. A magnetic concentrate of the material contained about 3.5 percent TiO2, reflecting the presence of ilmenite or titaniferous magnetite. Samples collected by Fischer (1975) contained about 0.02 percent V2O5, less than was reported by Reed and Detterman. Fischer's magnetite-rich concentrate from pyroxenite contained 40-60 percent iron, 3.1 percent TiO2, and 0.3-0.5 percent vanadium (Fischer, 1975). Bouley and others (1995) reported considerable iron in two samples of biotite pyroxenite they collected. Their sample 10 contained 18.78 percent iron (as Fe203). The rocks are also highly potassic and are similar to alkali ultramafic rocks in composite plutons elsewhere in the central Alaska Range (Foley and others, 1997).

Alteration:

Not noted.

Age of mineralization:

The pyroxenite is probably Late Cretaceous but possibly predates the 90 Ma Pebble Copper deposit (IL007).

Generic deposit model:

Deposit model:

Magnetite-bearing pyroxenite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Exploration has been limited to geologic mapping and surface sampling at this locale but see ARDF IL005 for drilling at a copper prospect about a mile to the south.

Production notes:

None.

Reserves:

Fischer (1975) estimated a resource of 7 billion tons of magnetite-bearing breccia that contained 7 million tons of vanadium.

Additional comments:

References:

Bouley, B.A., St. George, P., and Wetherbee, P.K., 1995, Geology and discovery at Pebble Copper, a copper-gold porphyry system in southwest Alaska: Canadian Institute of Mining, Metallurgy, and Petroleum, Special Volume 46, p. 422-435.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Iliamna, Lake Clark, Lime Hills, and McGrath quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-485, 101 p.

Cobb, E.H., and Reed, B.L., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in the Iliamna, Lake Clark, Lime Hills, and McGrath quadrangles, Alaska; Supplement to Open-File Report 76-485; Part A, Summaries to January 1, 1981: U.S. Geological Survey Open-File Report 81-1343-A, 25 p.

Cobb, E.H., and Reed, B.L., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in the Iliamna, Lake Clark, Lime Hills, and McGrath quadrangles, Alaska; Supplement to Open-File Report 76-485; Part B, Lists of references to January 1, 1981: U.S. Geological Survey Open-File Report 81-1343-B, 20 p.

Detterman, R.L., and Cobb, E.H., 1972, Metallic mineral resources map of the Iliamna quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-364, 1 sheet, scale 1:250,000.

Detterman, R.L., and Reed, B.L., 1980, Stratigraphy, structure, and economic geology of the Iliamna quadrangle, Alaska: U.S. Geological Survey Bulletin 1368-B, 86 p.

Fischer, R.P., 1975, Vanadium resources in titaniferous magnetite deposits: U.S. Geological Survey Professional Paper 926-B, p. B1-B10.

Foley, J.Y., Light, T.D., Nelson, S.W., and Harris, R.A., 1997, Mineral occurrences associated with mafic-ultramafic and related alkaline complexes in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 396-449.

Reed, B.L., and Detterman, R.L., 1965, A preliminary report on some magnetite-bearing rocks near Frying Pan Lake, Iliamna D-7 quadrangle, Alaska: U.S. Geological Survey Open-File Report 260, 2 p.

Primary Reference: Reed and Detterman, 1965; Fischer, 1975

Reporter(s): C.C. Hawley, Hawley Resource Group, Anchorage, Alaska; D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Pebble

Site type: Prospect

ARDF no.: IL007

Latitude: 59.8991 **Quadrangle:** IL D-7

Longitude: 155.2807

Location description and accuracy:

In plan view as of late 2011, the Pebble prospect covers an area about 1.9 by 2.8 miles and consists of two contiguous segments, West Pebble and East Pebble. The coordinates are at about the center of the prospect, about 9.2 miles north-northeast of Sharp Mountain and 18.7 miles northwest of Iliamna. It covers most of sections 26 to 28, T. 3 S., R. 35 W.

Commodities:

Main: Ag, Au, Cu, Mo

Other: As, Pb, Sb, Te, Zn

Ore minerals: Bornite, chalcocite, chalcopyrite, covellite, digenite, galena, goethite, gold, magnetite, molybdenite, pyrite, pyrrhotite, sphalerite, telluride minerals, tennantite-tetrahedrite

Gangue minerals: Quartz

Geologic description:

Pebble is a classic calc-alkalic copper-gold-molybdenum porphyry deposit. As of early 2011, the Pebble prospect extends over an area about 1.9 by 2.8 miles and has been explored to a depth of at least 5,000 feet (Gaunt and others, 2010). The Pebble prospect consists of two contiguous segments, Pebble West and Pebble East. Pebble West was discovered by Cominco American Inc. in 1988; it is amenable to open pit mining. Pebble East was discovered in 2005 by Northern Dynasty Minerals Inc. by drilling. Pebble East does not come to the surface and is covered by a wedge of postmineral volcanic and sedimentary rocks. It has been considered for underground mining by block caving.

In 2001, Northern Dynasty acquired the right to earn a 100 percent interest in Pebble from Teck-Cominco. As of 2006, Northern Dynasty had earned the 100 percent interest, subject only to royalties on production. In 2007, Northern Dynasty agreed to a partnership with Anglo American PLC to advance the Pebble project and as of early 2011, that partnership is in force as 'The Pebble Partnership' (2011).

From 1985 to 1997, Pebble was explored by Cominco American and Teck-Cominco, from 2001 to 2007 by Northern Dynasty, and from 2007 to early 2011 by The Pebble Partnership (Gaunt and others, 2010). The property has been covered by extensive geologic mapping and sampling, by several geochemical surveys, and by several ground and aerial geophysical surveys using a variety of techniques. As of December 2009, 1,085 holes, totaling 270,107 meters, have been drilled on Pebble. The drilling consisted of 568 exploration holes, 227 geotechnical holes, 60 holes for metallurgical samples, and 230 environmental holes. As the Northern Dynasty work has progressed, there has been a succession of profession technical reports describing the deposit and the work in detail; the latest is Gaunt and others (2010). (The others are in the reference list.)

The host rocks for the Pebble deposit are Jurassic and Cretaceous flysch that has been invaded by a variety of 96 to 99 Ma intrusive rocks including diorite sills, gabbro, alkali monzonite, a breccia complex, and granodiorite sills. Those rocks have been invaded by five 89-91 Ma granodiorite stocks, two of which are the principal sources of the mineralization in West Pebble and East Pebble. The East Pebble ore body is covered by a wedge of Upper Cretaceous to Tertiary sedimentary and volcanic rocks.

The mineralization consists mainly of pyrite, chalcopyrite, and molybdenite in and adjacent to two 90 Ma

granodiorite stocks (Gaunt and others, 2010). These ore minerals are disseminated and in zones of high-density quartz-vein stockworks, in the upper parts of the stocks, along granodiorite dikes that extend laterally from the stocks, and in the adjacent hornfelsed flysch and intrusive host rocks. Pebble West, which is exposed at the surface has an oxidized zone, usually no more than several tens of meters thick, and a supergene zone with deposition of chalcocite and covellite. The hornfelsed country rock is cut by a variety of veins including quartz veins, magnetite-bearing veins, pyrite-dominated veins, and polymetallic quartz-calcite veins with sphalerite galena, chalcopyrite, pyrrhotite, telluride minerals, and tetrahedrite-tennantite.

The mineralization was accompanied by several types of alteration. From younger to older, these include: 1) pre-hydrothermal hornfelsing; 2) deep sodic-calcic alteration; 3) early potassium feldspar-biotite-magnetite alteration that is associated with most of the copper-gold-molybdenum mineralization; 4) peripheral propylitic alteration; 5) an illite overprint of the the potassium silicate alteration; 6) younger advanced argillic alteration; and 7) young peripheral quartz-sericite-pyrite alteration.

As of November, 2010, the resources of the Pebble prospect have been calculated at 4 levels of copper-equivalent cut-off (CuEQ) (Ghaffari and others, 2011; Pebble Partnership, 2010). The measured and indicated mineral resources with a CuEQ of from 0.30 to 1.00 percent are from 5,942 million tonnes with a grade of 0.0.42 percent copper, 0.35 gram of gold per tonne, and 250 parts per million (ppm) molybdenum to 1,449 million tonnes with a grade of 0.76 percent copper, 0.52 gram of gold per tonne, and 341 ppm molybdenum. The inferred mineral resources with a CuEQ of from 0.30 to 1.00 percent are from 4,835 million tonnes with a grade of 0.24 percent copper, 0.26 gram of gold per tonne, and 215 ppm molybdenum to 353 million tons with a grade of 0.69 percent copper, 0.45 gram of gold per tonne, and 379 ppm molybdenum.

Alteration:

The mineralization was accompanied by several types of alteration. From younger to older, these include: 1) pre-hydrothermal hornfelsing; 2) deep sodic-calcic alteration; 3) early potassium feldspar-biotite-magnetite alteration that is associated with most of the copper-gold-molybdenum mineralization; 4) peripheral propylitic alteration; 5) an illite overprint of the the potassium-silicate alteration, 6) younger advanced argillic alteration; and 7) young peripheral quartz-sericite-pyrite alteration.

Age of mineralization:

Unambiguously related to two 89-91 Ma granodiorite stocks.

Generic deposit model:

Deposit model:

Porphyry Cu-Au-(Mo) (Cox and Singer, 1986; model 20c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c

Production Status: None

Site Status: Active

Workings/exploration:

From 1985 to 1997, Pebble was explored by Cominco American and Teck-Cominco, from 2001 to 2007 by Northern Dynasty, and from 2007 to early 2011 by The Pebble Partnership (Gaunt and others, 2010). The property has been covered by extensive geologic mapping and sampling, by several geochemical surveys, and by several ground and aerial geophysical surveys using a variety of techniques. As of December 2009, 1,085 holes, totaling 270,107 meters, have been drilled on Pebble. The drilling consisted of 568 exploration holes, 227 geotechnical holes, 60 holes for metallurgical samples, and 230 environmental holes. As the Northern Dynasty work has progressed, there has been a succession of profession technical reports describing the deposit and the work in detail; the latest is Gaunt and others (2010). (The others are in the reference list.)

Production notes:

None.

Reserves:

As of November, 2010, the resources of the Pebble prospect have been calculated at 4 levels of copper-equivalent cut-off (CuEQ) (Ghaffari and others, 2011; Pebble Partnership, 2010). The measured and indicated mineral resources with a CuEQ of from 0.30 to 1.00 percent are from 5,942 million tonnes with a grade of 0.0.42 percent copper, 0.35 gram of gold per tonne, and 250 parts per million (ppm) molybdenum to 1,449 million tonnes with a grade of 0.76 percent copper, 0.52 gram of gold per tonne, and 341 ppm molybdenum. The inferred mineral resources with a CuEQ of from 0.30 to 1.00 percent are from 4,835 million tonnes with a grade of 0.24 percent copper, 0.26 gram of gold per tonne, and 215 ppm molybdenum to 353 million tons with a grade of 0.69 percent copper, 0.45 gram of gold per tonne, and 379 ppm molybdenum.

Additional comments:

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Primary Reference: Gaunt, 2010

Reporter(s): C.C. Hawley (Hawley Resource Group); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Fog Lake

Site type: Prospect

ARDF no.: IL030

Latitude: 59.5116 **Quadrangle:** IL C-4

Longitude: 154.3639

Location description and accuracy:

This record represents an approximately 4,000-foot-long mineralized area along locally-named Fog Creek, a northwest-flowing tributary of Fog Lake (Fog Pond on some older maps). The site is in the approximate center of the area, in the NE1/4 SW1/4 sec. 3, T. 8 S., R. 30 W., Seward Meridian. The location is accurate within 0.1 mile for the center of the prospect area. The prospect is number 14 of Detterman and Cobb (1972) and number 12 of Reed (1967).

Commodities:

Main: Au, Cu

Other: Ag, Zn

Ore minerals: Azurite, chalcopyrite, gold, malachite, pyrite, sphalerite

Gangue minerals: Calcite, quartz

Geologic description:

The Fog Lake prospect is mainly in volcanic rocks exposed in the canyon of locally-named Fog Creek, a southeast tributary of Fog Lake.
The volcanic rocks and subordinate interbedded sedimentary rocks unconformably overlie Jurassic plutonic rocks at shallow depth (Retherford and Klemmick, 1999). From their base up, the strata are: (1) plutonic-cobble conglomerate of probable early Tertiary age; (2) green polymict conglomerate of probable early Tertiary age that possibly correlates with the upper conglomerate member of the Copper Lake Formation (Detterman and Reed, 1980); (3) dacite/dacite breccia of probable late Eocene to early Oligocene age; (4) dacite/quartz porphyry breccia similar in age to unit 3; (5) lahar flow breccia; (6) quartz-porphyry tuff breccia of probable late Eocene to early Oligocene age; (7) rhyodacite crystal tuff; and (8) argillized dacite. The volcanic rocks are cut by dacite dikes 2 to 20 feet in width (Retherford and Klemmick, 1999). Depending on their original composition, the volcanic rocks are widely propylitized and locally sericitized, silicified, and argillized. The dacite/dacite breccia of unit 3 may be coeval with intrusive rocks exposed about 6 miles east of Fog Lake that have been dated at about 36 Ma (Detterman and Reed, 1980). The Fog Lake deposit apparently is aligned northwesterly, subparallel to a fault along Fog Creek nearly coincident with the axis of a syncline. The deposit locally may extend east to northeast along cross faults or dacite dikes.

The Fog Lake deposit consists of gold- and sulfide-bearing quartz-calcite veins and sulfide disseminations (Butherus and others, 1981; Moller and others, 1982; Freeman and Farnham, 1983; Retherford and Klemmick, 1999). Pyrite and chalcopyrite are disseminated in all of the volcanic rocks but are most abundant in units 1 through 5. Swarms of sulfide veinlets up to an inch or so thick occur in northeast, northwest, and east-west fracture sets. Maximum vein density is about 8 per foot. Sulfides, mainly pyrite and chalcopyrite, along with subordinate olive-colored sphalerite, form small masses in quartz-calcite gangue. Azurite and malachite occur locally in gossan. Gold appears to correlate with sulfide content, and probably is free milling; it can be panned along about 2,200 feet of Fog Creek. Rock samples locally contain more than 1 ounce of gold per ton (Reed, 1967; Retherford and Klemmick, 1999). The deposit has been explored by shallow trenches. The maximum gold content in various samples from the trenches was

1.5 parts per million, and the maximum copper content was 11 percent (Freeman and Farnham, 1983). A gold-in-soil anomaly along Fog Creek is about one-half mile long and 700 feet wide. An exceptional soil sample contained 18.8 parts per million gold. Gold in soil correlates moderately well with copper and zinc.

As of 2008, Andover Ventures is exploring the deposit under an agreement with the Bristol Bay Native Corporation (Andover Ventures, 2006, Fog Lake; 2007, Progress Report). They have yet to drill the property but they have provided a map of the areas of interest and indicate several zones where numerous samples are anomalous in gold, copper, silver, and zinc (Andover Venures, 2008, Map of Fog Lake).

Alteration:

Extensive propylitic alteration in the darker volcanic rocks; local argillic, sericitic, and silicic alteration. Oxidation of iron and copper minerals.

Age of mineralization:

Possibly about 36 Ma, the age of intrusive rocks about six miles east of Fog Lake.

Generic deposit model:

Deposit model:

Epithermal gold-copper deposit, possibly grading downward into porphyry copper-gold deposit (Cox and Singer, 1986; models 25b and 20c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

25b, 20c?

Production Status: None

Site Status: Inactive

Workings/exploration:

The deposit was discovered in 1967 by B. L. Reed of the U.S. Geological Survey. Reed collected samples that contained anomalous copper and silver and as much as 37.7 parts per million gold (Reed, 1967). The prospect was subsequently staked by St. Eugene Mining Company, but abandoned without significant work. It was explored by Resource Associates of Alaska (RAA) for several years (Butherus and others, 1981; Moller and others, 1982; Freeman and Farnham, 1983). Soil samples were collected on a grid totaling more than 24,000 lineal feet (Butherus and others, 1981). Soil sampling was followed by detailed geologic mapping along Fog Creek, by trenching, and by magnetic and VLF surveys (Moller and others, 1982).

As of 2008, Andover Ventures is exploring the deposit under an agreement with the Bristol Bay Native Corporation (Andover Ventures, 2006, Fog Lake; 2007, Progress Report). They have yet to drill the property but they have provided a map of the areas of interest and indicate several zones where numerous samples are anomalous in gold, copper, silver, and zinc (Andover Venures, 2008, Map of Fog Lake).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Primary Reference: Moller and others, 1982; Retherford and Klemmick, 1999

Reporter(s): C.C. Hawley (Hawley Resource Group, Anchorage, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): KUY

Site type: Prospects

ARDF no.: IL035

Latitude: 59.2631 **Quadrangle:** IL B-5

Longitude: 154.611

Location description and accuracy:

The KUY prospects are about five miles south of the east end of Gibraltar Lake. They are in, and on the east and west flanks of, the incised north-trending canyon of informally-named Katrina Creek, in the SE1/4 sec. 35, T. 10 S., R. 32 W., Seward Meridian. Mineralization related to the KUY deposit may extend into the SW1/4 sec. 36, same township, and into the NE1/4 sec. 2, T. 11 S., R. 32 W.. For this record, the location is at an elevation of about 1,300 feet in the canyon, and is accurate for the center of this large and complex mineralized system.

Commodities:

Main: Au, Cu, Mo, Te

Other: Ag, Zn

Ore minerals: Chalcopyrite, gold, gold and silver tellurides?, magnetite, molybdenite, pyrite

Gangue minerals: Clay, quartz

Geologic description:

The KUY prospects explore deposits potentially valuable for gold and copper-molybdenum. The geologic setting of the prospects has been interpreted in different ways. From 1979 until 1984, Resource Associates of Alaska (RAA) mapped the country rocks as Cretaceous or Tertiary andesite and dacite flows that locally dip 50 degrees. As interpreted by RAA, the flows are cut by an irregular zone of breccia as much as 2,500 feet across composed mostly of fragments of dacite tuff that forms the center of a caldera about 8,000 feet across (Butherus and others, 1981). Retherford and Hickok (1990) subsequently proposed that the volcanic rocks are intruded by a Cretaceous or Tertiary quartz diorite stock, and that the breccia is a diatreme immediately north of the stock.

About 60 percent of the breccia is pervasively altered and contains 3 to 5 percent sulfides, mostly pyrite and subordinate chalcopyrite. The breccia is locally cut by quartz-magnetite veins, vuggy gold-bearing quartz veins, and pyritic clay veins. Silicification and intense argillization are probably superimposed on widespread propylitization. Retherford and Hickok (1990) proposed that there is a core zone of potassium silicate alteration and a zone of sericitic alteration between stock and diatreme (breccia).

In 1978, rich gold- and silver-bearing quartz veins were found by RAA in informally named Katrina Creek canyon at about 1,600 feet elevation. The RAA-named Discovery vein strikes NNE and dips about 55 SE; the subsequently discovered Amethyst vein strikes west-northwest and dips about 70 SW (Anderson and others, 1979). A sample of the Discovery vein assayed about 106 ounces of gold and 103 ounces of silver per ton (Anderson and others, 1979; Butherus and others, 1981). The gold occurs in masses about 2 mm across; gold and silver tellurides are also reported. The rich veins are about 10 inches or less thick and traceable for a maximum distance of about 200 feet. The auriferous part of the deposit was drilled in 1980 with little success, leading to the interpretation that the veins are in discontinuous gash fissures. There reportedly were core recovery problems and the rich veins remain an intriguing target. Two other types of gold-bearing veins are reported: pyritic clay veins that assay as much as 0.37 ounce of gold per ton, and quartz-pyrite-magnetite veins.

The exploration to 2006, suggested that a porphyry copper-molybdenum(-gold) system might underlie the

highly altered volcanic complex. Freeman and Farnham (1983) reported that samples from the Hercules and Minerva trenches contained up to 495 parts per million (ppm) copper and and 45 ppm molybdenum. One sample from Minerva 1 trench contained 1.23 ppm gold. Butherus (1984) followed up Freeman and Farnham's work with more trenches in the same area. His samples from the Minerva 3 trench contained as much as 1,175 ppm copper, 193 ppm lead, and 307 ppm zinc, and generally elevated values of molybdenum. Several reports suggest that rich gold veins are near the top of the mineralized system (Butherus, 1981; Freeman and Farnham, 1983; Butherus, 1984).

As of 2008, Andover Ventures (2006, Nov 13; 2006, News; 2006, KUY) holds the property. They sampled the property and carried out ground induced polarization surveys in 2006. They drilled four holes in 2007, totaling 793 meters (Andover Ventures, 2007, Progress Report) and cut significant intervals with silica flooding, quartz stockworks, clay alteration, and up to 15 percent sulfides. The mineralization was mainly pyrite with zones of chalcopyrite in veinlets and disseminated in the altered dacitic rocks.

Alteration:

Widespread propylitic alteration (chlorite, magnetite, and epidote) followed by argillization (kaolinite), and silicification (Butherus and others, 1981). Retherford and Hickok (1990) mapped a core zone of potassium silicate alteration extending outward through sericite alteration to peripheral propylitic alteration.

Age of mineralization:

Probably Late Cretaceous or Early Tertiary.

Generic deposit model:

Deposit model:

Epithermal low-sulfide gold-quartz veins; possibly overlying a porphyry copper-molybdenum system (Cox and Singer, 1986; models 36a and 21a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a, 21a?

Production Status: None

Site Status: Active

Workings/exploration:

Rich gold veins were discovered in 1978 by geologists of Resource Associates of Alaska (Anderson and others, 1979). Other veins were found in 1979, and the prospect was drilled in 1980, but the drill holes did not encounter rich ore. In addition to the drilling, the deposit has been trenched. Butherus (1984) followed up Freeman and Farnham's work with more trenches in the same area. As of 2008, Andover Ventures (2006, Nov 13; 2006, News; 2006, KUY) holds the property and did sampling and ground induced polarization surveys in 2006. They drilled four holes in 2007, totaling 793 meters (Andover Ventures, 2007, Progress Report) and cut significant intervals with silica flooding, quartz stockworks, clay alteration, and up to 15 percent sulfides. The mineralization was mainly pyrite with zones of chalcopyrite in veinlets and disseminated in the altered dacitic rocks.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Primary Reference: Anderson and others, 1979; Butherus and others, 1981; Retherford and Hickok, 1990

Reporter(s): C.C. Hawley (Hawley Resource Group): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Kamishak (Painted River)

Site type: Prospect

ARDF no.: IL047

Latitude: 59.2329 **Quadrangle:** IL A-4

Longitude: 154.4713

Location description and accuracy:

The Kamishak prospect is in the SE1/4 SE1/4 section 10, T. 11 S., R. 31 W. It is at an elevation of about 1,500 feet on the northwest wall of a southwest-trending canyon that continues into adjacent section 15. The location is accurate within 500 feet.

Commodities:

Main: Au, Cu

Other: Ag, Fe

Ore minerals: Bornite, chalcopyrite, magnetite, malachite, pyrite

Gangue minerals: Quartz

Geologic description:

The Kamishak prospect is a breccia pipe at least 300 feet in diameter in Jurassic(?) intermediate and mafic igneous rocks (Detterman and Reed, 1980; Alaska Geologic Materials Center, 1995; P. Thurston, written communication, 2003). The strongest mineralization in the pipe is near its walls, and consists of angular blocks of intensely sericitized, fine- to medium- grained gabbro, with 1 to 5 percent sulfides, in a matrix of coarse amphibole, biotite, and plagioclase. Weaker mineralization occurs in less-brecciated to massive gabbro and diorite, containing irregular clots of amphibole, biotite, chlorite, and sulfides. Minor phases of the breccia include hornblende gabbro and gabbroic anorthosite; the anorthosite locally contains a few percent of disseminated magnetite.

The sulfide minerals are chiefly pyrite and chalcopyrite; bornite locally makes up as much 5 percent of the breccia. Malachite coats joint faces of the mineralized rock which also contains up to about 3 percent magnetite. Samples of the breccia locally contain significant gold and copper and up to about 0.3 ounce of silver per ton. American Copper and Nickel Company (ACNC) drilled the deposit in 1990 and 1991 for a total of 5,300 feet (Alaska Geologic Materials Center, 1995). In drill hole 83523, the interval between 166 and 235 feet contained as much as 1,990 parts per billion gold and 2.58 percent copper; none of the core contained less than 102 parts per billion gold and 0.255 percent copper. Drill holes 83521 and 83524 through 83527 are also appreciably mineralized.

Alteration minerals in the breccia include chlorite, biotite, potassium feldspar, and sericite. Relatively high gold values appear to accompany coarse secondary biotite and apparently do not correlate with copper content.

Full Metal Minerals and Andover Ventures drilled 5 holes on this prospect in 2006 that totaled 750 meters (Andover Resources, 2008a, 2008b). Three of the 5 holes cut mineralization. Notable intercepts were: 1) 73.5 meters that contained 0.31 percent copper and 0.28 gram of gold per ton, 2) 51.0 meters that contained 0.48 percent copper and 0.46 gram of gold per ton, and 3) 7.50 meters that contained 0.36 percent copper and 0.53 gram of gold per ton. Two areas of mineralized breccia were identified. The westernmost breccia is a pipelike body about 30 by 50 meters in size; it is cut by a narrow fault with malachite and by thin sulfide- and magnetite-rich veins. The other breccia is a mineralized, pipelike body about 75 by 150 meters in size that extends to a depth of at least 75 meters. It has disseminated copper minerals as well as sulfide-bearing veinlets. This breccia locally contains abundant biotite, is strongly silicified, and also has sericite-pyrite, and

chlorite alteration.

In January, 2008 Alix Resources Corp. acquired the property from Full Metals Minerals and proposed future drilling to test two models of the deposit (Alix Resources Corp., 2008). One is that breccia mineralization is related to a porphyry-copper-type deposit. The other is that the breccia is structurally controlled and related to a northwest-striking structure across the property, i.e., the mineralization postdates the diorite and gabbro host rocks.

Alteration:

Propylitic and potassic: development of secondary biotite and potassium feldspar; local sericitization.

Age of mineralization:

Jurassic?

Generic deposit model:

Deposit model:

Porphyry copper-gold? (Cox and Singer, 1986; model 20c?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c?

Production Status: None

Site Status: Active

Workings/exploration:

The prospect was discovered by Andy Snyder of the Spokane office of American Copper and Nickel Company (P. Thurston, written communication, 2003). The company core drilled 18 holes in 1990 and 1991 for a total of 5,300 feet. Full Metal Minerals and Andover Ventures drilled 5 holes on this prospect in 2006 that totaled 750 meters (Andover Resources, 2008a, 2008b). In 2008, Alix Resources Corp. acquired the property.

Production notes:

None.

Reserves:

None.

Additional comments:

Much of the geologic description in this record is abstracted from logs of drill core stored at the Alaska Geologic Materials Center in Eagle River, Alaska (Alaska Geologic Materials Center, 1995).

References:

Alaska Geologic Materials Center, 1995, Geologic and mineral logs of 18 holes of the Kamishak prospect in the Paint River area of southwest Alaska: Alaska Division of of Geological and Geophysical Surveys, Alaska Geologic Materials Center Data Report No. 256, 127 p.

Alix Resources Corp., 2008, The Kamishak property: http://www.alixresources.com/index.php?page=kamishak (as of May 20, 2008).

Andover Resources, 2008, North Breccia Drilling Summary: http://www.andoverventures.com/projects/kamishak/north_breccia_drill_summary/ (as of March 4, 2008)

Detterman, R.L., and Reed, B.L., 1980, Stratigraphy, structure, and economic geology of the Iliamna

quadrangle, Alaska: U.S. Geological Survey Bulletin 1368-B, 86 p.

Primary Reference: Alix Resources Corp., 2008 (The Kamishak property)

Reporter(s): C.C. Hawley, Hawley Resource Group, Anchorage, Alaska; D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): 308 Zone

Site type: Prospect

ARDF no.: IL053

Latitude: 59.7779 **Quadrangle:** IL D-7

Longitude: 155.485

Location description and accuracy:

The 308 Zone prospect is about 2.8 miles west of the top of Sharp Mountain, near the northeast corner of section 1, T. 5 S., R. 37 W. The location is accurate.

Commodities:

Main: Au?, Cu, Mo

Other:

Ore minerals: Chalcopyrite, molybdenite, pyrite

Gangue minerals: Quartz

Geologic description:

A single hole was drilled on the 308 Zone in 2004 by Northern Dynasty Minerals Inc. to test a IP geophysical anomaly in an area where a monzodiorite dike projects from the Kaskanak batholith into an area of well-bedded hornfelsed, Jurassic to Cretaceous argillite and siltstone (Rebagliati and Payne, 2005). The hole was entirely in porphyry-style alteration and mineralization similar to that at the 38 Zone prospect (IL004) about three miles to the northeast. The main-stage mineralization consists of weak, potassium-feldspar alteration with disseminated chalcopyrite, and quartz veins with some chalcopyrite and molybdenite. This mineralization was overprinted by strong sericite-pyrite alteration associated with quartz-pyrite and pyrite veins. Several thin polymetallic veins were intersected in the drill holes. The amount of chalcopyrite decreases markedly with depth, and the density of all of the veins is low along the length of the hole. The extent of this deposit is unknown.

Alteration:

Main stage alteration consists of weak, potassium-feldspar alteration with disseminated chalcopyrite, and quartz veins with some chalcopyrite and molybdenite. The mineralization was overprinted by strong sericite-pyrite alteration associated with quartz-pyrite and pyrite veins.

Age of mineralization:

Probably Late Cretaceous, about 90 Ma, by analogy with the nearby Pebble deposit (IL007).

Generic deposit model:

Deposit model:

Porphyry copper-gold-molybdenum deposit (Cox and Singer, 1986; model 20c or 21a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c or 21a

Production Status: None

Site Status: Active

Workings/exploration:

The area has been covered by extensive geochemical and geophysical surveys beginning in about 1986 as part of the exploration of the Pebble block of claims first by Cominco, by it successor Teck-Cominco, and through early 2011 by Northern Dynasty Minerals Ltd. Considerable mapping and sampling at the surface; 1 hole drilled in 2004.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Gaunt, J.D., Rebagliati, C.M., Lang, James, Titley, Eric, Melis, Lawrence, Barratt. Derek, and Hodgson, Stephen, 2010, Technical report on the 2009 program and update on metallurgy, Pebble copper-gold-molybdenum project, Iliamna Lake area, southwestern Alaska, U.S.A: Unpublished Technical Report for Northern Dynasty Minerals Ltd., 195 p. (posted on www.sedar.com, Mar. 18, 2010).

Rebagliati, C.M., and Payne, J.G. 2005, 2004 summary report on the Pebble gold-copper project: Unpublished report for Northern Dynasty Minerals Ltd., 118 p. (posted on www.sedar.com, Apr. 4, 2005).

Primary Reference: Rebagliati and Payne, 2005

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Sill

Site type: Prospect

ARDF no.: IL054

Latitude: 59.8513 **Quadrangle:** IL D-6

Longitude: 155.2074

Location description and accuracy:

The Sill prospect is about 9.0 miles northeast of Sharp Mountain near the northeast corner of section 12. T. 4 S. R. 35 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold, pyrite

Gangue minerals: Quartz

Geologic description:

The Sill deposit is in Tertiary (40 Ma) fine-grained, equigranular to porphyritic latite (Bouley and others, 1995; Haslinger and others, 2004). The mineralization consists of narrow gold-quartz veins and quartz breccias in narrow pyritic alteration envelopes.

The Sill deposit was found in 1988 by Teck Cominco; they drilled 24 holes in 1988 and another 15 holes in 1989 for a total of 3,183 meters. Numerous intercepts contained more than 5 grams of gold per tonne including: 0.61 meters with 22.83 grams of gold per tonne, 0.61 meters with 24.34 grams of gold per tonne, 1.37 meters with 34.29 grams of gold per tonne, 0.49 meters with 26.00 grams of gold per tonne, and 0.30 meters with 25.99 grams of gold per tonne (Haslinger and others, 2004, table 8.0). Although the Sill prospect is in the large Pebble claim block held by Northern Dynasty Minerals Inc. as of early 201, they have done no work on the prospect.

Alteration:

Gold-quartz veins are in narrow pyritic alteration envelopes.

Age of mineralization:

40 Ma or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Low-sulfide gold-quartz veins (Cox and Singer, 1956; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

The Sill deposit was found in 1988 by Teck Cominco; they drilled 24 holes in 1988 and another 15 holes in 1989 for a total of 3,183 meters. Although the Sill prospect is in the large Pebble claim block held by Northern Dynasty Minerals Inc. as of early 201, they have done no work on the prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bouley, B.A., St. George, P., and Wetherbee, P.K., 1995, Geology and discovery at Pebble Copper, a copper-gold porphyry system in southwest Alaska: Canadian Insitute of Mining, Metallurgy, and Petroleum, Special Volume 46, p. 422-435.

Gaunt, J.D., Rebagliati, C.M., Lang, James, Titley, Eric, Melis, Lawrence, Barratt. Derek, and Hodgson, Stephen, 2010, Technical report on the 2009 program and update on metallurgy, Pebble copper-gold-molybdenum project, Iliamna Lake area, southwestern Alaska, U.S.A: Unpublished Technical Report for Northern Dynasty Minerals Ltd., 195 p. (posted on www.sedar.com, Mar. 18, 2010).

Haslinger, R.J., Payne, J.G., Price, S. and Rebagliati, C.M., 2004, 2003 Summary report on the Pebble Porphyry gold-copper project: Unpublished report for Northern Dynasty Minerals Ltd., 119 p. (posted on www.sedar.com, Jun. 30, 2004).

Primary Reference: Haslinger and others, 2004

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Hope

Site type: Prospect

ARDF no.: JU022

Latitude: 58.8815 **Quadrangle:** JU D-4

Longitude: 135.0996

Location description and accuracy:

The Hope prospect is at an elevation of about 2,350 feet, in the Kakuhan Range, 2 miles northeast of Pt. Sherman on Lynn Canal and 1 mile west of Lions Head Mountain. It is approximately 0.2 mile east-southeast of the Ivanhoe Mine in the NE1/4 section 32, T. 34 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, Cu

Ore minerals: Chalcopyrite, pyrite

Gangue minerals: Quartz

Geologic description:

Note: Beginning in the 1990s, this and several old other mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Kensington (Coeur-Alaska) deposit (JU261). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Hope prospect was discovered in 1895 and by 1902 was developed by 2 adits and an open cut. The prospect is an east-trending quartz vein in metamorphosed basalt, unlike most other veins in the Berners Bay district which typically are hosted in Jualin Diorite. The vein is 8 feet thick in one adit. Samples contained up to 25 ppm gold (Redman and others, 1989).

The Hope prospect is in the Berners Bay district at the north end of the Juneau Gold Belt. The district is characterized by a series of structurally-controlled mesothermal, gold-bearing quartz veins. Most of the veins are in Lower Cretaceous Jualin Diorite, which intrudes Upper Triassic metabasalt (Miller and others, 1995). The age of mineralization in the Berners Bay area is about 55 Ma, the same as the other mesothermal gold vein deposits in the Juneau Gold Belt (Goldfarb and others, 1997).

Alteration:

Age of mineralization:

The age of mineralization in the Berners Bay district is about 55 Ma, the same as the other mesothermal gold-quartz-vein deposits in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

The Hope prospect was discovered in 1895 and by 1902 it had 2 adits and an open cut.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Birak, D.J., 2006, Kensington gold project technical report: Unpublished Technical Report by Coeur d'Alene Mines, 116 p. (posted on www.sedar.com, April 20, 2008).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Primary Reference: Redman and others, 1989; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Ophir; Hartford; Chilkat; Selkirk; Acropolis

Site type: Prospect

ARDF no.: JU026

Latitude: 58.8696 **Quadrangle:** JU D-4

Longitude: 135.0983

Location description and accuracy:

The Ophir prospect (or 'mine' as it is commonly called even though it has no production) is at an elevation of about 1,450 feet, 2 miles northeast of Pt. Sherman on Lynn Canal and 1 mile west-southwest of Lions Head Mountain in the Kakuhan Range. The 'Ophir Mine' is marked on the Juneau D-4 topographic map. It is approximately 3/4 mile northwest of the Kensington Mine (JU029), in the NE1/4 section 5, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Cu, Pb, Sb, Te, Zn

Ore minerals: Arsenopyrite, calaverite, chalcopyrite, galena, gold, hessite, petzite, pyrite, sphalerite, tetrahedrite

Gangue minerals: Albite, ankerite, apatite, calcite, chlorite, ferroan dolomite, muscovite, quartz, rutile, tourmaline

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Kensington (Coeur-Alaska) deposit (JU261). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Ophir prospect consists of several quartz veins and associated quartz-vein stockwork in Jualin Diorite. The Ophir deposit was discovered in 1887; the workings consist of a 350-foot adit with 250 feet of drifts, a 125-foot adit with a 75-foot crosscut, and a 75-foot inclined shaft (Redman and others, 1989). The Ophir workings explored at least 5 quartz veins, the Hartford, Ophir, Chilkat, Selkirk, and Acropolis (Kensington Mines, 1914).

Alteration:

Hydrothermal alteration adjacent to the veins is characterized by reddish-brown ferroan dolomite alteration (Miller and others, 1995). Other alteration includes sericitization of plagioclase, chloritization and sulfidization of mafic minerals, and albitization of feldspars (Leveille, 1991).

Age of mineralization:

The age of mineralization in the Berners Bay district is about 55 Ma, the same as the other mesothermal gold-quartz-vein deposits in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Undetermined

Site Status: Active

Workings/exploration:

The Ophir deposit was discovered in 1887. Workings consist of a 350-foot adit with 250 feet of drifts, a 125-foot adit with a 75-foot crosscut and a 75-foot inclined shaft (Redman and others, 1989). The deposit has been explored by Placid Oil Co. and Echo Bay Mines/Coeur-Alaska, and in 2001 is controlled by Coeur-Alaska.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Kensington Mines Company, 1902-1914, Miscellaneous reports and data in connection with Kensington Mines Company, Berners Bay, Alaska: Alaska Territorial Department of Mines, Miscellaneous Report MR 112-02, 112 p.

Knopf, Adolph, 1911, Geology of the Berners Bay region, Alaska: U.S. Geological Survey Bulletin 446, 58 p.

Leveille, R.A., 1991, Geology and gold deposits of the Jualin mine area, Berners Bay district, southeastern Alaska: Fairbanks, University of Alaska, M.S. thesis, 200 p.

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Swainbank, R.C., Bundtzen, T.K., and Wood, J.E., 1991, Alaska's mineral industry, 1990: Alaska Division of Geological and Geophysical Surveys Special Report 45, 78 p.

Primary Reference: Miller and others, 1995; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Horrible; Savage

Site type: Mine

ARDF no.: JU027

Latitude: 58.8686 **Quadrangle:** JU D-4

Longitude: 135.0904

Location description and accuracy:

The Horrible Mine is at an elevation of about 2,150 feet, 2 miles northeast of Pt. Sherman on Lynn Canal and 1 mile west-southwest of Lions Head Mountain in the Kakuhan Range. The Horrible Mine is marked on the Juneau D-4 topographic map. It is approximately 1/2 mile northwest of the Kensington Mine (JU029), in the NW1/4 section 4, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Cu, Pb, Sb, Te, Zn

Ore minerals:

Gangue minerals: Albite, ankerite, apatite, calcite, chlorite, ferroan dolomite, muscovite, quartz, rutile, tourmaline

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Kensington (Coeur-Alaska) deposit (JU261). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The deposit at the Horrible Mine consists of a quartz vein that was discovered about 1887 and by 1912 was developed by a 84-foot adit, a 408-foot adit, a 230-foot crosscut, and a 20-foot winze (Redman and others, 1989). The mine produced 75 ounces of gold from 500 tons of ore, although 1,500 tons were mined from stopes (Redman and others, 1989). The main (Savage) vein in the Horrible Mine trends northerly and dips 45-75 east. It is in Jualin Diorite and consists of a primary quartz vein and a stockwork of quartz veins (Redman and others, 1989).

Alteration:

Age of mineralization:

The age of mineralization in the Berners Bay district is about 55 Ma, the same as the other mesothermal gold-quartz-vein deposits in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The Horrible vein was discovered about 1887 and by 1912 it was developed by a 84-foot adit, a 408-foot adit, a 230-foot crosscut and a 20-foot winze (Redman and others, 1989). The deposit has been extensively drilled by Placid Oil Co. and Echo Bay Mines/Coeur-Alaska and is currently (2001) controlled by Coeur-Alaska.

Production notes:

The Horrible mine produced 75 ounces of gold from 500 tons of ore, although 1,500 tons were mined from stopes (Redman and others, 1989).

Reserves:

None.

Additional comments:

References:

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).)

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Knopf, Adolph, 1911, Geology of the Berners Bay region, Alaska: U.S. Geological Survey Bulletin 446, 58 p.

Leveille, R.A., 1991, Geology and gold deposits of the Jualin mine area, Berners Bay district, southeastern Alaska: Fairbanks, University of Alaska, M.S. thesis, 200 p.

Miller, L.D., Goldfarb, R.J., Gehrels, G,E., and Snee, L.W., 1994, Genetic links among fluid cycling, vein formation, regional deformation, and plutonism in the Juneau gold belt, southeastern Alaska: Geology, v. 22, p. 203-206

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Primary Reference: Miller and others, 1995; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Mexican

Site type: Prospect

ARDF no.: JU028

Latitude: 58.867

Quadrangle: JU D-4

Longitude: 135.089

Location description and accuracy:

The Mexican prospect is at an elevation of about 2,050 feet, 2 miles northeast of Pt. Sherman on Lynn Canal and 1 mile west-southwest of Lions Head Mountain in the Kakuhan Range. It is 1/4 mile NW of the Kensington Mine (JU029) in the NW1/4 section 4, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Cu, Pb, Sb, Te, Zn

Ore minerals:

Gangue minerals: Albite, ankerite, apatite, calcite, chlorite, ferroan dolomite, muscovite, quartz, rutile, tourmaline

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Kensington (Coeur-Alaska) deposit (JU261). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Mexican prospect was discovered in 1887 and developed by 2 adits, a 135-foot crosscut, and a 106-foot drift. The deposit consists of a 1- to 8-foot-thick quartz vein, and a quartz-vein stockwork along a shear zone in Jualin Diorite. The zone trends northerly and dips 60-84 degrees east. The vein is possibly the same as the main vein one at the Horrible Mine (JU027) (Redman and others, 1989).

Alteration:

Hydrothermal alteration adjacent to the veins is characterized by reddish-brown ferroan dolomite alteration (Miller and others, 1995). Other alteration includes sericitization of plagioclase, chloritization and sulfidization of mafic minerals, and albitization of feldspars (Leveille, 1991).

Age of mineralization:

The age of mineralization in the Berners Bay district is about 55 Ma, the same as the other mesothermal gold-quartz-vein deposits in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
36a

Production Status: None

Site Status: Active

Workings/exploration:
In its early years, the Mexican prospect was developed by 2 adits, a 135-foot crosscut and a 106-foot drift.

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Coeur d'Alene Mines Corporation, 2001, Corporate website: http://www.coeur.com; accessed August 2002

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Knopf, Adolph, 1911, Geology of the Berners Bay region, Alaska: U.S. Geological Survey Bulletin 446, 58 p.

Leveille, R.A., 1991, Geology and gold deposits of the Jualin mine area, Berners Bay district, southeastern Alaska: Fairbanks, University of Alaska, M.S. thesis, 200 p.

Miller, L.D., Goldfarb, R.J., Gehrels, G,E., and Snee, L.W., 1994, Genetic links among fluid cycling, vein formation, regional deformation, and plutonism in the Juneau gold belt, southeastern Alaska: Geology, v. 22, p. 203-206

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Swainbank, R.C., Bundtzen, T.K., and Wood, J.E., 1991, Alaska's mineral industry, 1990: Alaska Division of Geological and Geophysical Surveys Special Report 45, 78 p.

Primary Reference: Miller and others, 1995; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Kensington

Site type: Mine

ARDF no.: JU029

Latitude: 58.8642 **Quadrangle:** JU D-4

Longitude: 135.0816

Location description and accuracy:

The Kensington Mine is at an elevation of approximately 2,000 feet, about 2 miles northeast of Pt. Sherman on Lynn Canal and 1 mile southwest of Lions Head Mountain in the Kakuhan Range. It is marked on the Juneau D-4 topographic map. It is in the center of section 4, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Cu, Pb, Sb, Te, Zn

Ore minerals:

Gangue minerals: Albite, ankerite, apatite, calcite, chlorite, ferroan dolomite, muscovite, quartz, rutile, tourmaline

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Kensington (Coeur-Alaska) deposit (JU261). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Kensington vein was discovered in 1886. It was explored and mined from 1897 to 1900. Total production was 2,600 ounces of gold from 10,342 tons of ore (Redman and others, 1989).

Alteration:

Age of mineralization:

Hydrothermal muscovite from veins at the Kensington Mine gives ages of from 53.4 to 56.6 Ma (Miller and others, 1994). This coincides with the 55 Ma age of the other mesothermal gold-quartz-vein deposits in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes

Site Status: Active

Workings/exploration:

The Kensington vein was discovered in 1886. It was explored and mined from 1897 to 1900.

Production notes:

Total production was 2,600 ounces of gold from 10,342 tons of ore (Redman and others, 1989).

Reserves:

None.

Additional comments:

References:

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Knopf, Adolph, 1911, Geology of the Berners Bay region, Alaska: U.S. Geological Survey Bulletin 446, 58 p.

Kucinski, R., Porterfield, J., and Croff, C., 1985, Kensington Project summary report - 1985: Unpublished report for Placid Oil Co., 27 p.

Leveille, R.A., 1991, Geology and gold deposits of the Jualin mine area, Berners Bay district, southeastern Alaska: Fairbanks, University of Alaska, M.S. thesis, 200 p.

Miller, L.D., Goldfarb, R.J., Gehrels, G,E., and Snee, L.W., 1994, Genetic links among fluid cycling, vein formation, regional deformation, and plutonism in the Juneau gold belt, southeastern Alaska: Geology, v. 22, p. 203-206

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Primary Reference: Miller and others, 1995; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Johnson; Northern Lights

Site type: Mine

ARDF no.: JU030

Latitude: 58.8659 **Quadrangle:** JU D-4

Longitude: 135.0656

Location description and accuracy:

The Johnson Mine is at an elevation of approximately 3,000 feet in the cirque at the head of Johnson Creek, about 3 miles northeast of Pt. Sherman on Lynn Canal and 3/4 mile southwest of Lions Head Mountain. It is in the NW1/4 section 3, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Cu, Pb, Sb, Te, Zn

Ore minerals:

Gangue minerals: Albite, ankerite, apatite, calcite, chlorite, ferroan dolomite, muscovite, quartz, rutile, tourmaline

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Kensington (Coeur-Alaska) deposit (JU261). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Johnson mine was discovered in 1886. It was developed by a 75-foot adit and 1,360 feet of workings from the Kensington (JU029) adit, which cut the Johnson vein in 1913. There was minor gold production from the Johnson mine in 1887 (Redman and others, 1989).

Alteration:

Age of mineralization:

The age of mineralization in the Berners Bay district is about 55 Ma, the same as the other mesothermal gold-quartz-vein deposits in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The Johnson deposit was discovered in 1886. It was developed by a 75-foot adit and 1,360 feet of workings from the Kensington (JU029) adit, which cut the Johnson vein in 1913.

Production notes:

There was minor production from the Johnson mine in 1887 (Redman and others, 1989).

Reserves:

None.

Additional comments:

References:

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Knopf, Adolph, 1911, Geology of the Berners Bay region, Alaska: U.S. Geological Survey Bulletin 446, 58 p.

Leveille, R.A., 1991, Geology and gold deposits of the Jualin mine area, Berners Bay district, southeastern Alaska: Fairbanks, University of Alaska, M.S. thesis, 200 p.

Miller, L.D., Goldfarb, R.J., Gehrels, G,E., and Snee, L.W., 1994, Genetic links among fluid cycling, vein formation, regional deformation, and plutonism in the Juneau gold belt, southeastern Alaska: Geology, v. 22, p. 203-206

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Primary Reference: Redman and others, 1989; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska)

Last report date: 2008-06-05

Site name(s): Eureka

Site type: Prospect

ARDF no.: JU031

Latitude: 58.8634 **Quadrangle:** JU D-4

Longitude: 135.0768

Location description and accuracy:

The Eureka prospect is at an elevation of about 2,300 feet, about 2 miles northeast of Pt. Sherman on Lynn Canal and 1 mile southwest of Lions Head Mountain in the Kakuhan Range. It is in the N1/2 of the SE1/4 section 4, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Cu, Pb, Sb, Te, Zn

Ore minerals:

Gangue minerals: Albite, ankerite, apatite, calcite, chlorite, ferroan dolomite, muscovite, quartz, rutile, tourmaline

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Kensington (Coeur-Alaska) deposit (JU261). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Eureka prospect is a quartz vein stockworks similar to the Kensington Mine (JU029). It strikes north and dips 63E. It is about 60 feet wide and has been traced along strike for 350 feet (Redman and others, 1989). The deposit was discovered in 1897. Workings include 2 adits, several open cuts, a short raise, and 360 feet of workings.

Alteration:

Age of mineralization:

The age of mineralization in the Berners Bay district is about 55 Ma, the same as the other mesothermal gold-quartz-vein deposits in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

The deposit was discovered in 1897. Workings include 2 adits, several open cuts, a short raise and 360 feet of workings.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Knopf, Adolph, 1911, Geology of the Berners Bay region, Alaska: U.S. Geological Survey Bulletin 446, 58 p.

Leveille, R.A., 1991, Geology and gold deposits of the Jualin mine area, Berners Bay district, southeastern Alaska: Fairbanks, University of Alaska, M.S. thesis, 200 p.

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Primary Reference: Redman and others, 1989; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Northern Belle; Elmira; Yellowjacket; Boston; Troy

Site type: Mine

ARDF no.: JU032

Latitude: 58.863 **Quadrangle:** JU D-4

Longitude: 135.0718

Location description and accuracy:

The Northern Belle Mine is at an elevation of about 2,500 feet, about 2.5 miles east-northeast of Pt. Sherman on Lynn Canal and 1 mile southwest of Lions Head Mountain in the Kakuhan Range. It is in the SE1/4 section 4, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Cu, Pb, Sb, Te, Zn

Ore minerals:

Gangue minerals: Albite, ankerite, apatite, calcite, chlorite, ferroan dolomite, muscovite, quartz, rutile, tourmaline

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Kensington (Coeur-Alaska) deposit (JU261). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The deposit at Northern Belle Mine consists of several quartz veins and associated vein stockwork, including the Northern Belle, Elmira, and Yellowjacket. The veins strike N5-30E and dip 55-70SE. The Northern Belle stockworks is about 35 feet wide and has been traced along strike for 1,500 feet and along dip for 636 feet. The Elmira vein is less well defined than the Northern Belle, and may be the extension of the Yellowjacket vein. It strikes N28E for 1200 feet and is 1-5 feet thick (Kucinski and others, 1985). The Northern Belle deposit was discovered prior to 1896 and was mined between 1896 and 1897. There were 2 adits and 2 open stopes. Nine-hundred and forty ounces of gold was recovered from 2,302 tons of ore. Reportedly, 78 percent of the gold in the deposit was free-milling (Redman and others, 1989).

Alteration:

Age of mineralization:

The age of mineralization in the Berners Bay district is about 55 Ma, the same as the other mesothermal gold-quartz-vein deposits in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes

Site Status: Active

Workings/exploration:

The Northern Belle deposit was discovered prior to 1896 and was mined between 1896 and 1897. There were 2 adits and 2 open stopes.

Production notes:

A total of 940 ounces of gold was recovered from 2,302 tons of ore.

Reserves:

None.

Additional comments:

References:

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Knopf, Adolph, 1911, Geology of the Berners Bay region, Alaska: U.S. Geological Survey Bulletin 446, 58 p.

Kucinski, R., Porterfield, J., and Croff, C., 1985, Kensington Project summary report - 1985: Unpublished report for Placid Oil Co., 27 p.

Leveille, R.A., 1991, Geology and gold deposits of the Jualin mine area, Berners Bay district, southeastern Alaska: Fairbanks, University of Alaska, M.S. thesis, 200 p.

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Primary Reference: Redman and others, 1989; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Bear

Site type: Mine

ARDF no.: JU034

Latitude: 58.8612 **Quadrangle:** JU D-4

Longitude: 135.0804

Location description and accuracy:

The Bear Mine is at an elevation of about 1,500 feet, about 2 miles east-northeast of Pt. Sherman on Lynn Canal and 1 mile southwest of Lions Head Mountain in the Kakuhan Range. It is in the SE1/4 section 4, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Cu, Pb, Sb, Te, Zn

Ore minerals:

Gangue minerals: Albite, ankerite, apatite, calcite, chlorite, ferroan dolomite, muscovite, quartz, rutile, tourmaline

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Kensington (Coeur-Alaska) deposit (JU261). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Bear Mine is on a quartz vein in Jualin Diorite. It strikes NW and dips 40-70 NE. It has been traced for 500 feet along strike and 350 feet vertically, and has an average width of 5 to 10 feet (Chris Croff, Placid Oil Co., oral communication, 1987; Redman and others, 1989). The Bear deposit was discovered in 1887 and was mined from 1895 to 1897. Workings include an 1,100-foot crosscut, a 200-foot raise, and 3 levels with 850 feet of drifts. From 1895 to 1897, 800 ounces of gold were recovered from 5,900 tons of ore (Redman and others, 1989).

Alteration:

Age of mineralization:

The age of mineralization in the Berners Bay district is about 55 Ma, the same as the other mesothermal gold-quartz-vein deposits in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
36a

Production Status: Yes

Site Status: Active

Workings/exploration:
The Bear deposit was discovered in 1887 and was mined from 1895 to 1897. Workings include an 1,100-foot crosscut, a 200-foot raise, and 3 levels with 850 feet of drifts.

Production notes:
From 1895 to 1897, 800 ounces of gold were recovered from 5,900 tons of ore (Redman and others, 1989).

Reserves:
None.

Additional comments:

References:
Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Knopf, Adolph, 1911, Geology of the Berners Bay region, Alaska: U.S. Geological Survey Bulletin 446, 58 p.

Kucinski, R., Porterfield, J., and Croff, C., 1985, Kensington Project summary report - 1985: Unpublished report for Placid Oil Co., 27 p.

Leveille, R.A., 1991, Geology and gold deposits of the Jualin mine area, Berners Bay district, southeastern Alaska: Fairbanks, University of Alaska, M.S. thesis, 200 p.

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Primary Reference: Redman and others, 1989, Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Comet

Site type: Mine

ARDF no.: JU036

Latitude: 58.8552 **Quadrangle:** JU D-4

Longitude: 135.0723

Location description and accuracy:

The Comet Mine is at an elevation of about 2,300 feet, about 3 miles east of Pt. Sherman on Lynn Canal and 1.5 miles south-southwest of Lions Head Mountain in the Kakuhan Range. The mine is marked on the Juneau D-4 topographic map. It is in the NE1/4 section 9, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, Cu, Pb, Zn

Ore minerals: Chalcopyrite, galena, gold, pyrite, sphalerite

Gangue minerals: Calcite, chlorite, ferroan dolomite, quartz

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Kensington (Coeur-Alaska) deposit (JU261). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The deposit at the Comet Mine consists of 2 principal quartz veins about 50 ft apart that strike north and dip 70E. The largest vein is 300-500 feet long; it averages 2 to 3 feet wide at the surface and is up to 9 feet thick in underground exposures. The vein is truncated to the north by a large, left-lateral fault; to the south it crosses a diorite-phyllite contact, where it splits and ends. The veins contain pyrite, chalcopyrite, galena and free gold (Redman and others, 1989).

The Comet Mine is the largest gold producer in the Berners Bay region; it produced 22,485 ounces of gold from 51,463 tons of ore between 1894 and 1900. The deposit was discovered in the 1880s and tunneling began in 1891. A 20-stamp mill was in place by 1892 and production began in 1894. The mine has 9,000 feet of workings on 9 levels, 5 adits, and 1 open stope.

Alteration:

Age of mineralization:

The age of mineralization in the Berners Bay district is about 55 Ma, the same as the other mesothermal gold-quartz-vein deposits in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The Comet deposit was discovered in the 1880s and tunneling began in 1891. A 20-stamp mill was in place by 1892 and production began in 1894. The mine has 9,000 feet of workings on 9 levels, 5 adits and 1 open stope. Placid Oil Co. drilled several core holes in 1981.

Production notes:

The Comet Mine is the largest gold producer in the Berners Bay region producing 22,485 ounces of gold from 51,463 tons of ore between 1894 and 1900. The deposit was discovered in the 1880s and tunneling began in 1891. A 20-stamp mill was in place by 1892 and production began in 1894.

Reserves:

None.

Additional comments:

References:

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Knopf, Adolph, 1911, Geology of the Berners Bay region, Alaska: U.S. Geological Survey Bulletin 446, 58 p.

Kucinski, R., Porterfield, J., and Croff, C., 1985, Kensington Project summary report - 1985: Unpublished report for Placid Oil Co., 27 p.

Leveille, R.A., 1991, Geology and gold deposits of the Jualin mine area, Berners Bay district, southeastern Alaska: Fairbanks, University of Alaska, M.S. thesis, 200 p.

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Primary Reference: Redman and others, 1989; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Seward; Thomas

Site type: Prospect

ARDF no.: JU037

Latitude: 58.8536 **Quadrangle:** JU D-4

Longitude: 135.0664

Location description and accuracy:

The Seward prospect is at an elevation of about 2,600 feet, about 3 miles east of Pt. Sherman on Lynn Canal and 1.5 miles south-southwest of Lions Head Mountain in the Kakuhan Range. It is in the saddle above the Comet mine (JU036), in the NW1/4 section 10, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold, pyrite

Gangue minerals: Quartz

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Kensington (Coeur-Alaska) deposit (JU261). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Seward prospect consists of a quartz vein in Jualin diorite. It is 5- to 12-feet thick, strikes N, dips E, and has been traced on the surface for approximately 1,100 feet. Samples collected before 1906 assayed up to 24 parts per million gold (Redman and others, 1989). The quartz contains free gold, but little or no sulfides (Kensington Mines, 1914). Workings include a 63-foot shaft with a 15-foot drift at the bottom, and 2 open cuts. The shaft and open cuts were completed during the 1890s.

Alteration:

Age of mineralization:

The age of mineralization in the Berners Bay district is about 55 Ma, the same as the other mesothermal gold-quartz-vein deposits in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
36a

Production Status: None

Site Status: Active

Workings/exploration:

Workings completed during the 1890s include a 63-foot shaft with a 15-foot drift at the bottom, and 2 open cuts. Placid Oil Co. drilled 3 core holes on the prospect in 1983; core samples assayed up to 0.7 ounce of gold per ton (Chris Croff, oral communication, 1987).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

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Leveille, R.A., 1991, Geology and gold deposits of the Jualin mine area, Berners Bay district, southeastern Alaska: Fairbanks, University of Alaska, M.S. thesis, 200 p.

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Primary Reference: Redman and others, 1989; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska)

Last report date: 2008-06-05

Site name(s): Cumberland

Site type: Prospect

ARDF no.: JU039

Latitude: 58.8493 **Quadrangle:** JU D-4

Longitude: 135.0722

Location description and accuracy:

The Cumberland prospect is at an elevation of about 2,250 feet, about 3 miles east of Pt. Sherman on Lynn Canal and 2 miles south-southwest of Lions Head Mountain in the Kakuhan Range. It is at the head of Sherman Creek in the E1/2 section 9, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals: Quartz

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Kensington (Coeur-Alaska) deposit (JU261). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Cumberland prospect was probably developed before 1909. Workings include a 54-foot adit and an open cut. The adit exposes gray phyllite and felsic phyllite. Thin quartz veins containing minor pyrite occur near the portal and in a small shear near the face of the adit. Although native gold in quartz veins has been identified in dump samples by other workers in the area, U.S. Bureau of Mines samples all contained less than 0.1 part per million gold (Redman and others, 1989).

Alteration:

Age of mineralization:

The age of mineralization in the Berners Bay district is about 55 Ma, the same as the other mesothermal gold-quartz-vein deposits in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
36a

Production Status: None

Site Status: Active

Workings/exploration:
The Cumberland prospect was probably developed before 1909 by a 54-foot adit and an open cut.

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Primary Reference: Redman and others, 1989; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): DZ

Site type: Prospect

ARDF no.: JU040

Latitude: 58.8491 **Quadrangle:** JU D-4

Longitude: 135.0291

Location description and accuracy:

The DZ prospect is at an elevation of about 2,350 feet, on the ridge northeast of upper Johnson Creek. It is about 2 miles south-southeast of Lions Head Mountain near the center of section 11, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, Cu, Pb, Zn

Ore minerals: Pyrite

Gangue minerals: Calcite, chlorite, ferroan dolomite, quartz

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Jualin (Coeur-Alaska) deposit (JU262). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

In 1984, Bear Creek Mining Company identified a N40W-trending, 300- to 800-foot-wide band of quartz veins with disseminated pyrite, that is now called the DZ prospect. The veins carry elevated gold values, accompanied by wallrock alteration similar in style to that at the Jualin Mine (JU044) and Kensington Mine (JU029) (Barnett, 1989). The veins at the DZ prospect are traceable for over 7,000 feet. Bear Creek collected 140 vein samples of which nearly 20 percent assayed 0.05 ounce or more gold per ton; the highest was 1.205 ounces of gold per ton. In 1987 and 1988 additional mapping and sampling was conducted by International Curator Resources, Ltd. (Barnett, 1989).

Alteration:

The alteration adjacent to the veins is characterized by reddish-brown ferroan dolomite alteration, sericitization of plagioclase, chloritization and sulfidization of mafic minerals, and albitization of feldspars (Leveille, 1991).

Age of mineralization:

The age of mineralization in the Berners Bay district is about 55 Ma, the same as the other mesothermal gold-quartz-vein deposits in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

The DZ deposit was discovered and sampled by Bear Creek Mining Company in 1984. International Curator Resources and Placer Dome U.S. conducted additional mapping and sampling in 1987 and 1988.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Barnett, J.C., 1989, Jualin gold project, 1988 progress report, Berners Bay District: Unpublished report for International Curator Resources, Ltd., 75 p.

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Leveille, R.A., 1991, Geology and gold deposits of the Jualin mine area, Berners Bay district, southeastern Alaska: Fairbanks, University of Alaska, M.S. thesis, 200 p.

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Primary Reference: Barnett, 1989; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Indiana

Site type: Prospect

ARDF no.: JU041

Latitude: 58.8476 **Quadrangle:** JU D-4

Longitude: 135.0494

Location description and accuracy:

The Indiana prospect is on the west side of upper Johnson Creek at an elevation of approximately 800 feet. It is 1/3rd of a mile north of the Jualin Mine (JU044), 2 miles south of Lions Head Mountain, and 4.5 miles north of Berners Bay. It is in the SE1/4 section 10, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals: Quartz

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Jualin (Coeur-Alaska) deposit (JU262). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Indiana prospect was worked from 1896 to 1901 and was developed to intersect the northern extension of the Jualin (JU044) vein system. But the northern extension of the Jualin system deflects from northerly to northwesterly and the Indiana tunnels failed to reach it. The workings consist of a 1,600-foot adit, a 900-foot adit, and a 400-foot adit. A 10-stamp mill was also installed but not used at this site (Redman and others, 1989). The workings reportedly intersected auriferous quartz veins and stockworks, but no production occurred (Poncin, 1940).

Alteration:

Age of mineralization:

The age of mineralization in the Berners Bay district is about 55 Ma, the same as the other mesothermal gold-quartz-vein deposits in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
36a

Production Status: None

Site Status: Active

Workings/exploration:
Workings driven from 1896 to 1901 consist of a 1600-foot adit, a 900-foot adit, and a 400-foot adit. A 10-stamp mill was installed but was apparently never put in operation (Redman and others, 1989).

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

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Poncin, E., 1940, Report on Jualin concessions of Alaska Goldfields Corporation, Region of Berners Bay, Alaska: Unpublished report [translated from French], 1940, 65 p.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Primary Reference: Redman and others, 1989; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Jualin

Site type: Mine

ARDF no.: JU044

Latitude: 58.8414 **Quadrangle:** JU D-4

Longitude: 135.0446

Location description and accuracy:

The Jualin Mine is in the Johnson Creek drainage at an elevation of approximately 700 feet, about 2.5 miles south of Lions Head Mountain and 4 miles north of Berners Bay. The mine is marked on the Juneau D-4 topographic map. It is in the NE1/4 section 15, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Ag, Au

Other: As, Cu, Pb, Sb, Te, Zn

Ore minerals: Arsenopyrite, calaverite, chalcopyrite, galena, gold, hessite, petzite, pyrite, sphalerite, tetrahedrite

Gangue minerals: Albite, ankerite, apatite, calcite, chlorite, ferroan dolomite, muscovite, quartz, rutile, tourmaline

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Jualin (Coeur-Alaska) deposit (JU262). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Jualin deposit was discovered in 1895 and gold recovery began in 1896 when a 10-stamp mill was in operation. In 1914, the first semi-diesel generators in Alaska were installed. Between 1895 and 1929 the mine produced 37,913 ounces of gold from 74,624 tons of ore. The mill recovered 85-90 percent of the gold; 85 percent of the gold was free-milling and the remaining 15 percent was combined with sulfides (Redman and others, 1989).

The Jualin Mine is in Jualin Diorite in a shear zone 400 to 600 feet wide; the shear zone has a strike length of nearly 15,000 feet, and extends from the Jualin Mine area to the Ophir prospect (JU026). The veins in the shear zone generally strike N35W and dip 50-75 NE. The ore bodies pinch and swell along strike; they are as much as 40 feet thick and form ore shoots that exhibit a strong southeast rake (Barnett and others, 1989). Noteworthy veins include the Empire vein, East vein, and the 1, 2, 3, 3E and 4 veins. Production was from relatively high-grade individual veins. The number 1 vein averaged 7 feet thick and contained 0.53 to 0.73 ounce of gold per ton; the number 2 vein averaged 3 feet thick and contained from 0.73 to 0.12 ounce of gold per ton; and the number 3 vein was about 5 feet thick with an average grade of 0.48 ounce of gold per ton (Redman and others, 1989).

Workings at the Jualin Mine include over 15,000 feet of workings on 5 levels. They included two inclined shafts, one 220 deep and the other 160 feet deep; a 310-foot main shaft; a 150-foot shaft; and the 5,000-foot Berners Tunnel (Redman and others, 1989). A 5.5-mile access road was completed from tidewater to the

mine site in July, 1988 (Barnett, 1989). Core drilling as of the end of 1991 totaled 82,337 feet in 126 holes (Bundtzen and others, 1991). Coeur Alaska acquired the rights to the Jualin Mine area from International Curator Resources Ltd. in 1995 (Swainbank and others, 1995).

Alteration:

Hydrothermal alteration adjacent to individual veins is characterized by reddish-brown ferroan dolomite (Miller and others, 1995). Other alteration includes sericitization of plagioclase, chloritization and sulfidization of mafic minerals, and albitization of feldspars (Leveille, 1991). The quartz-carbonate stockworks in the Jualin vein system feature three zones of alteration within and adjacent to the stockworks: 1) an inner zone of intense carbonate-sericite alteration; 2) an intermediate zone of mottled, dark-green diorite marked by cataclastic fabric and increased chlorite +/- sericite; and 3) an outer zone of equigranular diorite with abundant epidote, and locally, potassium feldspar (Barnett and others, 1989).

Age of mineralization:

Hydrothermal muscovite from veins in the Jualin Mine gives ages of from 53.2 Ma to 55.5 Ma (Miller and others, 1994). This coincides with the 55 Ma age of the mesothermal gold-quartz-vein deposits elsewhere in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes

Site Status: Active

Workings/exploration:

Workings at the Jualin Mine include over 15,000 feet of workings on 5 levels. These include two inclined shafts, one 220 deep and the other 160 feet deep; a 310-foot main shaft; a 150-foot shaft; and the 5, 000-foot Berners Tunnel (Redman and others, 1989). A 5.5-mile access road was completed from tidewater to the mine site in July, 1988 (Barnett, 1989). Core drilling as of the end of 1991 totaled 82,337 feet in 126 holes (Bundtzen and others, 1991).

Production notes:

The Jualin deposit was discovered in 1895 and the mine began producing gold in 1896 when a 10-stamp mill was in operation. In 1914, the first semi-diesel generators in Alaska were installed. Between 1895 and 1929, the mine produced 37,913 ounces of gold from 74,624 tons of ore. The mill recovered 85-90 percent of the gold; 85 percent of the gold was free-milling and the remaining 15 percent was combined with sulfides (Redman and others, 1989).

Reserves:

None.

Additional comments:

References:

Barnett, J.C., 1989, Jualin gold project, 1988 progress report, Berners Bay District: Unpublished report for International Curator Resources, Ltd., 75 p.

Barnett, J.C., Vandel, J.C., Monks, J.I., and Johnson, G.S., 1989, Jualin gold project, 1989 progress report: Unpublished report for Placer Dome U.S., Inc., 75 p.

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Bundtzen, T.K., Swainbank, R.C., Wood, J.E., Clough, A.H., 1991, Alaska's Mineral Industry 1991: Alaska Division of Geological & Geophysical Surveys, Special Report 46, 89 p.

Cheney, E.S., 1981, Geology of the Jualin gold property, Berners Bay district of the Juneau Gold Belt: Unpublished report for B-T Enterprises, Seattle, Wash.

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Knopf, Adolph, 1911, Geology of the Berners Bay region, Alaska: U.S. Geological Survey Bulletin 446, 58 p.

Kucinski, R., Porterfield, J., and Croff, C., 1985, Kensington Project summary report - 1985: Unpublished report for Placid Oil Co., 27 p.

Leveille, R.A., 1991, Geology and gold deposits of the Jualin mine area, Berners Bay district, southeastern Alaska: Fairbanks, University of Alaska, M.S. thesis, 200 p.

Miller, L.D., Goldfarb, R.J., Gehrels, G,E., and Snee, L.W., 1994, Genetic links among fluid cycling, vein formation, regional deformation, and plutonism in the Juneau gold belt, southeastern Alaska: Geology, v. 22, p. 203-206

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

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Woollett, G.N., 1990, Jualin Project: Unpublished report for International Curator International Resources, Ltd., Denver, Colo., 13 p.

Primary Reference: Barnett, 1989; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Snowslide Gulch

Site type: Prospect

ARDF no.: JU045

Latitude: 58.838 **Quadrangle:** JU D-4

Longitude: 135.0488

Location description and accuracy:

This prospect is in Snowslide Gulch at an elevation of 915 feet. It is 2.5 miles northwest of Berners Bay and 1/3rd of a mile south of the Jualin Mine (JU044) in the NE1/4 section 15, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Pyrite

Gangue minerals: Quartz

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Jualin (Coeur-Alaska) deposit (JU262). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Snowslide Gulch prospect was probably explored in the early 1900s by a 115-foot adit. The deposit consists of pyrite disseminated in quartz-chlorite phyllite and pyrite in a bluish quartz vein. The vein is in a shear zone in the phyllite. No significant metal values were found in samples collected by the U.S. Bureau of Mines (Redman and others, 1989).

Alteration:

Sericitic and chloritic.

Age of mineralization:

Hydrothermal muscovite from veins in the Jualin mine are 53.2 Ma to 55.5 Ma (Miller and others, 1994). This coincides with the 55 Ma age of the other mesothermal gold veins in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

The Snowslide Gulch prospect was explored in the early 1900s by a 115-foot adit.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Miller, L.D., Goldfarb, R.J., Gehrels, G,E., and Snee, L.W., 1994, Genetic links among fluid cycling, vein formation, regional deformation, and plutonism in the Juneau gold belt, southeastern Alaska: Geology, v. 22, p. 203-206

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Primary Reference: Redman and others, 1989, Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Valentine; Falls and Diana; Thomas

Site type: Prospects

ARDF no.: JU046

Latitude: 58.837 **Quadrangle:** JU D-4

Longitude: 135.0408

Location description and accuracy:

This prospect is at an elevation of about 550 feet, in the Johnson Creek drainage near the mouth of Snowslide Gulch. It is 2 miles northwest of Berners Bay and 1/3rd of a mile southeast of the Jualin Mine (JU044) in the NE1/4 section 15, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate and marks the center of several workings associated with these prospects.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, pyrite

Gangue minerals: Calcite, quartz

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Jualin (Coeur-Alaska) deposit (JU262). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

There are several prospects at this site which is completely covered by colluvium. The area is underlain mainly by sheared and altered Jualin Diorite (Barnett and others, 1988). Workings at the Thomas prospect include a caved adit (Barnett and others, 1988). A sample of dump material had 0.1 part per million (ppm) gold (Redman and others, 1989). The Valentine prospect, located on the Falls and Diana claims, is 300 feet west of the Thomas prospect. Workings include 2 water-filled shafts and a 115-foot adit. The shafts were sunk on felsic (quartz-sericite) phyllite and chlorite phyllite near the contact with the Jualin Diorite. The adit exposes pyritic, quartz-chlorite phyllite. The phyllite hosts a 5-foot band of stratiform pyrite and chalcopyrite which has been traced 150 feet to the southeast. The band contains up to 15 percent chalcopyrite and is in a shear zone in phyllite near the contact with Jualin Diorite (Redman and others, 1989). U.S. Bureau of Mines samples contained up to 161.9 ppm gold, 89.1 ppm silver, and 5.1 percent copper (Redman and others, 1989).

Alteration:

Age of mineralization:

Hydrothermal muscovite from veins in the Jualin mine are 53.2 Ma to 55.5 Ma (Miller and others, 1994). This coincides with the 55 Ma age of the other mesothermal gold veins in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

The Thomas prospect include a caved adit. The Valentine prospect, located on the Falls and Diana claims, is 300 feet west of the Thomas prospect and its workings include 2 water-filled shafts and a 115-foot adit.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Barnett, J.C., Hayden, T.J., Bair, D.K., and Croff, T.C., 1988, 1987 summary report, Jualin gold project, Berners Bay District: Unpublished report for International Curator Resources, Ltd., 75 p.

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Miller, L.D., Goldfarb, R.J., Gehrels, G,E., and Snee, L.W., 1994, Genetic links among fluid cycling, vein formation, regional deformation, and plutonism in the Juneau gold belt, southeastern Alaska: Geology, v. 22, p. 203-206

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Primary Reference: Redman and others, 1989; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Big Lake

Site type: Prospect

ARDF no.: JU047

Latitude: 58.8364 **Quadrangle:** JU D-4

Longitude: 135.0166

Location description and accuracy:

The Big Lake prospect is at an elevation of 1,200 feet, about 0.7 mile from the northeast side of Johnson Creek and 1 mile northwest of Berners Bay. It is in the NE1/4 section 14, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, Cu, Pb, Zn

Ore minerals: Chalcopyrite, malachite, pyrite

Gangue minerals: Ankerite, calcite, hematite, quartz

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Jualin (Coeur-Alaska) deposit (JU262). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Big Lake prospect was discovered in 1988 by International Curator Resources, Ltd. It consists of a series of parallel quartz veins that strike northwest and dip 70NE in Jualin Diorite. The veins crop out along the ridge crest for nearly 1,300 feet; they extend toward the Yankee Boy prospect (JU051), about 2,300 feet away. The Big Lake and Yankee Boy veins are probably part of the same vein system that consists of a zone about 300 feet wide. There are two distinct types of Big Lake quartz veins; one is massive and the other consists of thin, white veinlets. The massive veins are distinguished by a pervasive yellow-brown iron stain, sheared margins, and 1 to 10 percent pyrite; they are in sheared, chloritic diorite that contains about 1 percent disseminated pyrite. The small, white, veinlets range in thickness from one-eighth inch to three feet, and lay parallel to each other in zones up to fifty feet wide. The veins contain isolated blebs of pyrite, chalcopyrite, malachite, and specular hematite. Alteration adjacent to the veins is characterized by sericite, pervasive interstitial carbonate, and moderate to strong silicification (Barnett and others, 1989). In 1988, International Curator Resources Ltd. collected numerous samples of the Big Lake veins and Placer Dome U.S. drilled one core hole in 1989. The average for twenty grab samples collected along strike for 1200 feet was 0.454 ounce of gold per ton (Barnett, 1989). The drill hole had several anomalous intercepts; one 2.5-foot core sample assayed 0.109 ounce of gold per ton (Barnett and others, 1989).

Alteration:

Alteration adjacent to the veins is characterized by sericite, pervasive interstitial carbonate, and moderate to strong silicification. Local oxidation of copper minerals.

Age of mineralization:

Hydrothermal muscovite from veins in the Jualin mine are 53.2 Ma to 55.5 Ma (Miller and others, 1994). This coincides with the 55 Ma age of the other mesothermal gold veins in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

The Big Lake prospect was discovered in 1988. International Curator Resources, Ltd. collected numerous samples of the veins and Placer Dome U.S. drilled one core hole in 1989.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Barnett, J.C., 1989, Jualin gold project, 1988 progress report, Berners Bay District: Unpublished report for International Curator Resources, Ltd., 75 p.

Barnett, J.C., Vandel, J.C., Monks, J.I., and Johnson, G.S., 1989, Jualin gold project, 1989 progress report: Unpublished report for Placer Dome U.S., Inc., 75 p.

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Miller, L.D., Goldfarb, R.J., Gehrels, G,E., and Snee, L.W., 1994, Genetic links among fluid cycling, vein formation, regional deformation, and plutonism in the Juneau gold belt, southeastern Alaska: Geology, v. 22, p. 203-206

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Primary Reference: Barnett, 1989; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Hoggatt Creek

Site type: Prospect

ARDF no.: JU048

Latitude: 58.8322 **Quadrangle:** JU D-4

Longitude: 135.0267

Location description and accuracy:

This prospect is at an elevation of about 500 feet on Hoggatt Creek, a informally-named north tributary to Johnson Creek. It is 1.5 miles northwest of Berners Bay and 1 mile southeast of the Jualin Mine (JU044), in the SW1/4 section 14, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Pyrite

Gangue minerals: Calcite, quartz

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Jualin (Coeur-Alaska) deposit (JU262). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Hoggatt Creek deposit was probably discovered around 1895 but little work has been done since. Workings include a 22-foot adit, 2 open cuts, and several trenches. The deposit consists of a concordant quartz vein that cuts metavolcanic greenschist and Jualin Diorite. The vein strikes SE and dips 65-75SW; it has been traced in outcrop for at least 600 feet and is from a few inches to 4 feet thick. The vein contains 1 percent to 7 percent pyrite. Samples averaged 268 parts per million (ppm) copper and 0.4 ppm gold (Redman and others, 1989).

Alteration:

Age of mineralization:

Hydrothermal muscovite from veins in the Jualin mine are 53.2 Ma to 55.5 Ma (Miller and others, 1994). This coincides with the 55 Ma age of the other mesothermal gold veins in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
36a

Production Status: None

Site Status: Active

Workings/exploration:
There is a 22-foot adit, 2 open cuts, and several trenches; all probably date to before 1900.

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Primary Reference: Redman and others, 1989, Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Fremming

Site type: Prospect

ARDF no.: JU049

Latitude: 58.8317 **Quadrangle:** JU D-4

Longitude: 135.0355

Location description and accuracy:

This prospect is at an elevation of about 350 feet on Johnson Creek. It is 2 miles northwest of Berners Bay and 3/4 mile southeast of the Jualin Mine (JU044), in the SW1/4 section 14, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, gold, pyrite, sphalerite

Gangue minerals: Calcite, quartz

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Jualin (Coeur-Alaska) deposit (JU262). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Fremming prospect was discovered by Frank Fremming in about 1897. Fremming drove a 360-foot adit and sank a 85-foot inclined shaft by 1905. The deposit consists of a 6-foot thick phyllite layer that contains 1 to 3 percent disseminated pyrite and thin, stratiform lenses of pyrite. The stratiform pyrite has been traced on the surface for 800 feet by trenching (Redman and others, 1989). Underground, at the end of the adit, there is a 6-foot-wide zone of sulfide-bearing schist and quartz-calcite stringers that contains pyrite, chalcopyrite, galena, sphalerite, and free gold (Knopf, 1911). A shear zone near the Fremming shaft contains a quartz vein with sphalerite, galena, pyrite, and chalcopyrite (Redman and others, 1989). Redman and others (1989), interpret the Fremming prospect as a volcanogenic massive sulfide deposit. However, exploration of the Fremming prospect area by International Curator Resources Ltd., combined with observations of drill core from both the Jualin mine (JU044) and the Fremming prospect, indicate that the predominant host rock is Jualin Diorite (Barnett and others, 1988). This interpretation is supported by Kaplar (1988) who showed that the diorite loses its textural and mineralogical identity as shearing becomes more intense. Rocks at or near the Fremming workings thus can be classified as greenstone and phyllite but their protolith probably was Jualin Diorite (Kapler, 1988). Exploratory drilling by International Curator Resources Ltd. encountering minor zones of anomalous metal values (Barnett and others, 1988).

Alteration:

Chloritic.

Age of mineralization:

Hydrothermal muscovite from veins in the Jualin mine are 53.2 Ma to 55.5 Ma (Miller and others, 1994). This coincides with the 55 Ma age of the other mesothermal gold veins in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Volcanogenic massive sulfide deposit or a remobilized epigenetic copper-lead-zinc-gold deposit?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Workings consist of a 360-foot adit and an 85-foot inclined shaft.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Barnett, J.C., Hayden, T.J., Bair, D.K., and Croff, T.C., 1988, 1987 summary report, Jualin gold project, Berners Bay District: Unpublished report for International Curator Resources, Ltd., 75 p.

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Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Kaplar, J., 1988, Jualin prospect analysis--Petrographic microprobe, SEM, and XES geochemical analysis of core: Unpublished report for International Curator Resources, Ltd., Denver, Colo., 18p.

Knopf, Adolph, 1911, Geology of the Berners Bay region, Alaska: U.S. Geological Survey Bulletin 446, 58 p.

Miller, L.D., Goldfarb, R.J., Gehrels, G,E., and Snee, L.W., 1994, Genetic links among fluid cycling, vein formation, regional deformation, and plutonism in the Juneau gold belt, southeastern Alaska: Geology, v. 22, p. 203-206

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Primary Reference: Barnett and others 1988; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Berners Tunnel

Site type: Prospect

ARDF no.: JU050

Latitude: 58.8294 **Quadrangle:** JU D-4

Longitude: 135.0172

Location description and accuracy:

The Berners Tunnel is at an elevation of about 150 feet in a short, unnamed north tributary to Johnson Creek. It is 3.5 miles south of Lions Head Mountain and 2 miles north-northwest of Berners Bay, in the SE1/4 section 14, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, Cu, Pb, Zn

Ore minerals: Chalcopyrite, gold, pyrite

Gangue minerals: Ankerite, calcite, quartz

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Jualin (Coeur-Alaska) deposit (JU262). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Berners Tunnel was begun in 1914 to drain water from the Jualin Mine (Redman and others, 1989). The tunnel, which trends northwesterly was never completed. During construction, workers collected ten-foot rock-chip samples along its 5,000-foot length. Two intervals contained elevated gold values. Between stations 1912 and 2042 from the portal, a 130-foot zone averaged 0.12 ounce of gold per ton; between stations 2112 and 2212, a 100-foot zone averaged 0.087 ounce of gold per ton. The first 400 feet of the tunnel was in glacial till and colluvium and the portal has long since collapsed. In 1989, Placer Dome U.S. drilled 3 core holes along the trace of the Berners Tunnel. The drill holes cut numerous anomalous zones along a major NW-trending shear zone. The richest intercept averaged 0.028 ounce of gold per ton. The drill core consists of moderately to strongly sheared diorite with widespread potassic and sericitic alteration. The potassic alteration suite includes epidote, chlorite, and pyrite. Locally, the sheared diorite is highly silicified giving it a bleached appearance. This silicified diorite contains relatively abundant, disseminated pyrite and chalcopyrite, and quartz-pyrite veinlets (Barnett and others, 1989).

Alteration:

The drill core consists of moderately to strongly sheared diorite showing widespread potassic and sericitic alteration. The potassic alteration suite includes epidote, chlorite, and pyrite. Locally, the sheared diorite is highly silicified giving it a bleached appearance.

Age of mineralization:

Hydrothermal muscovite from veins in the Jualin mine are 53.2 Ma to 55.5 Ma (Miller and others, 1994).

This coincides with the 55 Ma age of the other mesothermal gold veins in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

The site consists of a 5,000-foot tunnel which is caved at the portal. Placer Dome U.S. drilled 3 core holes along the trace of the tunnel in 1989.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Barnett, J.C., Vandel, J.C., Monks, J.I., and Johnson, G.S., 1989, Jualin gold project, 1989 progress report: Unpublished report for Placer Dome U.S., Inc., 75 p.

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Miller, L.D., Goldfarb, R.J., Gehrels, G,E., and Snee, L.W., 1994, Genetic links among fluid cycling, vein formation, regional deformation, and plutonism in the Juneau gold belt, southeastern Alaska: Geology, v. 22, p. 203-206

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Primary Reference: Barnett, 1989; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Yankee Boy; Yankee

Site type: Prospect

ARDF no.: JU051

Latitude: 58.829 **Quadrangle:** JU D-4

Longitude: 135.0017

Location description and accuracy:

The Yankee prospect is at an elevation of 570 feet,on the north valley wall of Johnson Creek. It is 1 mile northwest of Berners Bay, in the SW1/4 section 13, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Ag, Au

Other: As

Ore minerals: Arsenopyrite, gold, pyrite

Gangue minerals: Calcite, quartz

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Jualin (Coeur-Alaska) deposit (JU262). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The Yankee Boy vein was discovered about 1911 and explored by a 136-foot adit and 4 open cuts (Redman and others, 1989). The Yankee Boy deposit consists of a single quartz vein in Jualin Diorite that is traceable for 3,000 feet northwest from the Yankee adit. The vein strikes N41W and dips steeply south. The thickness varies from a few inches to five feet and averages two feet. Roehm (1938) describes the vein as banded quartz with a darker, bluish core. The outer bands are nearly barren of sulfides and vary from milky white to glassy. Sulfide minerals are confined mainly to the central bluish band, which varies in width from a few inches to 18 inches but averages less than 12 inches. Pyrite and a little arsenopyrite are the only sulfides in the vein. The vein represents two generations of quartz: a milky white to glassy rim, and grayish blue core (Roehm, 1938). Roehm reports that samples of the vein contained up to 1.6 ounces of gold per ton and 1.0 ounce of silver per ton. In 1988, Curator International Resources Ltd. collected samples of the Yankee vein; one, two-foot chip sample assayed 1.35 ounces of gold per ton (Barnett, 1989).

Alteration:

Age of mineralization:

Hydrothermal muscovite from veins in the Jualin mine are 53.2 Ma to 55.5 Ma (Miller and others, 1994). This coincides with the 55 Ma age of the other mesothermal gold veins in the Juneau Gold Belt (Goldfarb and others, 1997).

Generic deposit model:

Deposit model:
Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
36a

Production Status: None

Site Status: Active

Workings/exploration:
The Yankee prospect was discovered about 1911 and explored by a 136-foot adit and 4 open cuts (Redman and others, 1989). Limited exploration was conducted by International Curator Resources Ltd. in 1988 (Barnett, 1989).

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Barnett, J.C., 1989, Jualin gold project, 1988 progress report, Berners Bay District: Unpublished report for International Curator Resources, Ltd., 75 p.

Birak, D.J., 2006, Kensington gold project: Unpublished Technical Report for Cour d'Alene Mines, 116 p. (posted on www/.sedar.com, April 20, 2006).

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

Miller, L.D., Goldfarb, R.J., Snee, L.W., Gent, C.A., and Kirkham, R.A., 1995, Structural geology, age, and mechanisms of gold vein formation at the Kensington and Jualin deposits, Berners Bay district, southeast Alaska: Economic Geology, v. 90, p. 343-368.

Redman, E.C., Maas, K.M., Kurtak, J.M., and Miller, L.D., 1989, Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984-1988, Volume 2--Detailed mine, prospect, and mineral occurrence descriptions, Section D, Juneau Gold Belt Subarea: U.S. Bureau of Mines Special Publication, 424 p.

Roehm, J.C., 1938, Preliminary report of Yankee group of claims, Berners Bay region, Alaska, 1938: Alaska Territorial Department of Mines Property Examination PE 112-13, 7 p.

Primary Reference: Roehm, 1938 (PE 112-13); Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Mystery

Site type: Prospect

ARDF no.: JU052

Latitude: 58.8267 **Quadrangle:** JU D-4

Longitude: 135.0201

Location description and accuracy:

The Mystery prospect is at an elevation of 350 feet, on the north wall of lower Johnson Creek. It is 1.5 miles northwest of Berners Bay and 1.5 mile southeast of the Jualin mine (JU044), in the NE1/4 section 23, T. 35 S., R. 62 E. of the Copper River Meridian. The location is accurate.

Commodities:

Main: Ag, Au, Cu

Other:

Ore minerals: Pyrite

Gangue minerals: Quartz

Geologic description:

Note: Beginning in the 1990s, this and other old mines and prospects in the vicinity were consolidated by Coeur-Alaska into a single property (Birak, 2006). They have carried out major new drilling and underground exploration that better defines the mineralization, largely blurs the geologic distinction among the old deposits, and extends the ore bodies greatly. They have developed a coherent modern interpretation of the mineralization as a single deposit which Coeur-Alaska intends to mine as a unit. This deposit is described separately in ARDF as the Jualin (Coeur-Alaska) deposit (JU262). For geologic reference purposes and for their historic value, the pre-Coeur-Alaska data for this and the other old mines and prospects that Coeur-Alaska consolidated are retained in ARDF.

The rocks at the Mystery prospect are similar to those at the Fremming prospect (JU049). They consist of light green, chloritic phyllite and greenstone. Redman and others (1989), interpret the Mystery prospect as a stratabound, volcanogenic massive sulfide deposit. However, exploration by International Curator Resources Ltd., combined with observations of drill core from both the Jualin Mine (JU044) and the nearby Fremming prospect (JU049), indicate that the predominant host rock is probably Jualin Diorite (Barnett and others, 1988). This interpretation is supported by Kaplar (1988) who showed that the diorite loses its textural and mineralogical identity as shearing becomes more intense. Rocks at or near the Mystery workings thus can be classified as greenstone and phyllite, but their protolith probably was Jualin Diorite (Kapler, 1988). Workings at the Mystery prospect include a water-filled shaft and several sloughed-in pits. The shaft is sunk on a 3-foot-thick layer of light green phyllite that contains 5-15 percent disseminated pyrite, and massive pyrite layers parallel to the foliation. The pyrite layers are up to 2 inches thick. Samples contain up to 1.4 part per million (ppm) gold, 1.5 ppm silver, and 5,500 ppm copper (Redman and others, 1989).

Alteration:

Chloritic.

Age of mineralization:

Hydrothermal muscovite from veins in the Jualin mine are 53.2 Ma to 55.5 Ma (Miller and others, 1994). This coincides with the 55 Ma age of the other mesothermal gold veins in the Juneau Gold Belt (Goldfarb

and others, 1997).

Generic deposit model:

Deposit model:

Volcanogenic massive sulfide deposit or a remobilized epigenetic copper-lead-zinc-gold deposit?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Workings at the Mystery prospect include a water-filled shaft and several sloughed-in pits.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Primary Reference: Redman and others, 1989; Birak, 2006

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Herbert Glacier; Herbert Gold

Site type: Prospect

ARDF no.: JU097

Latitude: 58.5309 **Quadrangle:** JU C-3

Longitude: 134.6855

Location description and accuracy:

This prospect is approximately 18.7 miles northeast of Juneau at the south edge of the terminus of Herbert Glacier at an elevation of approximately 500 feet. It is about 2.3 miles northeast of the center of Windfall Lake and about 0.5 mile south-southeast of the center of section 33, T. 38 S., R. 65 E., of the Copper River Meridian. The location site is centered in the area of drilling between 2010 and 2012 along where the Main vein outcrops.

Commodities:

Main: Ag, Au, Pb, Zn

Other:

Ore minerals: Arsenopyrite, galena, gold, pyrite, scheelite, sphalerite

Gangue minerals: Calcite, quartz

Geologic description:

The Herbert Glacier prospect is near the Coastal Shear Zone that parallels the boundary between the Gravina belt to the west and the Taku terrane to the east. The Gravina belt comprises Upper Jurassic to Mid-Cretaceous marine argillite and greywacke, interbedded andesite to basaltic volcanic and volcaniclastic rocks, and plutons ranging from quartz diorite to peridotite (Gehrels and Berg, 1994). The Taku terrane contains older Permian to Triassic age marble, phyllite, pillow basalt, and flysch-related rocks, which are overlain by Upper Jurassic to Mid-Cretaceous greywacke and, likely, related to similar age rocks in the Gravina belt. Metamorphic grade ranges from greenschist to amphibolite facies and generally increases from west to east. Regional metamorphism and deformation, including the Coastal Shear Zone, are broadly linked to emplacement of multiple intrusive rocks in the Coast Mountains that have isotopic ages ranging from 10 to 55 Ma (Gehrels and Berg, 1994).

The Herbert Glacier prospect was discovered in 1986 by Houston Oil and Minerals in outcrops recently exposed by retreating ice (Redman and others, 1989). The deposit consists of five east-trending veins; from north to south these are the North vein, the Goat Creek vein, the Main vein, the Deep Trench vein, and the Floyd vein (Grande Portage Resources Ltd., 2010a; Hale and Hawley, 2011). The veins are in a northwest-trending, fault-bounded band of hornblende-biotite quartz diorite about 800 meters wide. The diorite is bounded to the northeast by gneiss and to the southwest by low-grade metasedimentary rocks.

The veins dip steeply to the north, are composed of quartz and subordinate calcite, and exhibit ribbon texture. They pinch and swell and vary from a few inches to 4 feet thick. The veins are in shear zones perpendicular to the regional foliation, are marked by slickensided cores, and contain native gold, arsenopyrite, pyrite, galena, sphalerite, and scheelite. Fist-size clots of arsenopyrite form up to 20 percent of the principal veins and visible gold occurs in the footwalls of galena-rich parts of the veins. Potassic alteration in the footwalls extends several feet into the wallrock. U.S. Bureau of Mines samples contained up to 37.2 parts per million (ppm) gold, 186.7 ppm silver, more than 1 percent lead, and 0.36 percent zinc (Redman and others, 1989). Samples of the south set of veins contained up to 240.8 ppm gold, 126.9 ppm silver, more than 1 percent lead, and 0.36 percent zinc. The Bureau of Mines collected a 240-pound metallurgical sample for analysis and beneficiation tests in 1988. A gravity separation test recovered 88.8

percent of the gold and 80.7 percent of the silver (Redman and others, 1989).
In July 2016, Grande Portage Resources Ltd. announced it entered into an agreement, through its wholly-owned subsidiary GPG Alaska Resources Inc., with its' joint-venture partner Quaterra Alaska, Inc., the wholly-owned subsidiary of Quaterra Resources Inc., to acquire Quaterra's 35 percent participating interest in the Herbert Gold project (Athey and Werdon, 2017).

Alteration:

Potassic alteration in the footwalls extends several feet into the wallrock (Redman and others, 1989). Sericite, chlorite, and carbonate-altered quartz diorite is observed up to 1 meter adjacent to veining (DuPre and Webb, 2013).

Age of mineralization:

Isotopic dates indicate that the auriferous veins in the Juneau Gold Belt formed between 56 and 55 Ma (Miller and others, 1994; Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

Tenneco Minerals and its successor Echo Bay Mining Mining Company drilled at least 7 shallow holes from 1986 to 1988. Some notable intercepts were 1 foot that contained 3.85 ounces of gold per ton, 14 feet that contained 0.98 ounce of gold per ton, and 1 foot that contained 12.64 ounces of gold per ton (Grand Portage Resources Ltd., 2010a).

Grande Portage Resources Ltd. began exploring the Herbert Glacier deposit under an agreement with Quaterra Resources in June of 2010 (Grande Portage Resources Ltd., 2010a). In 2010, they drilled 19 holes in several veins (Grande Portage Resources Ltd., 2010b, 2010c). Some of the notable intercepts were 1.85 meters with 4.012 grams per tonne (g/t) gold; 1.51 meters with 4.84 g/t gold; 0.44 meter with 9.91 g/t gold; 1.14 meters with 17.1 g/t gold; and 0.71 meter with 11.35 g/t gold.

Grande Portage drilled 31 more holes in 2011 on the Goat Creek vein, the Ridge vein, the Main vein, and the Trench vein, and dug 4 trenches (Hale and Hawley, 2011; Grande Portage Resources Ltd., 2011). The tenor of the mineralization on the Main vein was confirmed. Some notable intercepts on the Deep Trench vein were 3.52 meters that averaged 11.53 g/t gold; 4.6 meters that averaged 4.18 g/t gold, and 1.36 meters that averaged 9.26 g/t gold.

In 2012 Grande Portage Resources Ltd. drilled 62 more holes for a total of 8,805 meters (DuPre and Webb, 2013). Highlights of some of the assay results from drilling include 13.23 meters at 4.04 g/t gold, 2.05 meters at 79.41 g/t gold, 1.13 meters at 48.12 g/t gold, and 2.12 meters at 11.72 g/t gold (Grande Portage Resources Ltd., 2012a). The best intercept occurred over 0.71 meter and contained 428 g/t gold. The 2012 drilling help delineate mineralization along strike of the Deep Trench vein for over 400 meters (Grande Portage Resources Ltd., 2012b).

Production notes:

None.

Reserves:

In 2013 DuPre and Webb completed an updated resource estimate for Herbert Glacier. The resource is

based on eight veins, uses 2 grams per tonne (g/t) for a cut-off, and assumes an average gold price of $1,500 per ounce. The inferred resource is 51,611 tonnes grading 7.73 g/t gold yielding 12,819 ounces of gold and the indicated resource is 821,100 tonnes grading 6.91 g/t gold yielding 182,400 ounces of gold (DuPre and Webb, 2013).

As recorded in their NI 43-101 technical report of April 10, 2013, the Herbert Gold project contains an indicated resource of 821,100 tonnes containing 182,400 ounces of gold at 6.91 grams of gold per tonne. Additionally, inferred resources include 51,600 tonnes containing 12,800 ounces of gold at 7.73 grams of gold per tonne (DuPre and Webb, 2013). Drilling has intersected the mineralized vein over a strike length of 370 meters and to a depth of more than 200 m. The vein can be traced at surface over a strike length of 1,000 meters (Athey and Werdon, 2017).

Additional comments:

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Primary Reference: DuPre and Webb, 2013

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Contractor, USGS); N.V. King (Alaska Earth Sciences); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Greens Creek

Site type: Mine

ARDF no.: JU253

Latitude: 58.079 **Quadrangle:** JU A-2

Longitude: 134.6312

Location description and accuracy:

The Greens Creek Mine is at an elevation of 1,500 feet on the south side of Greens Creek on Admiralty Island. The mine is marked on the Juneau A-2 topographic map in the NW1/4 section 9, T. 44 S., R. 66 E. of the Copper River Meridian. The location is accurate to about 1/4 mile.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other: Ba, Bi

Ore minerals: Acanthite, barite, bornite, chalcopyrite, electrum, freibergite, galena, proustite, pyrite, sphalerite, tetrahedrite, tennantite-tetrahedrite

Gangue minerals: Calcite, graphite, quartz

Geologic description:

The Greens Creek deposit is discontinuous along the contact between a structural hanging wall of thinly laminated, quartz-mica-carbonate phyllite and a structural footwall of black, graphitic, meta-argillite. Fossils in calcareous, black argillite clasts in pyritic massive sulfide ore are Late Triassic in age (Crafford, 1989). The most intense alteration is closest to the copper-rich portions of the orebody and consists of intense silica-pyrite alteration. Three main types of ore have been recognized at the Greens Creek Mine: massive, black, and white. Massive ore is the most common and contains more than 50 percent sulfides, chiefly pyrite, sphalerite and galena, in a matrix of locally barite-bearing silica-carbonate rock. Less-abundant ore minerals include chalcopyrite, tetrahedrite, freibergite, proustite, and electrum. The pyrite content of the massive ore varies from 80 to 90 percent in base-metal-poor ore to 10 to 15 percent in base-metal-rich ore. The black ore is similar to the massive ore, except that it contains appreciable graphite. White ore varies depending upon whether the gangue is primarily barite, silicates, or carbonates. The white ore is pyrite-poor and contains coarse-grained tetrahedrite-tennantite, bornite, freibergite, proustite, galena, sphalerite, chalcopyrite and acanthite. Very high precious metal values are common in base-metal-rich massive sulfides near the stratigraphic hanging wall contact, but gold is common in all three types of ore (Newberry and others, 1997).

The Greens Creek deposit was discovered in 1973 by following up a zinc stream-sediment anomaly (T.C. Crafford, oral communication, 2000). The underground mine and concentrator facility began operation in 1989, but was placed on standby in 1993, followed by a $114-million, 3-year, modernization. Operations resumed in 1996 (Kennecott Minerals Company, 2001) and have continued steadily to 2011. The deposit is serviced by 13 miles of road. In addition to the mine, there is an ore concentrating mill, a tailings impoundment area, a ship-loading facility, camp facilities, and a ferry dock at Hawk Inlet. Ore from the underground trackless mine is milled at the mine site. The mill produces gold-silver dore as well as lead, zinc and bulk concentrates. Concentrates are shipped from a marine terminal about nine miles from the mine site.

The rocks in the surrounding area are mainly Ordovician and Devonian to Triassic, clastic units, mafic-intermediate volcanic rocks, and subordinate limestone. The bedded rocks are intruded and locally metamorphosed by Cretaceous granodiorite (Gehrels and Berg, 1994).

In 2008, Hecla Mining Company acquired a 100 percent interest in the mine from Rio Tinto (Hecla Mining Company, 2011). In 2009, the Greens Creek Mine produced 7,459,170 ounces of silver, 67,278 ounces of gold, 70,379 tons of zinc, and 22,254 tons of lead from 790,871 tons of ore that was milled (Szumigala and others, 2010). In 2009, 39,000 feet of infill and exploration drilling added ore reserves equivalent to the ore that was mined that year. In 2009, the proven and probable ore reserves were 8,314,700 tons with an average grade of 12.1 ounces of silver per ton, 0.10 ounce of gold per ton, 20.3 percent zinc, and 3.6 percent lead.

In 2012, the Greens Creek Mine produced 1) 6,400,000 ounces of silver, 2) 55,496 ounces of gold, 3) 64, 249 tons of zinc, and 21,074 tons of lead from 789,569 tons of ore that was milled (Athey and others, 2013). In 2012, the proven and probable ore reserves were reported as 1) 92,500,000 ounces of silver with an average grade of 11.9 ounces of silver per ton, 2) 713,000 ounces of gold with an average grade of 0.09 ounces of gold per ton, 3) 9.0 percent zinc, and 4) 3.4 percent lead (McDonald and others, 2013).

In 2016, Hecla Mining Company produced 9,253,543 ounces of silver from Greens Creek mine, which was the highest since Hecla acquired 100 percent of the mine in 2008, an increase over the prior year by 9.5 percent; gold production of 53,912 ounces decreased by 11.0 percent from the 2015 level. The mine also yielded 20,596 tons of lead, and 57,729 tons of zinc. The mill operated at an average of 2,229 tons per day for the year, for a total of 815,639 tons. Ore grades milled were 14.55 ounces of silver per ton, 0.10 ounce of gold per ton, 3.11 percent lead, and 8.08 percent zinc. Definition drilling at Greens Creek in 2016 refined the resources of the 9A, Southwest Bench, East Ore and NWW zones (Athey and Werdon, 2017).

Alteration:

The most intense alteration is closest to the copper-rich portions of the orebody and consists of intense silica-pyrite alteration.

Age of mineralization:

Fossils in calcareous, black argillite clasts intercalated with pyritic massive-sulfide ore are Late Triassic (Crafford, 1989).

Generic deposit model:

Volcanogenic massive sulfide deposits (Franklin and others, 2005)

Deposit model:

Kuroko massive sulfide deposit (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: Yes; large

Site Status: Active

Workings/exploration:

The Greens Creek deposit was discovered in 1973. The underground mine and concentrator began operation in 1989. The deposit is serviced by 13 miles of road. In addition to the mine, there is an ore concentrating mill, a tailings impoundment area, a ship-loading facility, camp facilities, and a ferry dock at Hawk Inlet. The mine has been in continuous operation since 1996 after a few year's interruption to modernize the plant. In 2008, Hecla Mining Company acquired a 100 percent interest in the mine from Rio Tinto. In 2009, 39,000 feet of infill and exploration drilling added ore reserves equivalent to the ore that was mined that year.

Exploration at Greens Creek mine is concentrated along the trend of numerous underground volcanogenic massive sulfide ore bodies, and on Hecla Mining Company’s 23-square-mile, surface land package. Exploration work in 2016 increased reserves for the 9A and NWW zones, where approximately 8.3 million ounces of silver and 46,500 ounces of gold were added. Measured and indicated resources were increased with additions in the 9A, NWW, SW, Gallagher zones, and the newly established Upper Plate resource. Inferred resources decreased for silver and gold overall, as they were converted to reserves and indicated

resources at the NWW Zone; all other zones, except 200 South, showed increases in inferred gold and silver resources.

In 2016, exploration drilling was concentrated on the Gallagher Zone and the Mine Syncline, a new exploration target area where the ore horizon has been identified in the north and south-central parts of the mine. Drilling of the NWW Zone’s southern extension continues to define mineralization along the lower fold, continuing from the fold nose and along the upper limb. Mineralization is represented by multiple distinct bands of massive ore and mineralized argillites and has similar geometry and dimensions to the current resource model. Highlights of assay results include 45.4 ounces of silver per ton, 0.20 ounce of gold per ton, 19.0 percent zinc, and 10.3 percent lead over 18.6 feet, and 51.7 ounces of silver per ton, 0.20 ounce of gold per ton, 11.2 percent zinc, and 4.8 percent lead over 10.0 feet. Drilling also targeted the Upper Southwest Zone around previously mined levels, and identified mineralization that extends down to the upper limb of NWW Zone. Highlighted assay results from Upper Southwest Zone include 46.8 ounces of silver per ton, 0.03 ounce of gold per ton, 10.9 percent zinc, and 6.1 percent lead over 10.2 feet. The drilling also identified shallow mineralization east of the Kahuna fault. Recent drilling of the lower 9A Zone has generally confirmed and upgraded the resource model. Initial definition drilling of the East Ore Zone shows that overall the mineralization is thinner than expected compared to the model, but this drilling is advancing into stronger mineralized portions of the resource.

Gallagher Zone exploration drilling targeted a new flat-lying zone above the 4211 Drift that may define an ore-horizon contact that steepens to the east near the Gallagher fault. Deep exploration drilling of the Mine Syncline shows the ore-horizon contact continues steeply down dip from the NWW Zone and could define a broad syncline below the current mine infrastructure that could host mineralization. Drilling of this same syncline in the central part of the mine shows the ore-horizon contact is the down-dip extension of the lower fold limb of the NWW zone (Athey and Werdon, 2017).

Production notes:

In 2009, the Greens Creek Mine produced 7,459,170 ounces of silver, 67,278 ounces of gold, 70,379 tons of zinc, and 22,254 tons of lead from 790,871 tons of ore that was milled (Szumigala and others, 2010).

In 2012, the Greens Creek Mine produced 1) 6,400,000 ounces of silver, 2) 55,496 ounces of gold, 3) 64, 249 tons of zinc, and 21,074 tons of lead from 789,569 tons of ore that was milled (Athey and others, 2013).

In 2016, Hecla Mining Company produced 9,253,543 ounces of silver from Greens Creek mine, which was the highest since Hecla acquired 100 percent of the mine in 2008, an increase over the prior year by 9.5 percent; gold production of 53,912 ounces decreased by 11.0 percent from the 2015 level. The mine also yielded 20,596 tons of lead, and 57,729 tons of zinc. The mill operated at an average of 2,229 tons per day for the year, for a total of 815,639 tons. Ore grades milled were 14.55 ounces of silver per ton, 0.10 ounce of gold per ton, 3.11 percent lead, and 8.08 percent zinc. Definition drilling at Greens Creek in 2016 refined the resources of the 9A, Southwest Bench, East Ore and NWW zones (Athey and Werdon, 2017).

Reserves:

In 2009, the proven and probable ore reserves were 8,314,700 tons of of material with an average grade of 12.1 ounces of silver per ton, 0.10 ounces of gold per ton, 20.3 percent zinc, and 3.6 percent lead. In 2009, 39,000 feet of infill and exploration drilling added ore reserves equivalent to the ore that was mined that year.

In 2012, the proven and probable ore reserves were reported as 92,500,000 ounces of silver with an average grade of 11.9 ounces of silver per ton, 713,000 ounces of gold with an average grade of 0.09 ounces of gold per ton, 9.0 percent zinc, and 3.4 percent lead (McDonald and others, 2013).

As of December 31, 2016, proven and probable reserves at Greens Creek include 7.594 million short tons grading 11.7 ounces of silver per ton, 0.09 ounce of gold per ton, 2.9 percent lead and 7.6 percent zinc, for a contained metal content of 88.87 million ounces of silver, 673,000 ounces of gold, 217,280 tons of lead, and 576,130 tons of zinc. Indicated resources include 1,785,000 tons of material grading 10.8 ounces of silver per ton, 0.09 ounce of gold per ton, 3.1 percent lead and 7.8 percent zinc, for a contained metal content of 19.3 million ounces of silver, 154,000 ounces of gold, 55,980 tons of lead, and 139,660 tons of zinc. Inferred resources include 3,397,000 tons of material grading 11.9 ounces of silver per ton, 0.08 ounce of gold per ton, 2.9 percent lead, and 7.2 percent zinc, for a contained metal content of 40.25 million ounces of silver, 285,000 ounces of gold, 98,380 tons of lead, and 243,220 tons of zinc. The total silver resource in all categories is over 148 million ounces (Hecla Mining Company, 2017).

Additional comments:

References:

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Primary Reference: MacDonald, 2013

Reporter(s): J.C. Barnett and L.D. Miller (Juneau, Alaska); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Kensington (Coeur-Alaska)

Site type: Mine

ARDF no.: JU261

Latitude: 58.8628 **Quadrangle:** JU D-4

Longitude: 135.0801

Location description and accuracy:

This site represents the consolidation by Coeur-Alaska of more than 12 mines and prospects, 53 patented claims, and 377 unpatented claims along a northwest-trending belt about 2 miles long between the head of Johnson Creek and Sherman Creeks. By 2008, Coeur-Alaska had done considerable new underground exploration along this belt, discovered new veins, and connected many of the old workings. The work is far advanced and Coeur-Alaska plans to mine the deposit as a single entity. This site is referred to as the Kensington deposit/property, which is part of Coeur-Alaska's 'Kensington Project' (which also includes the Jualin deposit/property (JU262) to the southeast which is described separately. The coordinates are near the center of the Coeur-Kensington deposit, which is near the site of the old Kensington Mine (JU029). The Coeur-Kensington deposit also includes such old mines and prospects as the Ophir, (JU026), Horrible (JU027), and Comet (JU036) Mines as well as several other mines and prospects (JU022, JU028, JU030, JU031, JU032, JU034, JU036, JU037, and JU039); however, these are still described individually in ARDF for their pre-Coeur-Alaska geologic and historical data. This site is located 0.2 mile southeast from the center of section 4, T. 35 S., R. 62 E., of the Copper River Meridian. The location is accurate, though degree of accuracy is not reported.

Commodities:

Main: Ag, Au, Te

Other: Cu, Fe, Hg, Mo, Pb, Zn

Ore minerals: Altaite, bornite, calaverite, coloradoite, galena, gold, hessite, magnetite, molybdenite, petzite, pyrite, pyrrhotite, sphalerite, volynskite

Gangue minerals: Calcite, ferroan dolomite, quartz

Geologic description:

The modern exploration history of the Kensington project began in 1980 when the Kensington Mine was optioned to Homestake Mining Company and from 1980 to 1985 to Placid Oil Company. Placid drilled 13,626 feet near the old Kensington Mine (JU029) and another 14,076 feet on other targets in the area. Coeur d'Alene Mines Corporation became involved in the property in 1987 in a joint venture with Echo Bay Mines; exploration continued that resulted in a feasibility study in 1993. In 1995, Coeur gained total control of the property under a subsidiary, Coeur-Alaska. By 1997, with the decline of gold prices, the project was considered economically unattractive, but work continued in 1998 that added 300,000 ounces of gold resources. Feasibility and exploration continued and in 2005 Coeur drilled 34,035 feet underground to better identify the resources. As of 2006 (Birak, 2006), the Kensington deposit consisted of more than old 12 mines and prospects, 53 patented claims, and 377 unpatented claims that occur in a northwest-trending belt about 2 miles long between the head of Johnson Creek and Sherman Creeks.

Simultaneous, exploration also started in 1978 to the southeast on a contiguous block of mines, prospects, and claims around the old Jualin Mine. From 1983 to 1993, the area was explored by a succession of companies including Bear Creek Mining Company, International Curator Resources, Granges, and Placer-Dome USA. In 1993, Coeur entered into a joint venture on the property with Curator and in 1994, Coeur acquired a 100 percent interest in the property. Coeur subsequently carried out major drilling and

underground work on the property, which is now the Jualin deposit/property (JU262) of the Kensington Project.

In 2006, Coeur prepared an extensive NI 43-101 report (Birak, 2006) on the Kensington Project that is largely the basis of this description. As of 2006, the Kensington deposit had been defined by 342,000 feet of drilling; it and the continuous Jualin deposit (JU262) had been explored by 27,000 feet of underground workings. The resources of the Kensington Project, that is both the Kensington deposit described here and the contiguous Jualin deposit (JU262) are: 1) 617,000 tons of indicated resources with a grade of 0.436 ounce of gold per ton (at a cut off grade of 0.12 ounce of gold per ton); 2) 2,499,000 tons of inferred resources with a grade of 0.234 ounce of gold per ton (at a cut-off grade of 0.12 ounce of gold per ton); and 3) 4,206,000 tons of probable reserves with a grade of 0.250 ounce of gold per ton (at a cut-off grade of 0.16 ounce of gold per ton), all estimated at a gold price of $375 per ounce.

The mine plant for the project was largely completed by 2008 but the start of production was delayed to resolve permitting and legal issues. The new Kensington Mine began production in June of 2010 with a projected production rate of about 125,000 ounces of gold per year and a projected life of 12.5 years (Coeur Alaska, 2012). The mine produced 43,143 ounces of gold in 2010 from 174,028 tons of ore that was milled and 88,420 ounces of gold in 2011 (Coeur d'Alene Mines Corp., 2012).

The Kensington deposit is largely in the Cretaceous Jualin Diorite, a northwest-trending stock about 5 miles long and 3 miles wide that is bordered on the east by Triassic metavolcanic rocks of the Wrangellia Terrane and to the west by pelitic sedimentary rocks of the Cretaceous Treadwell Formation, part of the Gravina Belt. The structure of the area is dominated by two regional-scale, northwest-trending faults: the Gastineau shear zone which is southwest of the Kensington mineralization and the Kensington shear zone that trends through the mineralization. The Kensington shear zone has several strands and movement along them controlled the development of the veins in the Kensington deposit. Four periods of deformation are recognized in the Kensington shear zone that span the period from 110 Ma (D1) to 53 Ma (D4). The gold veins are coeval with the D3 deformation, which developed a system of right-lateral, reverse, wrench faults.

The Kensington deposit consists of seven mineralized bodies; they form an en echelon series that dips east and extends to at depth of at least 3,500 feet. The individual ore bodies are related to two general structures: 1) large swarms of discontinuous quartz-carbonate-pyrite veins in biaxial sets between right-lateral reverse, conjugate faults; and 2) small massive sulfide-bearing veins in dilation zones along individual shear zones. Large dilation zones typically have a tabular to sigmoidal shape and grade into barren diorite. The vein swarms typically are continuous across the entire width of the mineralized zones but locally contain poorly mineralized rock.

The vein mineralization typically consists of gold tellurides and gold-silver tellurides with minor base metal sulfides in quartz-carbonate gangue (Casey, 2000). Most of the gold is in calaverite ($AuTe_2$) that also contains tiny gold inclusions. Gold also occurs interstitially and along microfractures in pyrite. The veins also contain trace amounts of petzite (Ag_3AuTe_2), hessite (Ag_2S), coloradoite, (HgTe), volynskite ($AgBeTe_2$), and altaite (PbTe), as well as minor chalcopyrite and rare bornite, molybdenite, sphalerite, tetrahedrite, galena, magnetite, and pyrrhotite.

Hydrothermal alteration adjacent to the veins is characterized by reddish-brown ferroan dolomite (Miller and others, 1995). Other alteration includes sericitization of plagioclase, chloritization, sulfidization of mafic minerals, and albitization of feldspars (Leveille, 1991). Calcite is the dominant carbonate; quartz occurs in stages 2 to 4 of the mineralization; and minor ferroan dolomite occurs with the calcite in stage 4. The age of hydrothermal muscovite from veins at Kensington Mine (JU029) varies from 53.4 Ma to 56.5 Ma (Miller and others, 1994).

Alteration:

Hydrothermal alteration adjacent to the veins is characterized by reddish-brown ferroan dolomite (Miller and others, 1995). Other alteration includes sericitization of plagioclase, chloritization, sulfidization of mafic minerals, and albitization of feldspars (Leveille, 1991).

Age of mineralization:

About 50 Ma. Younger than the 1110 Ma, D1 deformation and younger than the Cretaceous Jualin Diorite. Hydrothermal muscovite from the Kensington Mine has been dated at 53.4 Ma to 56.5 Ma (Miller and others, 1994).

Generic deposit model:

Deposit model:

Te-Au pyrite-carbonate-quartz-carbonate-pyrite veins (Cox and Singer, 1986; model 22b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22b

Production Status: Yes

Site Status: Active

Workings/exploration:

The modern exploration history of the Kensington project began in 1980 when the Kensington Mine was optioned to Homestake Mining Company and from 1980 to 1985 to Placid Oil Company. Placid drilled 13,626 feet near the old Kensington Mine (JU029) and another 14,076 feet on other targets in the area. Coeur d'Alene Mines Corporation became involved in the property in 1987 in a joint venture with Echo Bay Mines; exploration continued that resulted in a feasibility study in 1993. In 1995, Coeur gained total control of the property under a subsidiary, Coeur-Alaska. By 1997, with the decline of gold prices, the project was considered economically unattractive, but work continued in 1998 that added 300,000 ounces of gold resources. Feasibility and exploration continued and in 2005, Coeur drilled 34,035 feet underground to better identify the resources. As of 2006 (Birak, 2006), the Kensington deposit consisted of more than old 12 mines and prospects, 53 patented claims, and 377 unpatented claims that occur in a northwest-trending belt about 2 miles long between the head of Johnson Creek and Sherman Creeks.

Simultaneous, exploration also started in 1978 to the southeast on a contiguous block of mines, prospects, and claims around the old Jualin Mine. From 1983 to 1993, the area was explored by a succession of companies including Bear Creek Mining Company, International Curator Resources, Granges, and Placer-Dome USA. In 1993, Coeur entered into a joint venture on the property with Curator and in 1994, Coeur acquired a 100 percent interest in the property. Coeur subsequently carried out major drilling and underground work on the property, which is now the Jualin deposit/property (JU262) of the Kensington Project.

In 2006, Coeur prepared an extensive NI 43-101 report (Birak, 2006) on the Kensington Project that is largely the basis of this description. As of 2006, the Kensington deposit had been defined by 342,000 feet of drilling; it and the continuous Jualin deposit (JU262) had been explored by 27,000 feet of underground workings.

The mine went into production in July 2010.

In 2012, Coeur-Alaska completed 143,796 feet of core drilling primarily devoted to in-fill drilling of Block K and the Raven veins, and identified 151,000 tons with initial proven and probable reserves of 50,400 ounces of gold. The average of 0.33 ounce per ton gold is approximately 51 percent higher than the overall average reserve grade at Kensington. Kensington produced 82,1225 ounces of gold in 2012 (Athey and others, 2012).

In 2016, Coeur Alaska, Inc.’s accelerated surface- and underground-exploration program was focused on potential resource conversion and expansion within the Kensington Main ore body, nearby Raven vein, and newly discovered high-grade Jualin deposit, as well as targeting for growth of several other new veins in the district discovered through surface-sampling programs. Exploration drilling at Kensington Main included four zones (lower Block M, and zones 12, 41, and 44) focusing on the potential expansion of the Kensington Main resource down-dip and to the south of the current resource model; one drill hole returned 3.7 meters of 41.5 grams of gold per tonne. Development of the Jualin decline (64 percent complete at year-end 2016) is allowing better exploration drilling access, and Coeur Alaska, Inc. reports the Jualin Vein #4 (1 of 5 known veins) contains a resource of 179,000 ounces of gold at 0.619 ounce of gold per ton. In addition, drilling in 2016 at the Raven vein targeted the down-plunge extension of a high-grade ore shoot. As of October 2016, a total of 31,586 feet (9,627 m) had been drilled in resource-infill with potential to convert to reserves, out of a total budgeted 60,000 feet (18,288 m). In addition, a total of 16,712 feet (5,094 m) was drilled underground in resource expansion by October 2016, with a total budgeted 25,000 (7,620 m) feet.

Exploration of the high-grade Jualin deposit accelerated following development of a new exploration station; 3 drill holes targeting the potential upgrade and expansion of the Jualin resource were completed. Surface drilling twinning historical Jualin drill holes began in August 2016, and this drill program had six planned holes for a total of 11,000 feet (~3,350 m). A surface-based winter drilling program followed the twinning program, and focused on potential expansion of the Jualin Vein #4; Vein #5 sits 300 feet (~90 m) below Vein #4 and has similar grade-thicknesses in 5 out of 6 holes drilled to this depth. Coeur Alaska, Inc. indicates accelerated surface and underground exploration will continue in 2017 at Kensington Main, Jualin, Raven, and other new vein discoveries in the district (Athey and Werdon, 2017).

Production notes:

About 65,000 ounces of gold was produced in the Berners Bay district prior to WWII. That production is documented individually by site in the ARDF records for the old mines in the vicinity of the Kensington deposit. (See the location field for their ARDF numbers). The new Kensington Mine began production in June of 2010 with a projected production rate of about 125,000 ounces of gold per year and a projected life of 12.5 years (Coeur Alaska, 2010). The mine produced 43,143 ounces of gold in 2010 from 174,028 tons of ore that was milled and 88,420 ounces of gold in 2011 (Coeur d'Alene Mines Corp., 2012).

In 2012, Kensington produced 82,1225 ounces of gold (Athey and others, 2012).

In 2016, Kensington mine produced 124,331 ounces of gold, and 620,209 tons of material were processed through the mill at an average grade of 0.21 ounce of gold per ton, with a 94.7 percent recovery rate. Development of the new Jualin decline was 64 percent complete as of year-end 2016. Capital expenditures are expected to increase in 2017, primarily as a result of ongoing development of the Jualin deposit, where production is expected to begin late in 2017 (Athey and Werdon, 2017).

Reserves:

As of December 31, 2011, the Kensington Mine has proven reserves of 1,164,000 tons with a grade of 0.280 ounce of gold per ton; probable reserves of 4,842,000 tons with an average grade of 0.209 ounces of gold per ton; measured and indicated resources of 3,039,000 tons with an average grade of 0.193 ounce of gold per ton; and an additional inferred resources of 731,000 tons with an average grade of 0.232 ounce of gold per ton (Coeur d'Alene Mines Corp., 2012).

As of January 1, 2013, the Kensington Mine has proven reserves of 647,000 tons (short) with a grade of 0.28 ounces of gold per ton and probable reserves of 4,020,000 tons with an average grade of 0.21 ounces of gold per ton; 3) measured resources of 382,000 tons with an average grade of 0.24 ounces of gold per ton; 4) indicated resources of 2,224,000 tons with an average grade of 0.20 ounces of gold per ton; and 5) inferred resources of 704,000 tons with an average grade of 0.24 ounces of gold per ton. These reserved include the Kensington deposit and the Raven deposit (formerly Horrible, JU027) (Barry, 2013).

As of year-end 2016, Kensington mine contains proven and probable reserves of 2,616,000 short tons grading 0.190 ounce of gold per ton, for a contained metal content of 497,000 ounces of gold; measured and indicated resources of 3,125,000 tons grading 0.279 ounce of gold per ton, for a contained metal content of 871,000 ounces of gold, which is a 350,000-ounce upgrade from 2015; and, total inferred resources for Kensington are 1,579,000 tons grading 0.276 ounce of gold per ton, for a contained metal content of 436,000 ounces of gold (Coeur Mining, 2016).

Additional comments:

The Kensington mine area consists of two contiguous Property Groups controlled by Coeur Alaska: the Kensington Group and Jualin Group. These two Groups constitute the Kensington Consolidated Property Package (Property Package) (Barry, 2013).

The Kensington Group includes the Raven (formerly Horrible, JU027), Kensington (JU261), Eureka (JU031), Johnson, and Elmira mineral deposits (Barry, 2013).

The Jualin Group includes the Jualin and the Empire mineral deposits. Both Groups are held through a combination of federal patented and unpatented lode mining and mill site claims and state of Alaska claims, all of which are either owned or held by lease agreements. The combined land holdings total over 14,000 acres, approximately 1,150 of which are covered by Federal patented lode claims (Barry, 2013).

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Primary Reference: Barry, 2013

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Jualin (Coeur-Alaska)

Site type: Mines

ARDF no.: JU262

Latitude: 58.8389 **Quadrangle:** JU D-4

Longitude: 135.0446

Location description and accuracy:

This site represents the consolidation by Coeur-Alaska of more than 10 mines and prospects, 25 patented claims, and 483 unpatented claims along a northwest-trending belt about 2 miles long that extends from the head of Berners Bay along Johnson Creek. By 2008, Coeur-Alaska had done considerable new underground exploration along this belt, discovered new veins, and connected many of the old workings. The work is far advanced and Coeur-Alaska plans to mine the deposit as a single entity. This site is referred to as the Jualin deposit/property, which is part of Coeur-Alaska's 'Kensington Project' which also includes the Kensington deposit/property (JU261) to the northwest, which is described separately. The coordinates are near the center of the Coeur-Jualin deposit. The Coeur-Jualin deposit now covers the old Jualin mine (JU 044) and several other mines and prospects (JU040, JU041, and JU045 to JU052); however, these are still described individually in ARDF for their pre-Coeur-Alaska geologic and historical data. This site is located 0.5 mile east-northeast from the center of section 15, T. 35 S., R. 62 E., of the Copper River Meridian. The location is accurate, though degree of accuracy not reported.

Commodities:

Main: Ag, Au, Te

Other: Cu, Fe, Mo, Pb, Zn

Ore minerals: Chalcopyrite, friedrichite-aikinite, galena, gold, hessite, molybdenite, pavonite, petzite, pyrite, rucklidgeite?, sphalerite, sylvanite

Gangue minerals: Calcite, dolomite, quartz

Geologic description:

The modern history of the Jualin deposit started in 1978 and eventually included a large block of 10 old mines and prospects, 25 patented claims, and 483 unpatented claims. From 1983 to 1993, the area was explored by a succession of companies including Bear Creek Mining Company, International Curator Resources, Granges, and Placer-Dome USA. In 1993, Coeur entered into a joint venture on the property with Curator and in 1994, Coeur acquired a 100 percent interest in the Jualin. Beginning in about 1980, exploration also began at the Kensington deposit (JU261) deposit to the northwest; this involved a succession of different companies on what became another large block of old mines, prospect, and new claims. In 1995, Coeur gained control of the Kensington deposit too Coeur subsequently carried out major drilling and underground work on both properties and as of 2008 the two main components of the Kensington Project are the Jualin deposit and the contiguous Kensington deposit (JU261).

In 2006, Coeur prepared an intensive NI 43-101 report (Birak, 2006) on the Kensington Project that is largely the basis of this description. As of 2006, the Jualin deposit had been defined by 72,000 feet of drilling; it and the contiguous Kensington deposit (JU261) had been explored by 27,000 feet of underground workings. As of 2006, the resources of the Kensington Project, that is, both the Jualin deposit described here and the contiguous Kensington deposit (JU261) are: 1) 617,000 tons of indicated resources with a grade of 0.436 ounce of gold per ton (at a cut off grade of 0.12 ounce of gold per ton); 2) 2,499,000 tons of inferred resources with a grade of 0.234 ounce of gold per ton (at a cut-off grade of 0.12 ounce of gold per ton); and 3) 4,206,000 tons of probable reserves with a grade of 0.250 ounce of gold per ton (at a cut-off grade of 0.16

ounce of gold per ton), all estimated at a gold price of $375 per ounce. The mine plant for the project is largely completed but the start of production is in abeyance pending resolution of permitting and legal issues. As of April, 2008, the current status of the project could be seen at the Coeur-Alaska web site (http://www.kensingtongold.com/).

The Jualin deposit is largely in the Cretaceous Jualin Diorite, a northwest-trending stock about 5 miles long and 3 miles wide that is bordered on the east by Triassic metavolcanic rocks of the Wrangellia Terrane and to the west by pelitic sedimentary rocks of the Cretaceous Treadwell Formation, part of the Gravina Belt. The structure of the area is dominated by two regional-scale, northwest-trending faults: the Gastineau shear zone which is southwest of the Kensington mineralization and the Kensington shear zone that trends through the mineralization. The Kensington shear zone has several strands and movement along them controlled the development of the veins in the Kensington Project. Four periods of deformation are recognized in the Kensington shear zone that span the period from 110 Ma (D1) to 53 Ma (D4). The gold veins are coeval with the D3 deformation, which developed a system of right-lateral, reverse, wrench faults.

As described by Birak (2006), the Jualin deposit consists of two deposits: Jualin Veins 1-4 and the Empire Zone. He recognizes several stages of mineralization, two of which are economically significant. The most important are large high-grade quartz-carbonate veins that often contain several ounces of gold per ton. High-grade portions of these veins were previously mined to a depth of about 300 feet; they typically contained 0.5 to 0.6 ounce of gold per ton. The Number 4 vein was discovered in 1990 by drilling and contains more than 1.0 ounce of gold per ton. The Jualin 1-4 veins strike northwest, parallel the regional structure, and dip steeply northeast. They vary from 2 to 20 feet wide and have been traced down dip more than 1,000 feet. The veins are known over an area about 500 feet wide and extend at least 1,000 feet along strike. The second style of mineralization consists of zones of low-angle, quartz-filled extension fractures between the principal shear-hosted veins. These zones vary from 20 to 50 feet thick and generally extend less than 100 feet along strike or dip; they typically average less than 0.06 ounce of gold per ton. The Empire is the largest and richest of these zones; it is about 50 feet wide, 1,000 feet long and averages about 0.10 ounce of gold per ton.

The Jualin mineralization consists of quartz-dolomite veins and veinlets with pyrite, chalcopyrite, galena, sphalerite, molybdenite, hessite, petzite, sylvanite, and native gold. Even small amounts of sulfides indicates gold in excess of 0.50 ounce of gold per ton. Several old deposits now included in the Coeur-Jualin deposit, the Valentine (JU046) and Flemming (JU049), have characteristics of massive sulfide deposits (Casey, 2000) in that they contain markedly more chalcopyrite and sphalerite than other deposits in the belt. The Valentine also has a unusual suite of bismuth sulfosalts including pavonite ((Ag,Cu)(Bi,Pb)3S5), bismuthinite (Bi2S3), a member of the friedrichite (Pb5Cu5Bi7S18) - aikinite (PbCuBiS3), solid-solution series, and rucklidgeite? ((Bi,Pb)3Te4).

Alteration:

Albitization and silicification adjacent to the veins (Birak, 2006).

Age of mineralization:

About 55Ma. Precedes the 53 Ma deformational event and younger than the Cretaceous Jualin Diorite. Hydrothermal muscovite from the nearby Kensington mine has been dated at 53.4 Ma to 56.5 Ma (Miller and others, 1994).

Generic deposit model:

Deposit model:

Te-Au pyrite-carbonate-quartz-carbonate-pyrite veins (Cox and Singer, 1986; model 22b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22b

Production Status: Yes

Site Status: Active

Workings/exploration:

The modern history of the Jualin deposit started in 1978 and eventually included a large block of 10 old mines and prospects, 25 patented claims, and 483 unpatented claims. From 1983 to 1993, the area was explored by a succession of companies including Bear Creek Mining Company, International Curator Resources, Granges, and Placer-Dome USA. In 1993, Coeur entered into a joint venture on the property with Curator and in 1994, Coeur acquired a 100 percent interest in the Jualin. Beginning in about 1980, exploration also began at the Kensington deposit (JU261) deposit to the northwest; this involved a succession of different companies on what became another large block of old mines, prospect, and new claims. In 1995, Coeur gained control of the Kensington deposit too Coeur subsequently carried out major drilling and underground work on both properties and as of 2008 the two main components of the Kensington Project are the Jualin deposit and the contiguous Kensington deposit (JU261).

In 2006, Coeur prepared an intensive NI 43-101 report (Birak, 2006) on the Kensington Project that is largely the basis of this description. As of 2006, the Jualin deposit had been defined by 72,000 feet of drilling; it and the contiguous Kensington deposit (JU261) had been explored by 27,000 feet of underground workings. The mine plant for the project is largely completed but the start of production is in abeyance pending resolution of permitting and legal issues.

Through the end of 2012, 104,618 ft. of core drilling in 142 holes has been reported at the Jualin and Empire Zones. This drilling has shown that near where Jualin Veins 1, 2 and 3 begin to fade away into weakly mineralized fractures, a new set of strong, well mineralized veins begins (Barry, 2013).

Extensive surface drilling was completed at Jualin in 2014 in order to define the northern extent of mineralization along strike of the Vein number 4 zone and increase the drill density spacing to define an inferred resource. There were 47 drill holes completed totalling 58,363 feet (Beebe and others, 2015).

Production notes:

Although development is well advanced, there has been no production from the Jualin deposit as defined by Coeur-Alaska since the 1990s. About 65,000 ounces of gold was produced in the Berners Bay district prior to WWII. That production is documented individually in the ARDF records for the old mines in the vicinity of the Jualin deposit. (See the location field for their ARDF numbers).

Reserves:

Birak (2006) reported the resources of the Kensington project, including both the Jualin deposit described here and the contiguous Kensington deposit (JU261), were: 1) 617,000 tons of indicated resources with a grade of 0.436 ounce of gold per ton (at a cut off grade of 0.12 ounce of gold per ton); 2) 2,499,000 tons of inferred resources with a grade of 0.234 ounce of gold per ton (at a cut-off grade of 0.12 ounce of gold per ton); and 3) 4,206,000 tons of probable reserves with a grade of 0.250 ounce of gold per ton (at a cut-off grade of 0.16 ounce of gold per ton), all estimated at a gold price of $375 per ounce.

A resource estimate for just the Jualin deposit was made by Beebe and others in 2015. The inferred resource using a cut-off value of 0.123 ounces per ton gold is 289,000 tons grading 0.62 ounces per ton gold containing 179,000 ounces of gold.

Additional comments:

The Kensington mine area consists of two contiguous properties controlled by Coeur Alaska: the Kensington Group and Jualin Group. These two Groups constitute the Kensington Consolidated Property Package (Property Package) (Barry, 2013).

The Kensington Group includes the Raven (formerly Horrible, JU027), Kensington (JU261), Eureka (JU031), Johnson (JU030), and Elmira (JU032) mineral deposits (Barry, 2013).

The Jualin Group includes the Jualin and the Empire mineral deposits. Both Groups are held through a combination of federal patented and unpatented lode mining and mill site claims and state of Alaska claims, all of which are either owned or held by lease agreements. The combined land holdings total over 14,000 acres, approximately 1,150 of which are covered by Federal patented lode claims (Barry, 2013).

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Primary Reference: Barry, 2013

Reporter(s): D.J. Grybeck (Port Ludlow, WA); V.C. Zinno (Alaska Earth Sciences, Inc.); N.V. King (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Old Glory; Last Chance

Site type: Mine

ARDF no.: KC033

Latitude: 55.6086 **Quadrangle:** KC C-6

Longitude: 131.9977

Location description and accuracy:

The Old Glory mine and adjacent Last Chance prospect are on the southwest foot of Gold Mountain at an elevation of 400-500 feet, and about 1.2 miles northwest of the mouth of Falls Creek. The site is in section 24, T. 72 S., R. 88 E., of the Copper River Meridian. It corresponds to locs. 254-2 to 254-28 and 255 in Maas and others (1995, fig. 46). The location is accurate within 0.1 mile. Figure 48 in Mass and others (1995) is a recent detailed map of the underground workings of the Old Glory Mine.

Also see Additional comments.

Commodities:

Main: Au

Other:

Ore minerals: Bornite, chalcopyrite, pyrite

Gangue minerals: Quartz

Geologic description:

The mines and prospects at the head of Smuggler Cove are an almost bewildering succession of companies, names for the mines, personalities, and financial plans if not schemes to fund the work on the deposits. Roppel (1905) has sorted out much of the detail but it is still unclear exactly what deposits were being controlled by which company at any given time in the area. Much of the knowledge of the mines she deciphered is centered on the companies rather than individual mines and prospects and it is not unlikely that the companies controlled different mines, claims, and prospects at various times. The Old Glory mine is probably the centerpiece of most of what Roppel has described in her chapter on 'Smuggler Cove MInes'.

Gold was discovered beyond the head of Smuggler Cove in 1899 and by 1901 the workings consisted of a 120-foot shaft with drifts and crosscuts from it. A 2-stamp mill was set in operation and produced a small amount of gold. Beginning in 1912, there were several companies active in the area but chiefly the Alaska Venture Syndicate and an Australian affiliate that controlled the operations, largely with capital raised on the London Stock Exchange. By 1914, there was about 1,500 feet of underground workings, a powerhouse had been constructed, and a compressor was in operation. In 1916, the Alaska Ventures Syndicate disbanded after spending more than about $150,000 on the property, and the deposits were largely dormant until the the late 1930s. A new company, the Alaska Gold Mountain Mines, Ltd., was formed then and began work financed by the sale of stock. They did considerable work underground, built a camp, cleared a road to the mine, and built a mill building to house the mill machinery which supposedly had been purchased. However the mill equipment never reached Alaska. The Security and Exchange Commission was soon investigating the company, and it was liquidated by 1940. After spending several hundred thousand dollars on the property from 1912 to 1940, the only production above the head of Smuggler Cove was the small amount of gold that was produced at the original 2-stamp mill in 1901. Figure 48 in Maas and others (1995) is a detailed map of the underground workings of the Old Glory Mine.

The country rocks in the area are andesitic and basaltic metavolcanic rocks that gradationally intertongue with subordinate pelitic metasedimentary rocks (Berg and others, 1988, p. 17-19). The strata were regionally metamorphosed to greenschist-grade phyllite and semischist in Late Cretaceous time (Brew, 1996, p. 27).

Their pre-metamorphic age is uncertain. Berg and others (1988, p. 17) state that they closely resemble Upper Jurassic to mid-Cretaceous marine flysch and volcanic rocks nearby on Gravina Island.

The Old Glory and Last Chance deposits consist of quartz fissure veins and stringer lodes in massive to schistose metavolcanic rocks (greenstone) (Maas and others, 1995, p. 183-184). Brooks (1902, p. 57) described two systems of quartz veins on the Last Chance claim: one strikes N-S, parallel to the foliation of the schist; the other strikes N60E. The veins contain pyrite and free gold, and the schistose country rocks adjacent to some of the veins are bleached and pyritic for a distance of up to 4.5 feet from the veins. Brooks also reported small amounts of chalcopyrite and bornite in the Last Chance veins, in addition to the pyrite and gold.

Maas and others (1995, table 25) report the following average metal contents in their samples from the main workings of the Old Glory mine: 2.29 parts per million gold, 0.30 ppm silver, 143 ppm copper, 14.0 ppm lead, and 83 ppm zinc. Samples from the Last Chance prospect contain: 6.73 ppm gold, 1.26 ppm silver, 1,338 ppm copper, 13.5 ppm lead, and 43 ppm zinc. The high copper content in the Last Chance deposit supports the early reports of copper minerals in the veins there. Maas and others (1995, table 24) also compare average gold values of the quartz veins with those of the pyritic schist at the Old Glory mine. Their results show 1.7 ppm gold in the quartz and 17.6 ppm gold in the altered schist next to the veins.

Fluid inclusion studies of quartz vein material from several of the Helm Bay lodes suggest that the veins formed at temperatures and pressures consistent with conditions during Late Cretaceous greenschist-grade regional metamorphism (Maas and others, 1995, p. 184).

Alteration:

The wallrocks adjacent to some of the veins are bleached and pyritic.

Age of mineralization:

Late Cretaceous.

Generic deposit model:

Deposit model:

Low-sulfide gold-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

The mines and prospects at the head of Smuggler Cove are an almost bewildering succession of companies, names for the mines, personalities, and financial plans if not schemes to fund the work on the deposits. Roppel (1905) has sorted out much of the detail but it is still unclear exactly what deposits were being controlled by which company at any given time in the area. Much of the knowledge of the mines she deciphered is centered on the companies rather than individual mines and prospects and it is not unlikely that the companies controlled different mines, claims, and prospects at various times. The Old Glory mine is probably the centerpiece of most of what Roppel has described in her chapter on 'Smuggler Cove Mines'.

Gold was discovered beyond the head of Smuggler Cove in 1899 and by 1901 the workings consisted of a 120-foot shaft with drifts and crosscuts from it. A 2-stamp mill was set in operation and produced a small amount of gold. Beginning in 1912, there were several companies active in the area but chiefly the Alaska Venture Syndicate and an Australian affiliate that controlled the operations, largely with capital raised on the London Stock Exchange. By 1914, there was about 1,500 feet of underground workings, a powerhouse had been constructed, and a compressor was in operation. In 1916, the Alaska Ventures Syndicate disbanded after spending more than about $150,000 on the property, and the deposits were largely dormant until the the late 1930s. A new company, the Alaska Gold Mountain Mines, Ltd., was formed then and

began work financed by the sale of stock. They did considerable work underground, built a camp, cleared a road to the mine, and built a mill building to house the mill machinery which supposedly had been purchased. However the mill equipment never reached Alaska. The Security and Exchange Commission was soon investigating the company, and it was liquidated by 1940. After spending several hundred thousand dollars on the property from 1912 to 1940, the only production above the head of Smuggler Cove was the small amount of gold that was produced at the original 2-stamp mill in 1901.Figure 48 in Maas and others (1995) is a detailed map of the underground workings of the Old Glory Mine.

Production notes:

Maas and others (1995, table 26) report production of 0.3 kilograms of gold and 0.8 kilograms of silver from the Old Glory mine.

Reserves:

None.

Additional comments:

The locations of the Old Glory and Last Chance sites in Elliott and others (1978, locations 34 and 35) have been revised in this report to agree with the locations of the sites in Maas and others (1995, figures 46 and 48). However, there is much uncertainty about the names and locations of the mines northwest of the head of Smuggler Cover.

References:

Berg, H.C., Elliott, R.L., and Koch, R.D., 1988, Geologic map of the Ketchikan and Prince Rupert quadrangles, southeastern Alaska: U.S. Geological Survey Mineral Investigations Series Map I-1807, 27 p., scale 1:250,000.

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Elliott, R.L., Berg, H.C., and Karl, S.M., 1978, map and table describing metalliferous and selected non-metalliferous mineral deposits, Ketchikan and Prince Rupert quadrangles, Alaska: U.S. Geological Survey Open-File Report 78-73-B, 17 p., 1 sheet, scale 1:250,000.

Maas, K.M., Bittenbender, P E., and Still, J.C., 1995, Mineral investigations in the Ketchikan mining district, southeastern Alaska: U.S. Bureau of Mines Open-File Report 11-95, 606 p.

Roppel, Patricia, 2005, Striking it rich! Gold mining in southern Southeastern Alaska: Greenwich, Connecticut, Coachlamp Productions, 286 p.

Primary Reference: Maas and others, 1995; Roppel, 2005

Reporter(s): H.C. Berg (USGS); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Shoenbar; Laskawanda; Schoenbar;

Site type: Prospects

ARDF no.: KC068

Latitude: 55.3493 **Quadrangle:** KC B-5

Longitude: 131.6419

Location description and accuracy:

This site includes several prospects or occurrences in about a square-mile area in and near the city of Ketchikan. They are at elevations ranging from near sea level to about 300 feet, and are from 0.1 to 0.7 mile northwest of the mouth of Ketchikan Creek in sections 19, 24, and 30, T. 75 S., R. 91 E., of the Copper River Meridian. The location is accurate. The site is locality 65 in Elliott and others (1978), and localities 276-280 in Maas and others (1995). The old workings on several of the prospects are concealed by housing and other city development, or are on private lots and have been filled in or covered by the owners (Maas and others, 1995, p. 194).

Commodities:

Main: Ag, Au

Other: Cu

Ore minerals: Chalcopyrite, pyrite

Gangue minerals: Quartz

Geologic description:

This part of Revillagigedo Island is underlain mainly by marine, andesitic or basaltic volcanic rocks and pelitic sedimentary rocks that are intruded by Cretaceous stocks, sills, and dikes of feldspar-porphyritic granodiorite, and by a stock and probably related plugs of Tertiary gabbro (Berg and others, 1988). The strata were regionally metamorphosed to greenschist-grade phyllite and semischist in Late Cretaceous time. They subsequently were contact metamorphosed to hornblende hornfels near some of the Cretaceous granodiorite contacts, and, more widely, peripheral to the Tertiary gabbro. The pre-metamorphic age range of the strata is uncertain. Berg and others (1988) note that they closely resemble Upper Jurassic to mid-Cretaceous flysch and volcanic rocks nearby on Gravina Island. The country rocks are cut by a high-angle fault along Tongass Narrows that displays about 4 miles of right-lateral offset.

The Laskawa or Shoenbar 'Mine' consists of a N 50 W, 50 NE sulfide-bearing band of phyllite and greenschist, cut by sulfide-bearing quartz fissure veinlets. The sulfide minerals are pyrite and chalcopyrite, and there were early reports of gold and silver (Wright and Wright, 1908, p. 152; Cobb and Elliott, 1980, p. 69). Roppel (2005) did considerable historic research on the 'Mine' and concluded that it was 'more business on paper than on what proved to be worthless ground'. The deposit was discovered in 1899 when John Shoenbar arrived in Ketchikan and purchased several claims along Ketchikan Creek. By 1904, the deposit was explored by two shafts, 125 and 85 feet deep, a short tunnel, and surface stripping. Shoenbar spend much time in the East trying to attract capital to develop the property but most of the work on the consisted of acquiring additional claims, constructing buildings and tramways, developing water rights, trying to develop power, and filing papers for patent to the claims. Little was done on the property by Shoenbar after 1904 although his claims were patented by 1920. In the 1930s, there was a brief attempt to cyanide the dump of the shafts; the results were disappointing although what little gold that may have been produced would have been the only gold produced from the property. In later years, the claims were developed and became part of the city of Ketchikan. A middle school, street, and bypass are named for Shoenbar, but all are misspelled 'Schoenbar' (Allen, 2002).

The following five occurrences were examined in the early 1990s by Maas and others (1995, locs. 276-280), who named them either from U.S. Bureau of Mines claim records, or, informally, for local landmarks.

Loc. 276: Forest Avenue quarry. Samples of silicified(?) volcanic rocks contained up to 222 parts per billion (ppb) gold, 2970 parts per million (ppm) copper, and 111 ppm molybdenum.

Loc. 277: Prison parking lot. A 2-foot sample of silicified(?) volcanic rock contained 2.1 ppm gold.

Loc. 278: Nevada lode. A 7-foot sample of silicified(?) greenstone contained 1282 ppb gold and 5,705 ppm copper. A shaft on this property was plugged.

Loc. 279: American Legion quarry. Samples of unidentified material contained up to 2,235 ppm zinc.

Loc. 280: Cape Fox. Samples of unidentified material contained up to 20 ppb gold. This property was explored in the early 1900s by a 24-foot adit and a shaft, which have been plugged.

Alteration:

Age of mineralization:

The quartz fissure veins that crosscut the metamorphic foliation probably are Late Cretaceous or younger.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Inactive

Workings/exploration:

Workings in the early 1900s included surface cuts and several short adits, shafts, and tunnels most of which have been covered by housing or commercial development, or filled in.

Production notes:

Probably none or very small.

Reserves:

None.

Additional comments:

References:

Allen, June, 2002, Name it Schoenbar: What's in a name?: http://www.sitnews.org/JuneAllen/060902_schoenbar.html (as of March 4, 2008).

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Cobb, E.H., and Elliott, R.L., 1980, Summaries of data on and lists of references to metallic and selected nonmetallic mineral deposits in the Ketchikan and Prince Rupert quadrangles, Alaska: U.S. Geological Survey Open-File Report 80-1053, 157 p.

Elliott, R.L., Berg, H.C., and Karl, S.M., 1978, map and table describing metalliferous and selected non-metalliferous mineral deposits, Ketchikan and Prince Rupert quadrangles, Alaska: U.S. Geological Survey Open-File Report 78-73-B, 17 p., 1 sheet, scale 1:250,000.

Maas, K.M., Bittenbender, P E., and Still, J.C., 1995, Mineral investigations in the Ketchikan mining district, southeastern Alaska: U.S. Bureau of Mines Open-File Report 11-95, 606 p.

Roppel, Patricia, 2005, Striking it rich! Gold mining in southern Southeastern Alaska: Greenwich, Connecticut, Coachlamp Productions, 286 p.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Wright and Wright, 1908; Maas and others, 1995

Reporter(s): H.C. Berg (USGS); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Sea Level; Sealevel

Site type: Mine

ARDF no.: KC095

Latitude: 55.3683 **Quadrangle:** KC B-4

Longitude: 131.1899

Location description and accuracy:

The Sea Level mine extends from the shoreline of Thorne Arm northeastward to an elevation of about 300 feet. The mine is in section 18, T. 75 S., R. 94 E., and it coincides with the 'Sealevel Mine' symbol on the 1:63,360-scale, Ketchikan B-4 topographic map (1949) The site corresponds to loc. 92 in Elliott and others (1978), and to loc. 301 (1-5) in Maas and others (1995). The location is accurate within a hundred or so feet.

Also see Additional comments.

Commodities:

Main: Ag, Au

Other: Pb, Zn

Ore minerals: Galena, gold, pyrite, sphalerite

Gangue minerals: Muscovite, quartz

Geologic description:

The history of the Sea Level Mine has been researched in some detail by Roppel (2005). The deposit was found in 1897 and by 1898 a 35-foot tunnel was driven along a vein from which $10,000 in rich ore was recovered. Following considerable interest in the property, I.B. Hammond began developing the property in 1901 as the Sealevel Mining and Milling Company. Soon it was the most active mine in southern southeastern Alaska and about 800 feet of workings were driven on the vein, a large camp had been erected, and a 30-stamp mill was built. The mill began operation in May of 1902 and ran for 3 weeks before shutting down. After more underground exploration, the mill ran intermittently but ceased operation in July of 1903 for lack of ore, and the assets of the Sealevel Mining and Milling Company were foreclosed on in 1906. There were several attempts to put the property back in operation from 1906 to 1925, but by 1913 the buildings were already deteriorating. From 1926 to 1929, there was considerable activity by the Peerless Consolidated Mining Company to put the mine back in operation, including the construction of a new camp and power plant and the construction of a new 50-ton mill. About 300 tons of ore went through the mill in 1929 and 47 ounces of gold was produced. But the Peerless Company was reorganized soon after and what followed was mainly management changes and legal actions through the rest of the 1930s. There was little if any mining or milling beyond 1929 and eventually the patented claims were sold for their timber.

The total length of the workings was more than 1200 feet. A short tunnel with winze was also driven on the (main) vein at a point 350 feet N60E of the shaft house. The vein was exposed at several other points by opencuts and prospect tunnels, and it appears to continue northeastward for at least 2000 feet, onto the adjoining Sea Breeze claim (KC094).

The rocks in the area of the Sea Level Mine are mainly phyllite and semischist derived from pelitic sedimentary rocks and andesitic or basaltic volcanic rocks, intruded by Cretaceous granodiorite (Berg and others, 1988). The premetamorphic age of the strata is speculative. On the basis of various criteria, the rocks have been interpreted as Mesozoic or late Paleozoic (Berg and others, 1988) and Permo-Triassic or Jurassic-Cretaceous (Crawford and others, 2000). The bedded rocks and some of the granodiorite were regionally metamorphosed to greenschist grade in Late Cretaceous time and subsequently remetamorphosed

to hornblende hornfels near contacts of Cretaceous granodiorite plutons emplaced after the regional metamorphism. The metamorphic and intrusive rocks are overlain by Quaternary or Tertiary andesite and basalt.

The Sea Level deposit consists of sulfide-bearing quartz fissure veins. The veins cut hydrothermally altered mafic metavolcanic (greenstone schist) country rocks, and a 25-foot-thick body that either is an intrusive dike of altered porphyry ('blue porphyry' of Brooks, 1902, p. 65-67; and Wright and Wright, 1908, p. 144-146), or a zone of hydrothermally altered mafic metavolcanic rock (Maas and others, 1995, p. 210-218). The principal workings were on two parallel veins 15 feet apart. One is 5 feet thick and one 1-2 feet thick; both strike NE and dip steeply SE, at an acute angle to the NW strike of the foliation of the metamorphic country rocks. The veins consist of coarsely crystalline, milky quartz and minor muscovite, and contain (auriferous) pyrite, galena, and sphalerite, and sparse flakes of native gold. Pyrite cubes also are common in the altered wallrocks of the veins. Included in the veins are large breccia fragments of altered country rocks that reportedly carried as high values in precious metals as the quartz. Locally conspicuous, open-space-filling textures indicate quartz deposition at shallow crustal levels. In addition to the faulting that preceded vein formation; some of the veins in turn are sheared and offset by small faults. The quartz in the veins, however, is not recrystallized, and they thus are probably younger than most or all of the Late Cretaceous regional metamorphism (Maas and others, 1995, p. 215).

Most of the quartz veins are bordered by a hydrothermally altered zone up to three feet thick, characterized by fine-grain, light-gray to bluish-gray, massive, carbonate- and sericite-bearing rock that commonly contains cubic pyrite crystals up to an inch across (Maas and others, 1995, p. 215). Maas and others (1995) interpret this zone as hydrothermally altered mafic metavolcanic rock. Early miners called this altered rock 'blue porphyry,' which they interpreted as crosscutting altered dikes that predate the quartz veins, but are closely associated with some of the orebodies (Brooks, 1902, p. 65; Wright and Wright, 1908, p. 143). Gold content of these pyritic altered zones is high adjacent to the quartz veins and diminishes away from them. Weathered altered rocks have a reddish-brown, oxidized rind up to three inches thick.

An unknown amount of gold and silver was produced from the Sea Level mine in the early 1900s, when the ore reportedly averaged $5.35 of gold per ton (at $20.67 per ounce of gold) (Brooks, 1902, p. 66-67). Forty-seven ounces of gold was produced in 1929 from 300 tons of ore.

Alteration:

Most of the quartz veins are bordered by a hydrothermally altered zone up to three feet thick, characterized by fine-grain, light-gray to bluish-gray, massive, carbonate- and sericite-bearing rock that commonly contains cubic pyrite crystals up to an inch across (Maas and others, 1995, p. 215). Maas and others (1995) interpret this zone as hydrothermally altered mafic metavolcanic rock. Early miners called this altered rock 'blue porphyry,' which they interpreted as crosscutting altered dikes that predate the quartz veins, but are closely associated with some of the orebodies (Brooks, 1902, p. 65; Wright and Wright, 1908, p. 143). Gold content of these pyritic altered zones is high adjacent to the quartz veins and diminishes away from them. Weathered altered rocks have a reddish-brown, oxidized rind up to three inches thick.

Age of mineralization:

The quartz in the veins is not recrystallized (Maas and others, 1995, p. 215). The veins thus are probably younger than most or all of the Late Cretaceous regional metamorphism.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

The history of the Sea Level Mine has been researched in some detail by Roppel (2005). The deposit was found in 1897 and by 1898 a 35-foot tunnel was driven along a vein from which $10,000 in rich ore was recovered. Following considerable interest in the property, I.B. Hammond began developing the property in 1901 as the Sealevel Mining and Milling Company. Soon it was the most active mine in southern southeastern Alaska and about 800 feet of workings were driven on the vein, a large camp had been erected, and a 30-stamp mill was built. The mill began operation in May of 1902 and ran for 3 weeks before shutting down. After more underground exploration, the mill ran intermittently but ceased operation in July of 1903 for lack of ore, and the assets of the Sealevel Mining and Milling Company were foreclosed on in 1906. There were several attempts to put the property back in operation from 1906 to 1925, but by 1913 the buildings were already deteriorating. From 1926 to 1929, there was considerable activity by the Peerless Consolidated Mining Company to put the mine back in operation, including the construction of a new camp and power plant and the construction of a new 50-ton mill. About 300 tons of ore went through the mill in 1929 and 47 ounces of gold was produced. But the Peerless Company was reorganized soon after and what followed was mainly management changes and legal actions through the rest of the 1930s. There was little if any mining or milling beyond 1929 and eventually the patented claims were sold for their timber.

The total length of the workings was more than 1200 feet. A short tunnel with winze was also driven on the (main) vein at a point 350 feet N60E of the shaft house. The vein was exposed at several other points by opencuts and prospect tunnels, and it appears to continue northeastward for at least 2000 feet, onto the adjoining Sea Breeze claim (KC094).

Production notes:

An unknown amount of gold and silver was produced from the Sea Level mine in the early 1900s, when the ore reportedly averaged $5.35 in gold per ton (at $20.67 per ounce of gold) (Brooks, 1902, p. 66-67). In 1929, 300 tons of ore was milled to recover 47 ounces of gold (Roppel, 2005).

Reserves:

None.

Additional comments:

Throughout its history, the name of the property has varied from 'Sea Level' to 'Sealevel.'

In the 1930s, the management of the Sea Level Mine was frequently combined with that of the the nearby Goo Goo Mine (KC096) and they shared their many legal and operational problems.

References:

Berg, H.C., 1982, The Alaska Mineral Resource Assessment Program; guide to information about the geology and mineral resources of the Ketchikan and Prince Rupert quadrangles, southeastern Alaska: U.S. Geological Survey Circular 855, 24 p.

Berg, H.C., Elliott, R.L., and Koch, R.D., 1988, Geologic map of the Ketchikan and Prince Rupert quadrangles, southeastern Alaska: U.S. Geological Survey Mineral Investigations Series Map I-1807, 27 p., scale 1:250,000.

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Crawford, M.L., Crawford, W.A., and Gehrels, G.E., 2000, Terrane assembly and structural relationships in the eastern Prince Rupert quadrangle, British Columbia, in H.H. Stowell and W.C.McClelland, eds., Tectonics of the Coast Mountains, southeastern Alaska and British Columbia: Geological Society of America Special Paper 343, p. 1-21.

Elliott, R.L., Berg, H.C., and Karl, S.M.,1978, Map and table describing metalliferous and selected non-metalliferous mineral deposits in the Ketchikan and Prince Rupert quadrangles, Alaska: U.S. Geological Survey Open-File Report 78-73B, 17 p., 1 sheet, scale 1:250,000.

Maas, K.M., Bittenbender, P E., and Still, J.C., 1995, Mineral investigations in the Ketchikan mining district, southeastern Alaska: U.S. Bureau of Mines Open-File Report 11-95, 606 p.

Roppel, Patricia, 2005, Striking it rich! Gold mining in southern Southeastern Alaska: Greenwich, Connecticut, Coachlamp Productions, 286 p.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Brooks, 1902; Maas and others, 1995

Reporter(s): H.C. Berg (USGS); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Goo Goo; Golden Dream; Mountain

Site type: Mine

ARDF no.: KC096

Latitude: 55.3687 **Quadrangle:** KC B-4

Longitude: 131.1877

Location description and accuracy:

The Goo Goo claim is in section 18, T. 75 S., R. 94 E., of the Copper River Meridian. It adjoins the Goo Goo Extension (KC097) claim on the northeast. It is at an elevation of approximately 150-200 feet north of, and roughly parallel to, Gokachin Creek. The main workings are about 0.3-0.4 mile inland from the shore of Thorne Arm, and the map coordinates are for the approximate center of the claim. The site corresponds to loc. 93 in Elliott and others (1978), and to loc. 302 (1-6) in Maas and others (1995). The location is accurate within 0.1 mile.

Also see Additional comments.

Commodities:

Main: Au

Other: Pb, Zn

Ore minerals:

Gangue minerals: Quartz

Geologic description:

The Goo Goo Mine and Goo Goo Extension (KC097) combined soon after their discovery and they share a common history. In addition, in the 1930s, both of them were sometimes linked with the Sea Level Mine (KC095). Roppel (2005) provides extensive details of the complex history of these properties. The Goo Goo vein was located in 1904 and the Goo Goo Extension in 1907, and they soon were developed by a 20-foot shaft and 15-foot tunnel. Brooks (1902, p. 67) reported gold values up to $4.00 in gold per ton (at $20.67 per ounce). About $1000 in gold (at $20.67 per ounce) was produced in 1907 from rich hand-picked samples processed with a mortar and pestle. Work continued through the 1920s and increased markedly in the 1930s with some underground exploration and considerable legal and other activity by the numerous people involved or investing in the property. Perhaps the most notable mining in the later history of the mining was the recovery in 1933 of $40,000 in gold (at $35 per ounce?) by a leaser from a rich pocket. The workings, dating back to the early 1900s, include 2 adits, one 1,800 feet long and one caved, a shaft, and several surface trenches and pits.

The rocks in the area of the Sea Level Mine are mainly phyllite and semischist derived from pelitic sedimentary rocks and andesitic or basaltic volcanic rocks, intruded by Cretaceous granodiorite (Berg and others, 1988). The premetamorphic age of the strata is speculative. On the basis of various criteria, the rocks have been interpreted as Mesozoic or late Paleozoic (Berg and others, 1988) and Permo-Triassic or Jurassic-Cretaceous (Crawford and others, 2000). The bedded rocks and some of the granodiorite were regionally metamorphosed to greenschist grade in Late Cretaceous time and subsequently remetamorphosed to hornblende hornfels near contacts of Cretaceous granodiorite plutons emplaced after the regional metamorphism. The metamorphic and intrusive rocks are overlain by Quaternary or Tertiary andesite and basalt.

According to Wright and Wright (1908, p. 147), the Goo Goo deposit is a quartz fissure vein that contains pyrite, sphalerite, galena, and free gold. The vein reportedly included pockets of ore containing considerable free gold. The Wrights do not describe the country rocks or the geologic setting of the vein.

Maas and others (1995, p. 216) provide the following combined description of an auriferous quartz fissure vein more than 4900 feet long on the Goo Goo claim and its continuation southwestward onto the adjoining Goo Goo Extension claim (KC097). The vein, which strikes NE and dips steeply SE, is in mafic metavolcanic rocks and contains, in addition to free gold, pyrite, sphalerite, and galena. Hydrothermally altered metavolcanic rock adjacent to the vein contains disseminated pyrite and accompanying gold values (see Alteration). The best results of sampling in 1946 (Maas and others, 1995, p. 217) included: 5.8 parts per million (ppm) gold in a section of vein 7.5 feet thick and 79 feet long; and 7.1 ppm gold in a section of vein 4.6 feet thick and 25 feet long. Thirty-one samples of the vein collected by Maas and others (1995) contained an average of 1.1 ppm gold. Maas and others' (1995) description of the Goo Goo and Goo Goo Extension vein indicates that its character and setting are virtually identical to the main vein on the Sea Level claim (KC095).

Combined recorded production from the claims, probably much in the early 1900s, was 1.4 kg of gold. Notably, however, $40,000 in gold (at $35 per ounce?) was produced by a leaser in 1935 from a rich pocket (Roppel, 2005).

Alteration:

The Goo Goo vein, like most of the other principal veins in the Sea Level mine area, is bordered by a hydrothermally altered zone up to three feet thick, characterized by generally fine-grain, light-gray to bluish-gray, massive, carbonate- and sericite-bearing rock that commonly contains cubic pyrite crystals up to an inch across (Maas and others, 1995, p. 215). Maas and others (1995) interpret this zone as hydrothermally altered mafic metavolcanic rock. Early miners called this altered rock 'blue porphyry,' which they interpreted as crosscutting altered dikes that predate the quartz veins, but are closely associated with some of the orebodies (Brooks, 1902, p. 65; Wright and Wright, 1908, p. 143). Gold content of these pyritic altered zones is high adjacent to the quartz veins and diminishes away from them. Weathered altered rocks have a reddish-brown, oxidized rind up to three inches thick.

Age of mineralization:

Maas and others (1995, p. 215) note that the quartz in the veins in the Sea Level mine area is not recrystallized; the veins thus are probably younger than most or all of the Late Cretaceous regional metamorphism.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

The Goo Goo Mine and Goo Goo Extension (KC097) combined soon after their discovery and they share a common history. In addition, in the 1930s, both of them were sometimes linked with the Sea Level Mine (KC095). Roppel (2005) provides extensive details of the complex history of these properties. The Goo Goo vein was located in 1904 and the Goo Goo Extension in 1907, and they soon were developed by a 20-foot shaft and 15-foot tunnel. Brooks (1902, p. 67) reported gold values up to $4.00 in gold per ton (at $20.67 per ounce). About $1000 in gold (at $20.67 per ounce) was produced in 1907 from rich hand-picked samples processed with a mortar and pestle. Work continued through the 1920s and increased markedly in the 1930s with some underground exploration and considerable legal and other activity by the numerous people involved or investing in the property.Perhaps the most notable mining in the later history of the mining was the recovery in 1933 of $40,000 in gold (at $35 per ounce?) by a leaser from a rich pocket. The

workings, dating back to the early 1900s, include 2 adits, one 1,800 feet long and one caved, a shaft, and several surface trenches and pits.

Production notes:

Combined recorded production from the Goo Goo and Goo Goo Extension claims, probably most in the early 1900s, was 1.4 kg of gold (Maas and others, 1995, p. 218). Notably, however, $40,000 in gold (at $35 per ounce?) was produced by a leaser in 1935 from a rich pocket (Roppel, 2005).

Reserves:

None.

Additional comments:

Some early reports apparently refer to this property as the Golden Dream claim, or Mountain claim (Cobb and Elliott, 1980, p. 145).

References:

Berg, H.C., 1982, The Alaska Mineral Resource Assessment Program; guide to information about the geology and mineral resources of the Ketchikan and Prince Rupert quadrangles, southeastern Alaska: U.S. Geological Survey Circular 855, 24 p.

Berg, H.C., Elliott, R.L., and Koch, R.D., 1988, Geologic map of the Ketchikan and Prince Rupert quadrangles, southeastern Alaska: U.S. Geological Survey Mineral Investigations Series Map I-1807, 27 p., scale 1:250,000.

Brooks, A.H., 1902, Preliminary report on the Ketchikan mining district, Alaska, with an introductory sketch of the geology of southeastern Alaska: U.S. Geological Survey Professional Paper 1, 120 p.

Cobb, E.H., and Elliott, R.L., 1980, Summaries of data on and lists of references to metallic and selected nonmetallic mineral deposits in the Ketchikan and Prince Rupert quadrangles, Alaska: U.S. Geological Survey Open-File Report 80-1053, 157 p.

Crawford, M.L., Crawford, W.A., and Gehrels, G.E., 2000, Terrane assembly and structural relationships in the eastern Prince Rupert quadrangle, British Columbia, in H.H. Stowell and W.C.McClelland, eds., Tectonics of the Coast Mountains, southeastern Alaska and British Columbia: Geological Society of America Special Paper 343, p. 1-21.

Elliott, R.L., Berg, H.C., and Karl, S.M.,1978, Map and table describing metalliferous and selected non-metalliferous mineral deposits in the Ketchikan and Prince Rupert quadrangles, Alaska: U.S. Geological Survey Open-File Report 78-73B, 17 p., 1 sheet, scale 1:250,000.

Maas, K.M., Bittenbender, P E., and Still, J.C., 1995, Mineral investigations in the Ketchikan mining district, southeastern Alaska: U.S. Bureau of Mines Open-File Report 11-95, 606 p.

Roppel, Patricia, 2005, Striking it rich! Gold mining in southern Southeastern Alaska: Greenwich, Connecticut, Coachlamp Productions, 286 p.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Wright and Wright, 1908; Maas and others, 1995

Reporter(s): H.C. Berg (USGS); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Goo Goo Extension; Majestic; Mother Lode

Site type: Prospect

ARDF no.: KC097

Latitude: 55.3687 **Quadrangle:** KC B-4

Longitude: 131.1907

Location description and accuracy:

The Goo Goo Extension claim is in section 18, T. 75 S., R. 94 E., of the Copper River Meridian. It adjoins the Goo Goo claim (KC096) on the southwest. It is about 0.15 mile north of, and parallel to, Gokachin Creek, and extends from the shoreline of Thorne Arm northeastward to an elevation of about 150 feet. The coordinates at about the center of the claim. The site corresponds to loc. 94 in Elliott and others (1978), and to loc. 303 (1-16) in Maas and others (1995). The location is accurate.

Also see Additional comments.

Commodities:

Main: Au

Other: Pb, Zn

Ore minerals:

Gangue minerals: Quartz

Geologic description:

The Goo Goo Extension and the Goo Goo Mine (KC096) combined soon after their discovery and they share a common history. In addition, in the 1930s, both of them were sometimes linked with the Sea Level Mine (KC095). Roppel (2005) provides extensive details of the complex history of these properties. The Goo Goo vein was located in 1904 and the Goo Goo Extension in 1907, and they soon were developed by a 20-foot shaft and 15-foot tunnel. Brooks (1902, p. 67) reported gold values up to $4.00 in gold per ton (at $20.67 per ounce). About $1000 in gold (at $20.67 per ounce) was produced in 1907 from rich hand-picked samples processed with a mortar and pestle. Work continued through the 1920s and increased markedly in the 1930s with some underground exploration and considerable legal and other activity by the numerous people involved or investing in the property. Perhaps the most notable mining in the later history of the mining was the recovery in 1933 of $40,000 in gold (at $35 per ounce?) by a leaser from a rich pocket. The workings, dating back to the early 1900s, include 2 adits, one 1,800 feet long and one caved, a shaft, and several surface trenches and pits.

The rocks in the area of the Sea Level Mine are mainly phyllite and semischist derived from pelitic sedimentary rocks and andesitic or basaltic volcanic rocks, intruded by Cretaceous granodiorite (Berg and others, 1988). The premetamorphic age of the strata is speculative. On the basis of various criteria, the rocks have been interpreted as Mesozoic or late Paleozoic (Berg and others, 1988) and Permo-Triassic or Jurassic-Cretaceous (Crawford and others, 2000). The bedded rocks and some of the granodiorite were regionally metamorphosed to greenschist grade in Late Cretaceous time and subsequently remetamorphosed to hornblende hornfels near contacts of Cretaceous granodiorite plutons emplaced after the regional metamorphism. The metamorphic and intrusive rocks are overlain by Quaternary or Tertiary andesite and basalt.

Wright and Wright (1908, p. 147) describe this deposit as a 20-foot-thick quartz vein in altered schists. The vein, which they suggest is a continuation of the Goo Goo vein (KC096), strikes N63E, and contains pyrite, sphalerite, and galena. Workings in the early 1900s consisted of an open pit 10 feet deep and a tunnel 10 feet long. At that time, a picked sample assayed $30 in gold per ton (at $20.67 per ounce) (Brooks, 1902,

p. 67). Maas and others (1995, p. 217) report a mean value of 959 parts per billion gold in 24 samples of the Goo Goo Extension vein. Private examination in the early-mid-1980s of an 1,837-foot adit on the Goo Goo Extension claim outlined five zones of elevated gold values, mainly along the margins of the vein(s) (Maas and others, 1995, p. 215).

Maas and others (1995, p. 216) provide the following combined description of an auriferous quartz fissure vein more than 4900 feet long on the Goo Goo claim (KC096) and its continuation southwestward onto the adjoining Goo Goo Extension claim. The vein, which strikes NE and dips steeply SE, is in mafic metavolcanic rocks and contains, in addition to free gold, pyrite, sphalerite, and galena. Hydrothermally altered metavolcanic rock adjacent to the vein contains disseminated pyrite and accompanying gold values (see Alteration). The best results of sampling in 1946 (Maas and others, 1995, p. 217) included: 5.8 parts per million (ppm) gold in a section of vein 7.5 feet thick and 79 feet long; and 7.1 ppm gold in a section of vein 4.6 feet thick and 25 feet long. Thirty-one samples of the vein collected by Maas and others (1995) contained an average of 1.1 ppm gold. Maas and others' (1995) description of the Goo Goo (KC096) and Goo Goo Extension vein indicates that its character and setting are virtually identical to the main vein on the Sea Level claim (KC095).

Combined recorded production from the claims, probably much in the early 1900s, was 1.4 kg of gold. Notably, however, $40,000 in gold (at $35 per ounce?) was produced by a leaser in 1935 from a rich pocket (Roppel, 2005).

Alteration:

The Goo Goo Extension vein, like most of the other principal veins in the Sea Level mine area, is bordered by a hydrothermally altered zone up to three feet thick, characterized by generally fine-grain, light-gray to bluish-gray, massive, carbonate- and sericite-bearing rock that commonly contains cubic pyrite crystals up to an inch across (Maas and others, 1995, p. 215). Maas and others (1995) interpret this zone as hydrothermally altered mafic metavolcanic rock. Early miners called this altered rock 'blue porphyry,' which they interpreted as crosscutting altered dikes that predate the quartz veins, but are closely associated with some of the orebodies (Brooks, 1902, p. 65; Wright and Wright, 1908, p. 143). Gold content of these pyritic altered zones is high adjacent to the quartz veins and diminishes away from them. Weathered altered rocks have a reddish-brown, oxidized rind up to three inches thick.

Age of mineralization:

Maas and others (1995, p. 215) note that the quartz in the veins in the Sea Level Mine area is not recrystallized; the veins thus are probably younger than most or all of the Late Cretaceous regional metamorphism.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

The Goo Goo Extension and the Goo Goo Mine (KC096) combined soon after their discovery and they share a common history. In addition, in the 1930s, both of them were sometimes linked with the Sea Level Mine (KC095). Roppel (2005) provides extensive details of the complex history of these properties. The Goo Goo vein was located in 1904 and the Goo Goo Extension in 1907, and they soon were developed by a 20-foot shaft and 15-foot tunnel. Brooks (1902, p. 67) reported gold values up to $4.00 in gold per ton (at $20.67 per ounce). About $1000 in gold (at $20.67 per ounce) was produced in 1907 from rich hand-picked

samples processed with a mortar and pestle. Work continued through the 1920s and increased markedly in the 1930s with some underground exploration and considerable legal and other activity by the numerous people involved or investing in the property. Perhaps the most notable mining in the later history of the mining was the recovery in 1933 of $40,000 in gold (at $35 per ounce?) by a leaser from a rich pocket. The workings, dating back to the early 1900s, include 2 adits, one 1,800 feet long and one caved, a shaft, and several surface trenches and pits.

Production notes:

Combined recorded production from the Goo Goo and Goo Goo Extension claims, probably most in the early 1900s, was 1.4 kg of gold (Maas and others, 1995, p. 218). Notably, however, $40,000 in gold (at $35 per ounce?) was produced by a leaser in 1935 from a rich pocket (Roppel, 2005).

Reserves:

None.

Additional comments:

Early reports refer to this property as the Majestic or Mother Lode claim.

References:

Berg, H.C., 1982, The Alaska Mineral Resource Assessment Program; guide to information about the geology and mineral resources of the Ketchikan and Prince Rupert quadrangles, southeastern Alaska: U.S. Geological Survey Circular 855, 24 p.

Berg, H.C., Elliott, R.L., and Koch, R.D., 1988, Geologic map of the Ketchikan and Prince Rupert quadrangles, southeastern Alaska: U.S. Geological Survey Mineral Investigations Series Map I-1807, 27 p., scale 1:250,000.

Brooks, A.H., 1902, Preliminary report on the Ketchikan mining district, Alaska, with an introductory sketch of the geology of southeastern Alaska: U.S. Geological Survey Professional Paper 1, 120 p.

Crawford, M.L., Crawford, W.A., and Gehrels, G.E., 2000, Terrane assembly and structural relationships in the eastern Prince Rupert quadrangle, British Columbia, in H.H. Stowell and W.C.McClelland, eds., Tectonics of the Coast Mountains, southeastern Alaska and British Columbia: Geological Society of America Special Paper 343, p. 1-21.

Elliott, R.L., Berg, H.C., and Karl, S.M.,1978, Map and table describing metalliferous and selected non-metalliferous mineral deposits in the Ketchikan and Prince Rupert quadrangles, Alaska: U.S. Geological Survey Open-File Report 78-73B, 17 p., 1 sheet, scale 1:250,000.

Maas, K.M., Bittenbender, P E., and Still, J.C., 1995, Mineral investigations in the Ketchikan mining district, southeastern Alaska: U.S. Bureau of Mines Open-File Report 11-95, 606 p.

Roppel, Patricia, 2005, Striking it rich! Gold mining in southern Southeastern Alaska: Greenwich, Connecticut, Coachlamp Productions, 286 p.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Wright and Wright, 1908; Maas and others, 1995

Reporter(s): H.C. Berg (USGS); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (south of Kurupa Lake)

Site type: Occurrence

ARDF no.: KL001

Latitude: 68.2304 **Quadrangle:** KL

Longitude: 154.7257

Location description and accuracy:
This occurrence is about 9.8 miles south-south west of the center of Kurupa Lake and about 0.5 mile west of the center of section 28, T. 33 N., R. 18 E. The location is accurate to within one mile.

Commodities:

Main: Cu

Other:

Ore minerals: Azurite, chalcopyrite, malachite

Gangue minerals: Quartz

Geologic description:
The rocks in the area are black shale, siltstone, sandstone, quartzite, and conglomerate of the Upper Devonian, Ear Peak Member of the Kanayut Conglomerate (Kurtak and others, 1995). Anastomosing, chalcopyrite-quartz veins stained with malachite and azurite cut sandstone. The veins trend north, dip east, and are exposed for about 60 meters. Select samples contain up to 0.56 percent copper; a 2-meter chip sample across a zone of mixed sandstone and quartz veins contained 0.01 percent copper.

Alteration:
Not noted.

Age of mineralization:
Late Devonian or later based on the age of the host rock.

Generic deposit model:

Deposit model:
Chalcopyrite-quartz veins in sandstone.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:
Only limited sampling by the U.S. Bureau of Mines and the U.S. Geological Survey.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS No. 0020210007

References:

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Sutley, S.J., Duttweiler, K.A., and Hopkins, R.T., 1984, Analytical results and sample locality map of stream-sediment and panned concentrate samples from the Killik River 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report OF 84-406, 18 leaves, 1 map, scale 1:250,000.

Primary Reference: Kurtak and others, 1995

Reporter(s): J.M. Schmidt (U.S. Geological Survey); K.D. Kelley (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (near tributary to Kakivilak Creek)

Site type: Occurrence

ARDF no.: KL002

Latitude: 68.1303 **Quadrangle:** KL A-4

Longitude: 154.9944

Location description and accuracy:

This occurrence is about 4.5 miles north-northeast of the small lake at the divide between a tributary to Kakivilak Creek and the head of Itilyiargiok Creek; it is about 0.6 mile west-northwest of the center of section 33, T. 32 N., R. 17 E. The location is known to within about a mile.

Commodities:

Main: Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena

Gangue minerals: Quartz

Geologic description:

The rocks in the area are mainly shale of the Upper Devonian, Hunt Fork Shale. One sample of a quartz vein found in float contained 15.37 percent lead, 0.07 percent zinc, and 0.64 percent copper. Little is known about this occurrence.

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Pb-Zn quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only limited sampling by the U.S. Bureau of Mines.

Production notes:

None.

Reserves:

None.

Additional comments:

The occurrence is in the Gates of the Arctic National Park which is closed to prospecting and mining.

References:

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Meyer, M.P., and Kurtak, J.M., 1992, Results of the 1991 U.S. Bureau of Mines Colville mining district study: U.S. Bureau of Mines Open-File Report 75-92, 101 p.

Primary Reference: Meyer and Kurtak, 1992

Reporter(s): J.M. Schmidt (U.S. Geological Survey); K.D. Kelley (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Unnamed (near head of Kakivilik Creek)

Site type: Occurrence

ARDF no.: KL003

Latitude: 68.16 **Quadrangle:** KL A-4

Longitude: 154.965

Location description and accuracy:

This occurrence is about 6.8 miles north-northeast of the pass between the small lake at the divide between a small tributary of Kakivilak Creek and the head of Itilyiargiok Creek. It is about 0.4 mile northwest of the center of section 22, T. 32 N., R. 17 E. The location is accurate to within about a mile.

Commodities:

Main: Pb, Zn

Other: Ag, Cu

Ore minerals: Chalcopyrite, galena, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks in the area consist of shale with minor interbedded graywacke, quartzite, and conglomerate of the Upper Devonian Hunt Fork Shale. The U.S. Bureau of Mines (Kurtak and others, 1995) resampled anomalous samples collected by the U.S. Geological Survey (Sutley and others, 1984). The Bureau of Mines collected several samples of quartz veins with galena, chalcopyrite, and sphalerite. One vein was 1.5 meters thick but its extent is unknown. The samples contained 0.25 to 3.6 percent lead and 1.1 to 7.7 percent zinc; one sample contained 2,729 parts per million copper and another 2.8 grams of silver per tonne.

Alteration:

Not noted.

Age of mineralization:

Upper Devonian or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Lead-zinc-quartz veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only sampling and mapping by the U.S. Geological Survey and U.S. Bureau of Mines.

Production notes:

None.

Reserves:

None.

Additional comments:

The occurrence is in the Gates of the Arctic National Park which is closed to prospecting and mining.

MAS No. 0020200006

References:

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Sutley, S.J., Duttweiler, K.A., and Hopkins, R.T., 1984, Analytical results and sample locality map of stream-sediment and panned concentrate samples from the Killik River 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report OF 84-406, 18 sheets, 1 map, scale 1:250,000.

Primary Reference: Kurtak and others, 1995

Reporter(s): J.M. Schmidt (U.S. Geological Survey); K.D. Kelley (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Outwash Creek South-Southwest

Site type:

ARDF no.: KL004

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:
This site is actually part of KL012 an occurrence that is now within the Gates of the Arctic National Park.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Primary Reference:

Reporter(s): J.M. Schmidt (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Outwash Southwest

Site type: Occurrence

ARDF no.: KL005

Latitude: 68.1526 **Quadrangle:** KL A-4

Longitude: 155.2492

Location description and accuracy:

This occurrence is about 6.5 miles northwest of the small lake at the divide between a tributary to Kakivilak Creek and head of Itilyiargiok Creek. It is about 0.6 mile southeast of the center of section 20, T. 32 N., R. 16 E. The location is accurate to within about a half mile.

Commodities:

Main: Pb, Zn

Other:

Ore minerals: Galena, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks in the area are shale and minor graywacke sandstone of the Upper Devonian, Hunt Fork Shale. The occurrence consists of rubblecrop of silicified sandstone and conglomerate with sphalerite, galena and pyrite. Samples contained up to 2.8 percent zinc and 0.62 percent lead (Kurtak and others, 1995). The extent of the mineralization was not determined.

Alteration:

The sandstone host rock is silicified.

Age of mineralization:

Late Devonian or younger based on the age of the host rock. Possibly Late Jurassic to Cretaceous based on analogy with other deposits in the western Brooks Range.

Generic deposit model:

Deposit model:

Disseminated lead-zinc mineralization in sandstone.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only limited sampling and mapping by the U.S. Geological Survey and U.S. Bureau of Mines.

Production notes:

None.

Reserves:

None.

Additional comments:

The occurrence is in the Gates of the Arctic National Park which is closed to prospecting and mining.

References:

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Meyer, M.P., and Kurtak, J.M., 1992, Results of the 1991 U.S. Bureau of Mines Colville mining district study: U.S. Bureau of Mines Open-File Report 75-92, 101 p.

Sutley, S.J., Duttweiler, K.A., and Hopkins, R.T., 1984, Analytical results and sample locality map of stream-sediment and panned concentrate samples from the Killik River 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report OF 84-406, 18 leaves, 1 map, scale 1:250,000.

Primary Reference: Kurtak and others, 1995

Reporter(s): J.M. Schmidt; K.D. Kelley (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Outwash West

Site type: Occurrence

ARDF no.: KL006

Latitude: 68.1688 **Quadrangle:** KL A-4

Longitude: 155.2624

Location description and accuracy:

This occurrence is about 7.4 miles northwest of the small lake at the divide between a tributary to Kakivilak Creek and the head of Itilyiargiok Creek; it is about 0.4 mile south of the center of section 17, T. 32 N., R. 16 E. The location is accurate to within about a half mile.

Commodities:

Main: Ag, Pb, Zn

Other: Cu

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks in the area consist of quartz and sandstone of the Upper Devonian, Hunt Fork Shale in thrust contact with the Upper Devonian or Lower Mississippian, Kanayut Conglomerate (Kurtak and others, 1995). The rocks are cut by silicified fault zones and quartz veins with sphalerite, galena, and pyrite, mostly found only as rubblecrop. A random chip sample from an outcrop of a quartz vein of unknown extent contained 7.1 percent zinc, 1.95 percent lead, and 0.2 percent copper. A series of selected samples of quartz veins contained up to 24 percent zinc, 1.6 percent lead, and 171 grams of silver per tonne. The extent of the mineralization was not determined.

Alteration:

Not mentioned.

Age of mineralization:

Late Devonian or younger based on the age of the host rock. Possibly Late Jurassic to Cretaceous based on analogy with other deposits in the western Brooks Range.

Generic deposit model:

Deposit model:

Silver-lead-zinc-quartz veins and quartz breccia.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only limited sampling by government agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS No. 0020210008

References:

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Meyer, M.P., and Kurtak, J.M., 1992, Results of the 1991 U.S. Bureau of Mines Colville mining district study: U.S. Bureau of Mines Open-File Report 75-92, 101 p.

Sutley, S.J., Duttweiler, K.A., and Hopkins, R.T., 1984, Analytical results and sample locality map of stream-sediment and panned concentrate samples from the Killik River 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report OF 84-406, 18 leaves, 1 map, scale 1:250,000.

Primary Reference: Kurtak and others, 1995

Reporter(s): J.M. Schmidt (U.S. Geological Survey); K.D. Kelley (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Kady

Site type: Occurrence

ARDF no.: KL007

Latitude: 68.1989 **Quadrangle:** KL A-4

Longitude: 154.9866

Location description and accuracy:

The Kady deposit is about 1.6 miles northwest of the end of Kakivilik Creek near the center of section 4, T. 32., R. 17 E. Kurtak and others (1995) have several maps of the occurrence.

Commodities:

Main: Ag, Pb, Zn

Other: As, Au, Cu, Sn

Ore minerals: Chalcopyrite, galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The Kady deposit was found by the U.S. Geological Survey in about 1986 as a result of stream-sediment sampling (Duttweiler,1987). It was subsequently mapped and sampled by the U.S. Bureau of Mines (Kurtak and others, 1995).

The rocks at this occurrence are sandstone and minor conglomerate of the Shainin Lake Member of the Upper Devonian to Lower Mississippian Kanayut Conglomerate, that are thrust over the Ear Peak Member of the Kanayut (Kurtak and others, 1995). The rocks are intensely deformed into a series of generally east-trending folds. The fold axes trend N65E and plunge south.

The mineralization consists of a series of swarms of quartz veins and quartz-cemented breccia zones that crosscut the bedding and fold axes (Kurtak and others, 1995). There are two distinct types of veins: 1) barren quartz veins, and 2) sulfide-quartz veins with major sphalerite and galena, and lesser chalcopyrite and pyrite. The two types are spatially separated. The best concentration of sulfide veins and breccia is about 800 feet long and up to 150 feet wide, and trends north-northwest. It is bordered on the east by a zone up to 500 feet wide of barren quartz veins. Individual veins vary from a few centimeters to 30 meters wide and can be traced for up to 229 meters along strike. Most of the sulfide-bearing veins strike N40E and dip vertically. Another set which contains higher metal values strikes N40W and dips steeply south. At least 9 separate veins or mineralized zones have been identified in an area about 5,000 feet by 3,000 feet in size. Some notable sample included: 1) samples of galena from a breccia contained up to 59.8 percent lead, 0.7 percent zinc, and 745 grams of silver per tonne; 2) a chip sample across a 3-meter-wide vein contained 10 percent zinc, 0.10 percent lead, 10.8 grams of silver per tonne, and 53 parts per billion gold; 3) a continuous chip sample across a 1.7-meter-wide quartz vein contained 1.06 percent zinc, and 3.4 grams of silver per tonne; and 4) a grab sample across 6 meters of rubblecrop contained 14,560 parts per million copper, 0.24 percent lead, 2.3 percent zinc, and 5.8 grams of silver per tonne. Tin and arsenic are also reported.

Alteration:

Not specifically noted but associated with the introduction of much quartz in the veins and breccia.

Age of mineralization:

Late Devonian or younger based on the age of the host rock. Possibly Late Jurassic to Cretaceous by analogy with other deposits in the western Brooks Range.

Generic deposit model:

Deposit model:
Silver-lead-zinc-quartz veins and vein-breccias.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:
Only sampling and mapping by the U.S. Geological Survey and U.S. Bureau of Mines.

Production notes:
None.

Reserves:
None.

Additional comments:
The occurrence is in the Gates of the Arctic National Park which is closed to prospecting and mining.

MAS No. 002010001

References:
Duttweiler K.A., 1987, Use of factor analysis in locating base metal mineralization in the Killik River Quadrangle, Alaska: U.S. Geological Survey Circular C 0998, p. 27-30.

Kelley, K.D., and Kelley, D.L., 1992, Reconnaissance exploration geochemistry in the central Brooks Range, northern Alaska; implications for exploration of sediment-hosted zinc-lead-silver deposits: Journal of Geochemical Exploration, vol .42, no.2-3, p..273-300.

Kelley, K.D., and Mull, C.G., 1995, Maps showing areas of potential for mineral resources in the Killik River 1 degree x 3 degree quadrangle, Brooks Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2225-A, 1 sheet, scale 1:250,000.

Kelley, K.D., Mull, C. G., and Barton, H. N., 1995, Maps showing the distribution of selected elements in minus-30-mesh stream-sediment samples from the southern part of the Killik River 1 degree x 3 degree quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2225-C, 2 sheets, scale 1:250,000.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kurtak and others, 1995

Reporter(s): J.M. Schmidt; K.D. Kelley (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Vidlee

Site type: Occurrence

ARDF no.: KL008

Latitude: 68.1297 **Quadrangle:** KL A-4

Longitude: 155.2837

Location description and accuracy:

This occurrence is 5.9 miles at an azimuth of 305 degrees from the small lake at the divide between a tributary to Kakivilak Creek and head of Itilyiargiok Creek. It is about 0.5 mile west of the center of section 32, T. 32 N., R. 16 E. The location is accurate to within about a half mile.

Commodities:

Main: Ag, Pb, Zn

Other: As, Au, Cu

Ore minerals:

Gangue minerals:

Geologic description:

This occurrence is near the contact of shale and sandstone of the Upper Devonian, Hunt Fort Shale and the Upper Devonian or Lower Mississippian, Kanayut Conglomerate. As originally identified by the U.S. Geological Survey (Kelly and Mull, 1995), the occurrence is a single 5-meter-wide outcrop exposed along strike for about 25 meters. The mineralization is in shale and sandstone and consists of galena, sphalerite, chalcopyrite, and pyrite in quartz veins and in quartz-cemented breccia. The veins trend N40E with a shallow northwest dip. There is noticeable banding in the sulfides. Samples collected by the U.S. Geological Survey contained up to 25 percent zinc, 1 percent copper, 1.5 to 2 percent lead, 300 parts per million (ppm) silver, 1,000 ppm arsenic, and 0.75 ppm gold. Three continuous chip samples averaging 2.6 meters in length were collected by the U.S. Bureau of Mines (Kurtak and others, 1995). They averaged 2.0 percent zinc, 1.1 percent lead, 1,103 ppm copper, and 130 grams of silver per tonne. A select sample from an outcrop contained 56.9 percent zinc, 9.8 percent lead, 1,287 grams of silver per tonne, and 1,056 ppm copper.

Kurtak and others (1995) found similar mineralization nearby, about 0.8 mile north of the discovery outcrop. There, galena and sphalerite are in quartz veinlets and veins 6 millimeters to 15 centimeters thick that cut sandstone. Two select samples contained up to 1.4 percent lead, 12.1 percent zinc, and 432.4 ppm silver. About 0.6 mile northwest of the discovery outcrop, a grab sample of vein quartz in float contained 3.5 percent lead and 32 ppm silver.

Alteration:

Not mentioned.

Age of mineralization:

Late Devonian or younger based on the age of the host rock. Possibly Late Jurassic to Cretaceous based on analogy with other deposits in the western Brooks Range.

Generic deposit model:

Deposit model:

Silver-lead-zinc-quartz veins and quartz breccia.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only limited sampling and mapping by the U.S. Geological Survey and U.S. Bureau of Mines.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS No. 0020210004

References:

Duttweiler K.A., 1987, Use of factor analysis in locating base metal mineralization in the Killik River Quadrangle, Alaska: U.S. Geological Survey Circular C 0998, p. 27-30.

Kelley, K.D., and Kelley, D.L., 1992, Reconnaissance exploration geochemistry in the central Brooks Range, northern Alaska; implications for exploration of sediment-hosted zinc-lead-silver deposits: Journal of Geochemical Exploration, vol .42, no.2-3, p..273-300.

Kelley, K.D., and Mull, C.G., 1995, Maps showing areas of potential for mineral resources in the Killik River 1 degree x 3 degree quadrangle, Brooks Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2225-A, 1 sheet, scale 1:250,000.

Kelley, K.D., Mull, C. G., and Barton, H. N., 1995, Maps showing the distribution of selected elements in minus-30-mesh stream-sediment samples from the southern part of the Killik River 1 degree x 3 degree quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2225-C, 2 sheets, scale 1:250,000.

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Primary Reference: Kelley and Mull, 1995; Kurtak and others, 1995

Reporter(s): J.M. Schmidt (U.S. Geological Survey); K.D. Kelley (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Outwash Southeast

Site type: Occurrence

ARDF no.: KL012

Latitude: 68.1487 **Quadrangle:** KL A-4

Longitude: 155.2332

Location description and accuracy:

This occurrence is about 6.0 miles northwest of the small lake at the divide between a tributary to Kakivilak Creek and head of Itilyiargiok Creek. It is about 0.5 mile north-northeast of the center of section 26, T. 32 N., R. 16 E. The location is accurate to within about a half mile.

Commodities:

Main: Ag, Pb, Zn

Other: Cu

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks in the area are Upper Devonian, Hunt Fork Shale and Noatak Sandstone. In a follow-up investigation of geochemical samples collected by the U.S. Geological Survey (Sutley and others, 1984), the Bureau of Mines discovered quartz-cemented breccia and quartz veins with galena and pyrite (Kurtak and others, 1995). A select sample of quartz-cemented breccia in shale contained 25 percent lead and 352 grams of silver per tonne. Another select sample of rubblecrop contained 7.3 percent lead, 9.3 percent zinc, more than 50 parts per million (ppm) silver, and 785 ppm copper. The extent of the mineralization was not determined.

Alteration:

Not noted.

Age of mineralization:

Late Devonian or younger based on the age of the host rock. Possibly Late Jurassic to Cretaceous based on analogy with other deposits in the western Brooks Range.

Generic deposit model:

Deposit model:

Silver-lead-zinc-quartz veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only limited sampling by the U.S. Geological Survey and U.S. Bureau of Mines.

Production notes:

None.

Reserves:

None.

Additional comments:

The occurrence is in the Gates of the Arctic National Park which is closed to prospecting and mining.

MAS No. 002010009

References:

Kurtak, J.M., Meyer, M.P., Hicks, R.W., Werdon, M.B., and Mull, C.G., 1995, Mineral investigations in the Colville mining district and southern National Petroleum Reserve in Alaska: U.S. Bureau of Mines Open-File Report 8-95, 217 p.

Sutley, S.J., Duttweiler, K.A., and Hopkins, R.T., 1984, Analytical results and sample locality map of stream-sediment and panned concentrate samples from the Killik River 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report OF 84-406, 18 leaves, 1 map, scale 1:250,000.

Primary Reference: Kurtak and others, 1995

Reporter(s): J.M. Schmidt (U.S. Geological Survey); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Bonanza Hills; Main Saddle

Site type: Prospect

ARDF no.: LC016

Latitude: 60.7061 **Quadrangle:** LC C-5

Longitude: 154.5956

Location description and accuracy:

The Bonanza Hills prospect extends about 1.5 km along a ridge, between peak 3,860 and peak 3,966, in the Bonanza Hills. It is approximately 3.5 km east-southeast of Little (Upper) Bonanza Creek in the SW1/4SW1/4 sec. 6, T. 7 N., R. 30 W., of the Seward Meridian. The location is accurate.

Commodities:

Main: Ag, Cu, Pb

Other: Au

Ore minerals: Arsenopyrite, chalcopyrite, galena, tetrahedrite

Gangue minerals: Quartz

Geologic description:

A quartz-sulfide vein system containing tetrahedrite, arsenopyrite, galena, and chalcopyrite cuts sedimentary rocks and dacite hornfels (Eakins and others, 1978). The mineralization consists of a 3-meter-wide zone of quartz sulfide 'splatter' veinlets that extends at least 150 meters along strike to a depth of 50 meters. Channel samples contain an average of 103 grams of silver per tonne and 0.5 percent combined Cu and Pb. Samples contain up to 2.24 parts per million (ppm) gold.

The contact-metamorphosed dacite flows and sedimentary rocks are part of a Jurassic to Cretaceous unit (KJs) that consists of interbedded lithic graywacke, silty sandstone, black shale , and local conglomerate (Nelson and others, 1983). Irregular quartz segregations and veinlets are locally present. Scattered stocks and locally abundant dikes of intermediate to felsic composition intrude these sedimentary rocks. Contact aureoles of hornfels ring some of the larger igneous bodies which include rhyolite dikes and a Late Cretaceous, two-mica, hypabyssal, granite pluton (Nokleberg and others, 1997).

Liberty Star Uranium and Metals Corporation (2007) has 54 State of Alaska claims covering about 13.5 square miles around this prospect. Twenty samples were collected in their preliminary work; 5 contained 0.001 to 0.006 ounce of gold per ton, 2 contained 0.02 ounce of gold per ton, 1 contained 0.267 ounce of gold per ton, one contained 0.403 ounce of gold per ton, and one contained 3.11 ounces of gold per ton.

Alteration:

Unknown.

Age of mineralization:

Cretaceous or younger.

Generic deposit model:

Deposit model:

Gold vein system or disseminated gold deposit associated with a composite intrusive center?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

In 2008 within a large block of claims held by Liberty Star Uranium and Metals Corporation who did preliminary sampling.

Production notes:

No production.

Reserves:

Nokleberg and others (1987; 1997) estimate that the deposit contains 45,000 tonnes of material with a grade of 81 grams of silver per tonne, 0.15 grams of gold per tonne, 0.15 percent copper, and 0.067 percent lead.

Additional comments:

References:

Cobb, E.H., and Reed, B.L., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in the Iliamna, Lake Clark, Lime Hills, and McGrath quadrangles, Alaska; Supplement to Open-File Report 76-485; Part A, Summaries to January 1, 1981: U.S. Geological Survey Open-File Report 81-1343-A, 25 p.

Cobb, E.H., and Reed, B.L., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in the Iliamna, Lake Clark, Lime Hills, and McGrath quadrangles, Alaska; Supplement to Open-File Report 76-485; Part B, Lists of references to Januray 1, 1981: U.S. Geological Survey Open-File Report 81-1343-B, 20 p.

Eakins, G.R., Gilbert W.G., and Buntzen, T.K., 1978, Preliminary bedrock geology and mineral resource potential of west-central Lake Clark quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File Report 118, 15 p., 2 plates, scale 1:25,000.

Liberty Star Uranium and Metals Corp., 2007, Bonanza Hills project: http://www.libertystaruranium.com/sub.asp?sub_id=35&section_id=8 (as of March 4, 2008).

Nelson, W.H., Carlson, C., and Case, J.E., 1983, Geologic map of the Lake Clark quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1114-A, 1 sheet, scale 1:250,000.

Nelson, W.H., King, H.D., Case, J.E., Tripp, R.B., Crim, W.D., and Cooley, E.F., 1985, Mineral resource map of the Lake Clark quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1114-B, 1 sheet, scale 1:250,000.

Nokleberg, W.J., Bundtzen, T.K., Berg, H.C., Brew, D.A., Grybeck, D.J., Robinson, M.S., Smith, T.E., and Yeend, W., 1987, Significant metalliferous lode deposits and placer districts of Alaska: U.S. Geological Survey Bulletin 1786, 104 p., 2 plates, scale 1:5,000,000.

Nokleberg, W.J., Bundtzen, T.K., Dawson, K.M., Eremin, R.A., Goryachev, N.A., Koch, R.D., Ratkin, V.V, Rozenblum, I.S., Shpikerman, V.I., Frolov, Y.F., Gorodinsky, M.E., Melnikov, V.D., Diggles, M.F., Ognyanov, N.V., Petrachenko, E.D., Petrochenko, R.I., Pozdeev, A.I., Ross, K.V., Wood, D.H., Grybeck, D., Khanchuck, A.I., Kovbas, L.I., Nekrasov, I.Y., and Sidorov, A.A., 1996, Significant metalliferous and

selected non-metalliferous lode mineral deposits and placer districts, and for metallogenesis of the Russian Far East, Alaska, and the Canadian Cordillera: U.S. Geological Survey Open-File Report 96-513-B, 385 p.; U.S. Geological Survey Open-File Report 96-513-B, 385 p. (CD-ROM format).

Primary Reference: Eakins and others, 1978

Reporter(s): M.L. Miller (USGS); D.P. Bickerstaff (USGS); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Big Chunk; White Sox

Site type:

ARDF no.: LC054

Latitude: 60.079 **Quadrangle:** LC A-7

Longitude: 155.423

Location description and accuracy:

In 2003, Liberty Star Uranium and Metals Corp. staked two large blocks of claims that covered about 177 square miles. In 2004 and 2005, they did considerable surface work and drilled four holes on them. The exact locality of the drill holes is uncertain and arbitrarily the coordinates are placed at about the center of the largest block of claims near the center of section 7, T. 2 S., R. 36 W. However, the drilling may be many miles away. The outline of the claim blocks is shown on Liberty Star's web site (2008).

Commodities:

Main: Au, Cu, Mo

Other:

Ore minerals: Chalcopyrite, molybdenite

Gangue minerals:

Geologic description:

In 2003, Liberty Star Uranium and Metals Corp. (2007) staked two large blocks of claims that covered an area of about 177 square miles. They carried out extensive surface sampling and geochemical and geophysical surveys in 2004 and 2005 and drilled 4 holes at the White Sox locality in 2004 that totaled 1,329 feet. Visible chalcopyrite and molybdenite was seen in the core which contained low gold values. The data suggest a copper porphyry.

Alteration:

No information.

Age of mineralization:

Generic deposit model:

Deposit model:

Au-Cu-Mo porphyry.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

In 2003, Liberty Star Uranium and Metals Corp. (2007) staked two large blocks of claims that covered an area of about 177 square miles. They carried out extensive surface sampling and geochemical and geophysical surveys in 2004 and 2005 and drilled 4 holes at the White Sox locality in 2004 that totaled 1,329 feet.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Liberty Star Uranium and Metals Corp., 2007, Big Chunk Super Project: http://www.libertystaruranium.com/sub.asp?sub_id=17&section_id=8 (as of March 4, 2008).

Primary Reference: This record

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Kody

Site type: Prospect

ARDF no.: LC055

Latitude: 60.3968 **Quadrangle:** LC B-6

Longitude: 154.9043

Location description and accuracy:

The Kody prospect is located in the hills between the Koksetna and Chilikadrotna Rivers approximately 20 miles northwest of Lake Clark. It lies in a saddle northwest of hill 3084 at the headwaters of a tributary of the Koksetna River. The northwest 1/4 of section 31 in T. 4 N., R. 32 W. of the Seward Meridian is the approximate center of a 4 square mile prospect area. The location is accurate within 200 meters.

Commodities:

Main: Ag, Cu, Sn

Other: As, Au

Ore minerals: Arsenopyrite, chalcopyrite, pyrite, pyrrhotite

Gangue minerals: Quartz, sericite, tourmaline

Geologic description:

The area between the Koksetna and Chilikadrotna Rivers is underlain by undivided Kuskokwim Group sedimentary rocks and the Koksetna River sequence of Wallace and others (1989) that have been intruded by Cretaceous to Tertiary quartz monzonite plutons and rhyolite to dacite plugs, sills, dikes and flows (Wilson and others, 2006).

The Kody prospect is a 1 square kilometer intrusive/subvolcanic complex that has been pervasively greisenized. An exposed, steep-sided, late Cretaceous quartz monzonite plug has intruded and hornfelsed siliceous clastic sedimentary rocks that strike northeast and dip to the northwest (Ellis and others, 1985) correlating with the Jurassic-Cretaceous Koksetna River sequence of Wallice and others (1989). The quartz monzonite and adjacent hornfelsed sedimentary rocks form a 4 square kilometer topographic knob which rises greater than 1,100 feet above the surrounding lowlands. The eastern edge of the quartz monzonite and the hornfelsed sedimentary rocks has been cut by numerous rhyolite apophyses of Tertiary (?) age (Scott and Ellis, 1982).

Greisenization of the quartz monzonite is widespread. Smaller non-greisenized areas exist adjacent to the faulted northwestern hornfels contact, and these areas are chloritized and locally sericitized. The greisen varies from a white to tan to gray, fine- to medium-grained, granular, quartz-white mica rock with abundant voids. The white mica occurs as tiny 1 to 3 millimeter sprays that appear interstitial to the fine-grained secondary quartz. Incipient tourmalinization is associated with the white mica (Ellis and others, 1985).

Sulfide mineralization is distinctly localized in greisenized areas implying a genetic relationship between greisenization and introduction of the sulfides. Locally abundant sulfides were deposited in open spaces in the greisens, in fractures, in quartz-flooded zones, and in hornfelsed zones (Scott and Ellis, 1982). The greisen locally grades into a banded, fine-grained, and white to black tourmaline-quartz rock. In these flooded zones, the rock is extremely fine-grained, and open-space filling by arsenopyrite and chalcopyrite is locally common. The rock is very hard, forming irregulary shaped cobbles with a patina of intense iron-oxide stain. Where this 'flooding' occurs in the hornfels, the sedimentary rocks are also iron-stained (Ellis and others, 1985).

Pyrrhotite (up to 30 percent), arsenopyrite (up to 10 percent), chalcopyrite (up to 3 percent) and silver from 0.5 to 11 ounces per ton is present in scattered zones within the altered intrusive. A 100 by 300 meter

zone near the eastern margin of the of the greisenized quartz monzonite averaged over 1 ounce per ton silver and exceeded 100 parts per million (ppm) tin (Ellis and others, 1985).

Alteration:

A quartz-white mica-tourmaline greisen has replaced the majority of the exposed quartz monzonite at the Kody prospect. Ungreisenized areas in the quartz monzonite show local chloritization of biotite and hornblende and clay alteration of feldspars. The rhyolite which intrudes both the quartz monzonite and hornfelsed sediments is locally tourmalinized. Relict feldspar phenocrysts in the rhyolite are intensely sericitized (Ellis and others, 1985).

Age of mineralization:

Mineralization is probably related to 60.5 to 61.6 Ma intrusions dated in the area (Eakins and others, 1978).

Generic deposit model:

Deposit model:

Porphyry Sn (Cox and Singer, 1986; model 20a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20a

Production Status: None

Site Status: Inactive

Workings/exploration:

The Kody prospect was discovered by Anaconda Minerals Company in 1982. Exploration work included geologic mapping, grid rock sampling, a one kilometer induced polarization (IP)-resistivity line and a 10 square kilometer gravity survey. A Bouguer gravity map based on 39 surveyed stations and a gravity profile show an 8 milligal low that is best depicted as a 2.5 kilometer northwest dipping slab that broadens slightly with depth. The top of this anomaly is coincident with mapped quartz monzonite, greisen, and rhyolite intrusive rock (Scott and Ellis, 1982). Pyrrhotite (up to 30 percent), arsenopyrite (up to 10 percent), chalcopyrite (up to 3 percent), silver from 0.5 to 11 ounces per ton, and gold from 100 to 800 parts per billion is present in scattered zones within the altered intrusive. A 100 by 300 meter zone near the eastern margin of the of the greisenized quartz monzonite averaged over 1 ounce per ton silver and from 100 to 400 parts per million tin (Ellis and others, 1985).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Eakins, G.R., Gilbert, W.G., and Bundtzen,T.K., 1978, Preliminary bedrock geology and mineral resource potential of west-central Lake Clark quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File Report 118, 16 p., 2 sheets, scale 1:125,000. http://dggs.alaska.gov/pubs/id/34

Ellis, W.T., Whitte, D.M., and Millholland, M.A., 1985, 1983-1984 CIRI in Region Reconnaissance, Anaconda Minerals Company, Alaska District (report available from Alaska Earth Sciences, Anchorage, Alaska).

Scott, R.W. and Ellis, W.T., 1982, CIRI 'In-Region' Reconnaissance Project Report, Anaconda Minerals Company, Domestic Metals Exploration, Anchorage, Alaska (report available from Alaska Earth Sciences, Anchorage, Alaska).

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Wilson, F.H., Blodgett, R.B., Blome, C.D., Mohadjer, Solmaz, Preller, C.C., Klimasauskas, E.P., Gamble, B.M., and Coonrad, W.L., 2006, Reconnaissance bedrock geologic map for the northern Alaska Peninsula area southwest Alaska: U.S. Geological Survey Open-File Report 2006-1303, 114 p., scale 1:250,000. http://pubs.usgs.gov/of/2006/1303

Primary Reference: Ellis and others, 1985

Reporter(s): W.T. Ellis (Alaska Earth Sciences)

Last report date: 2016-03-15

Site name(s): Koksetna, Chilikat East

Site type: Prospect

ARDF no.: LC056

Latitude: 60.4713 **Quadrangle:** LC B-5

Longitude: 154.8076

Location description and accuracy:

The Koksetna prospect is located in the hills between the Koksetna and Chilikadrotna Rivers approximately 20 miles northwest of Lake Clark. The center of the prospect is on the northeast side of the valley above 2500 foot elevation at the headwaters of a tributary of the Koksetna River in the northeast 1/4 of section 3, T. 4 N., R. 32 W. of the Seward Meridian. The location is accurate within 200 meters.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other: As, F, Sb, Sn

Ore minerals: Arsenopyrite, chalcopyrite, galena, pyrite, tetrahedrite

Gangue minerals: Kaolinite, quartz, sericite, tourmaline

Geologic description:

The area between the Koksetna and Chilikadrotna Rivers is underlain by undivided Kuskokwim Group sedimentary rocks and the Koksetna River sequence of Wallace and others (1989) that have been intruded by Cretaceous to Tertiary quartz monzonite plutons and rhyolite to dacite plugs, sills, dikes and flows (Wilson and others, 2006).

The Koksetna prospect is an altered and mineralized pipe-like breccia zone approximately 750 meters diameter cutting siltstones of the Koksetna River sequence. Several siliceous breccia units and a quartz-eye rhyolite porphyry along with wall rock clasts have been noted in the breccia pipe (Scott and Ellis, 1982).

Hydrothermal alteration at Koksetna is related to the intrusive rocks as well as a final stage of supergene leaching (Scott and Ellis, 1982). Prospect alteration is laterally restricted to the composite pipe and a 200 foot peripheral zone of spotty propylitiztion in the wall rock. This is due to the non-reactive nature of the siltstones, and their low permeability. The first alteration event accompanied the intrusion of quartz-eye rhyolite porphyry which has a plug-like geometry. The vast majority of the exposed porphyry is argillically altered to kaolinite with minor sericite and montmorillonite. Argillization is generally restricted to the porphyry groundmass with occasional replacement of sanidine phenocrysts by kaolinite. Small zones of quartz-sericite alteration were observed in central portions of the porphyry. Here the porphyry texture is totally obliterated and replaced by a hard, silica-rich skeleton. Crystal vugs are commonly lined with orange-yellow jarosite, probably from the weathering of sulfide. Intrusion of the rhyolite porphyry also propylitized the wall rock siltstone, andesite, and greywacke, creating localized conversion to chlorite, epidote, illite, and secondary biotite (Ellis and others, 1985).

At least two and possibly three separate pulses of mineralization have been identified at Koksetna. An early pulse of 1 to 5 percent sulfide with a high silver to copper ratio is believed to have been originally disseminated in the quartz-eye rhyolite porphyry. A possible second pulse of minor sulfide mineralization accompanied the intrusion of silica breccia. The third and final pulse of sulfide mineralization is represented by fracture-filling veins that average 2 to 5 millimeters in thickness and appear to cut all lithologies visible within the near periphery of the Koksetna breccia pipe. The quartz veins contain iron oxides, rare chalcopyrite and tetrahedrite. Local stockwork fracture zones, frequently healed by quartz, tourmaline, or sulfide veinlets, occur within the wall rock along a 100 meter margin of the intrusive contact (Ellis and

others, 1985).

Alteration:

Hydrothermal alteration at Koksetna is related to the intrusive rocks as well as a final stage of supergene leaching (Scott and Ellis, 1982). Prospect alteration is laterally restricted to the composite pipe and a 200 foot peripheral zone of spotty propylitiztion in the wall rock. This is due to the non-reactive nature of the siltstones and to their low permeability.

The first alteration event accompanied the intrusion of quartz-eye rhyolite porphyry in a plug-like geometry. The vast majority of the exposed porphyry is argillicaly altered to kaolinite with minor sericite and montmorillonite. Argillization is generally restricted to the porphyry groundmass with occasional replacement of sanidine phenocrysts by kaolinite. Small zones of quartz-sericite alteration were observed in central portions of the porphyry where the porphyry texture is totally obliterated and replaced by a hard, silica-rich skeleton. Crystal vugs are commonly lined with orange-yellow jarosite, probably from the weathering of sulfide. Intrusion of the rhyolite porphyry also propylitized the wall rock siltstone, andesite, and greywacke, creating localized conversion to chlorite, epidote, illite, and secondary biotite (Ellis and others, 1985).

Age of mineralization:

Mineralization is probably related to 60.5 to 61.6 Ma intrusions dated in the area (Eakins and others, 1978).

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Inactive

Workings/exploration:

In 1982 the geophysical crew of Anaconda Minerals Company (Anaconda) conducted a induced polarization (IP)-resistivity survey over the center of the rhyolite breccia pipe. The objectives of this survey were to evaluate the quality of the IP-resistivity data gathered in 1975 by Von Blaricom Geophysical Services, and to test below 1,000 feet depth for a hypothetical supergene enrichment zone (Scott and Ellis, 1982). Three-hundred rock samples were collected from a grid over the Koksetna prospect with each sample representing a 50 foot composite zone along the grid lines. Select samples of mineralized veins and breccias contained anomalous geochemistry as follows: copper 0.15 to 4 percent, silver 0.5 to 16 ounces per ton (oz/ton), lead 100 to 4100 parts per million (ppm), zinc 200 to 2700 ppm, antimony 20 to 480 ppm, tin 20 to 550 ppm, arsenic 300 to 17300 ppm, and 5 samples had anomalous gold from 50 to 1250 parts per billion (ppb) (Scott and Ellis, 1982).

In 1983 Anaconda collected 10 check samples and 7 vein samples at the Koksetna prospect. The geochemistry from these samples verified that anomalous mineralization in the periphery of the feeder pipe was strongest in the northern contact zone. Geochemical values were the following: silver 1 ppm to 4.05 oz/ton, copper 125 to 3000 ppm, lead 100 to 3500 ppm, zinc 300 to 4080 ppm, fluorine 300 to 1350 ppm, arsenic 200 to over 1000 ppm, tin 30 to 340 ppm, and gold 30 to 565 ppb (Ellis and others, 1985).

In 2007 Andover Ventures Inc. conducted a ridge and spur rock and soil sampling survey peripheral to the multiphase intrusive pipe. An IP-resisivity survey was attempted but was unable to get sufficient current into the poorly developed soils to get meaningful results (Ellis and Hoffman, 2008).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Eakins, G.R., Gilbert, W.G., and Bundtzen,T.K., 1978, Preliminary bedrock geology and mineral resource potential of west-central Lake Clark quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File Report 118, 16 p., 2 sheets, scale 1:125,000. http://dggs.alaska.gov/pubs/id/34

Ellis, W.T. and Hoffman, H., 2008, Annual Report on 2007 BBNC Reconnaissance Southwest Alaska, prepared for Andover Ventures Inc., 61 p. (report available from Alaska Earth Sciences, Anchorage, Alaska).

Ellis, W.T., Whitte, D.M., and Millholland, M.A., 1985, 1983-1984 CIRI in Region Reconnaissance, Anaconda Minerals Company, Alaska District (report available from Alaska Earth Sciences, Anchorage, Alaska).

Scott, R.W. and Ellis, W.T., 1982, CIRI 'In-Region' Reconnaissance Project Report, Anaconda Minerals Company, Domestic Metals Exploration, Anchorage, Alaska (report available from Alaska Earth Sciences, Anchorage, Alaska).

Wallace, W.K., Hanks, C.L., and Rogers, J.F., 1989, The Southern Kahiltna terrane: Implications for the tectonic evolution of southwestern Alaska: Geologic Society of America Bulletin, v. 101, p.1389-1407.

Wilson, F.H., Blodgett, R.B., Blome, C.D., Mohadjer, Solmaz, Preller, C.C., Klimasauskas, E.P., Gamble, B.M., and Coonrad, W.L., 2006, Reconnaissance bedrock geologic map for the northern Alaska Peninsula area southwest Alaska: U.S. Geological Survey Open-File Report 2006-1303, 114 p., scale 1:250,000. http://pubs.usgs.gov/of/2006/1303

Primary Reference: Ellis and others, 1985

Reporter(s): W.T. Ellis (Alaska Earth Sciences)

Last report date: 2016-03-15

Site name(s): Kosmic; Chilikat West

Site type: Prospect

ARDF no.: LC057

Latitude: 60.525 **Quadrangle:** LC C-6

Longitude: 155.0668

Location description and accuracy:

Located at the headwaters of a tributary approximately 5 miles to the south of the Chilikadrotna River, approximately 30 miles northwest of Lake Clark. The prospect is along a crescent shaped ridge immediately south of hill 3213 in the northeast 1/4 of section 16, T. 5 N., R. 33 W. of the Seward Meridian. Location is accurate to within 200 meters.

Commodities:

Main: Ag, Au, Cu, Zn

Other: As, F, Mo, Sn

Ore minerals: Arsenopyrite, cassiterite, chalcopyrite, covellite, molybdenum, pyrite, scorodite

Gangue minerals: Muscovite, quartz, sericite, tourmaline

Geologic description:

The area between the Koksetna and Chilikadrotna Rivers is underlain by undivided Kuskokwim Group sedimentary rocks and the Koksetna River sequence of Wallace and others (1989) that have been intruded by Cretaceous to Tertiary quartz monzonite plutons and rhyolite to dacite plugs, sills, dikes and flows (Wilson and others, 2006). The Kosmic prospect lies within the Kuskokwim Group.

Quartz monzonite porphyry occurs as a small stock approximately one kilometer in diameter and is the dominant intrusive rock at Kosmic. Quartz monzonite porphyry is characterized by abundant phenocrysts of smoky quartz 3 to 5 millimeters in diameter and plagioclase with less abundant potassium feldspar phenocrysts (Scott and Ellis, 1982).

Rhyolite porphyry occurs as dikes emanating outward from the quartz monzonite porphyry. Intrusive contacts between rhyolite and quartz monzonite porphyry were not observed and at one location quartz monzonite porphyry appears to grade into rhyolite porphyry. Moderate fracturing and contact metamorphism extends outward roughly 100 meters from the intrusive-sedimentary rock contact and dies out rapidly between 100 and 200 meters from the contact (Ellis and others, 1985).

The strongest alteration occurs in rhyolite porphyry although the majority of the rocks at Kosmic are unaltered. Alteration of rhyolite porphyry is primarily sericitic and includes localized patches of silicified, tourmalinized rock where black tourmaline occurs in fractures and as rosettes throughout the rock (Ellis and others, 1985).

The rhyolite and quartz monzonite are locally cross-cut by veins; however, veining is more common in the hornfelsed sedimentary rocks. Four types of veins were observed. Type 1 veins occur in the hornfels and are 0.5 centimeter wide fractures filled with quartz, minor muscovite, and rare traces of arsenopyrite. Type 1 veins have no alteration envelopes. Some of these veins carry anomalous silver and gold. Type 2 veins are 1.0 to 5.0 millimeters wide fractures in quartz monzonite and rhyolite porphyry. These fractures are filled with quartz and minor arsenopyrite with scorodite. Muscovite envelopes extend outward approximately 1.0 to 5.0 centimeters from these veins. Grab samples from these veins carry anomalous silver and tin. Type 3 veins occur in hornfels near intrusive contacts as coarsely crystalline veins and pods up to 10 centimeters in diameter. These pegmatic veins contain glassy quartz, muscovite, biotite, and potassium feldspar. Dark green or black tourmaline crystals and very rare cassiterite occur in these veins. Type 3 veins are probably

late pegmatic phases of quartz monzonite porphyry. Type 4 veins occur in hornfels as sinuous veins and pods of milky white metamorphic quartz with clots of biotite and muscovite. These veins are common in the area and are produced by contact metamorphism. At the Kosmic prospect type 4 veins frequently contain coarse splays of pale green tourmaline (Ellis and others, 1985).

In addition to vein-type mineralization described above, three patches (approximately 10 meters in diameter each) of mineralized rhyolite porphyry were mapped on the east flank of the Kosmic prospect. The mineralization occurs in a narrow (20 meter) east-west rhyolite porphyry dike that extends onto the adjacent ridge. The mineralized rock contains 1 to 3 percent disseminated arsenopyrite and includes minor amounts of chalcopyrite, covellite, and molybdenite(?). Covellite coats chalcopyrite and arsenopyrite and has copper values to 695 ppm (Ellis and others, 1985).

Alteration:

The strongest alteration occurs in rhyolite porphyry although the majority of the rocks at Kosmic are unaltered. Alteration of rhyolite porphyry is primarily sericitic and includes localized patches of silicified, tourmalinized rock where black tourmaline occurs in fractures and as rosettes throughout the rock (Ellis and others, 1985).

Age of mineralization:

Mineralization is probably related to 60.5 to 61.6 Ma intrusions dated in the area (Eakins and others, 1978).

Generic deposit model:

Deposit model:

Polymetallic veins? (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Inactive

Workings/exploration:

Anaconda Minerals Company (Anaconda) discovered the Kosmic prospect during a regional exploration in 1982 (Scott and Ellis, 1982). In 1983 Anaconda mapped and sampled Kosmic identifying four types of veins, three of which were mineralized. Type 1 veins in hornfels sometimes carried elevated silver up to 27 parts per million (ppm) and gold up to 4430 parts per billion (ppb). Grab samples from type 2 veins in the quartz monzonite and rhyolite porphyry carried elevated silver up to 17 ppm and tin up to 1450 ppm. Type 3 veins contained rare cassiterite, identified in hand specimen and in thin section. Eleven grab samples from mineralized rhyolite porphyry with 1 to 3 percent disseminated arsenopyrite and minor chalcopyrite, covellite and molybdenite (?) contained anomalous silver (1.3 to 30 ppm), arsenic (over 1000 ppm), and fluorine (over 5000 ppm). Five out of 22 samples had anomalous tungston values from 100 to 475 ppm. Three samples of greisenized rhyolite contained 395, 440, and 565 ppm tin (Ellis and others, 1985).

An induced polarization (IP) and resistivity anomaly at the north end of Kosmic was discovered in 2007 when Andover Ventures Inc. completed a 2.7 kilometer long geophysical survey along the crescent ridge. Rock and soil sampling along the IP line detected anomalous arsenic, copper, and zinc (Ellis and Hoffman, 2008).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Eakins, G.R., Gilbert, W.G., and Bundtzen,T.K., 1978, Preliminary bedrock geology and mineral resource potential of west-central Lake Clark quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File Report 118, 16 p., 2 sheets, scale 1:125,000. http://dggs.alaska.gov/pubs/id/34

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Primary Reference: Ellis and others, 1985

Reporter(s): W.T. Ellis (Alaska Earth Sciences)

Last report date: 2016-03-15

Site name(s): Kolossal; Black Hill

Site type: Prospect

ARDF no.: LC058

Latitude: 60.2827 **Quadrangle:** LC B-6

Longitude: 155.2481

Location description and accuracy:

Located near the headwaters of Black Creek, a tributary of the Koksetna River about 25 miles west of Lake Clark. The prospect lies on the northeast flank of VABM Black in the northeast 1/4 of section 7, T. 2 N., R. 34 W. of the Seward Meridian.

Commodities:

Main: Ag, Au, Cu

Other: As, F

Ore minerals: Arsenopyrite, chalcopyrite, pyrite, pyrrhotite, scorodite

Gangue minerals: Calcite, fluorite, quartz, sericite, tourmaline

Geologic description:

The Kolossal prospect is underlain by sedimentary rocks of the Koksetna River sequence of Wallace and others (1989) that have been intruded by Cretaceous to Tertiary quartz monozonite plutons and rhyolite to dacite plugs, sills, dikes and flows. The Koksetna sequence at the prospect consists of dominantly fine grained silty sandstones and sandy siltstones. Local zones of thin bedded to laminated siltstones and poorly sorted medium-grained greywacke are interbedded on the eastern portion of the prospect area (Wilson and others, 2006).

At Kolossal the sedimentary rocks have been extensively hornfelsed, becoming pinkish-gray in color and commonly having a conchoidal fracture (Scott and Ellis, 1982). Locally the rocks have been highly tourmalinized and tourmaline veins with radiating crystals and quartz with tourmaline cores are common. The hornfelsed sedimentary rocks commonly contain from 1 to 2 percent finely disseminated pyrrhotite.

A leucocratic fine-grained equigranular, locally porphyritic, granite occurs in the northwest portion of the Kolossal prospect. Ten to twenty percent potassium feldspar phenocrysts 2 to 3 millimeters in diameter occur in portions of the intrusive. One to three percent chloritized mafics (after hornblende and biotite) are generally present except where leaching has left iron-oxide stained vugs. Locally miarolitic cavities 1 to 3 millimeters in diameter occur and are commonly lined with euhedral quartz and feldspar crystals (Ellis and others, 1985). The equigranular groundmass is composed of approximately 70 percent potassium feldspar plus plagioclase along with about 30 percent quartz and 1 to 3 percent chloritized mafics (biotite and hornblende). This granite was emplaced as a high level hypabyssal intrusion.

Greisen occurs sporadically in float in a 200 meter by 100 meter zone approximately 300 meters due north of VABM Black (Scott and Ellis, 1982). It consists of 65 to 90 percent granular quartz, 5 to 15 percent white mica (sericite) which is commonly in fractures and along boundaries of quartz grains, and 5 to 10 percent hornblende pseudomorphs which contain traces of unidentified opaques. Local zones of 1 to 3 percent purple fluorite occur. The greisens are locally mineralized with 1 to 3 percent arsenopyrite or its oxidation product, scorodite. Two occurrences of tourmaline quartz breccia have been located as float in the greisen area. The breccia consists of 1 to 10 centimeter fragments of greisenized granite and fine-grained 40 percent tourmaline and 60 percent quartz matrix (Ellis and others, 1985).

Five to ten meter wide aplite dikes occur sporadically in the prospect area. They are typically fine-grained (locally porphyritic) and are composed dominantly of quartz and feldspar. Near Black Creek the aplite dikes

contain 1 to 2 percent pyrite and quartz carbonate veins also located along the creek contain limonite stains and replacements, possibly after pyrite and chalcopyrite. On the northeast side of VABM Black a quartz latite dike is spatially associated with fracture controlled pyrite and chalcopyrite and local tourmalinization (Ellis and others, 1985).

Alteration:

At Black Hill the sedimentary rocks have been extensively hornfelsed, becoming pinkish-gray in color and commonly having a conchoidal fracture (Scott and Ellis, 1982). Locally the rocks are highly tourmalinized and tourmaline veins with radiating crystals and quartz with tourmaline cores are common.

Greisen occurs sporadically in float in a 200 meter by 100 meter zone approximately 300 meters due north of VABM Black (Scott and Ellis, 1982). It consists of 65 to 90 percent granular quartz, 5 to 15 percent white mica (sericite) which is commonly in fracture 1 to 3 percent purple fluorite occur. The greisens are locally mineralized with 1 to 3 percent arsenopyrite or its oxidation product, scorodite.

Age of mineralization:

Mineralization is probably related to 59.5 intrusions dated in the area (Eakins and others, 1978).

Generic deposit model:

Deposit model:

Polymetallic veins? (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Inactive

Workings/exploration:

The Kolossal prospect was discovered by Anaconda Minerals Company (Anaconda) following up on aeromagnetic anomalies in 1982. In 1983 Anaconda conducted geologic mapping, grid rock sampling, and gravity and ground magnetic surveys (Ellis and others, 1985).

During the 1982-1983 Anaconda programs five types of mineralization were identified at Kolossal: 1) arsenopyrite-bearing greisen, 2) quartz latite dike spatially associated with fracture controlled pyrite and chalcopyrite, 3) disseminated pyrrhotite in horfelsed sediments, 4) aplite dikes with pyrite, and 5)quartz carbonate veins with limonite stain and replacement. Rock samples from the mineralized quartz latite dike on Black Hill had fracture controlled pyrite and chalcopyrite which returned gold values from 0.3 to 1.7 parts per million (ppm) and silver values from 2 to 28 ppm. The most anomalous grab sample taken adjacent to an aplite dike contained 0.15 percent copper, 28 ppm silver, and 1 ppm gold (Ellis and others, 1985). The most anomalous tin value in a rock sample was 225 ppm.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Eakins, G.R., Gilbert, W.G., and Bundtzen,T.K., 1978, Preliminary bedrock geology and mineral resource potential of west-central Lake Clark quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File Report 118, 16 p., 2 sheets, scale 1:125,000. http://dggs.alaska.gov/pubs/id/34

Ellis, W.T., Whitte, D.M., and Millholland, M.A., 1985, 1983-1984 CIRI in Region Reconnaissance, Anaconda Minerals Company, Alaska District (report available from Alaska Earth Sciences, Anchorage, Alaska).

Scott, R.W. and Ellis, W.T., 1982, CIRI 'In-Region' Reconnaissance Project Report, Anaconda Minerals Company, Domestic Metals Exploration, Anchorage, Alaska (report available from Alaska Earth Sciences, Anchorage, Alaska).

Wallace, W.K., Hanks, C.L., and Rogers, J.F., 1989, The Southern Kahiltna terrane: Implications for the tectonic evolution of southwestern Alaska: Geologic Society of America Bulletin, v. 101, p.1389-1407.

Wilson, F.H., Blodgett, R.B., Blome, C.D., Mohadjer, Solmaz, Preller, C.C., Klimasauskas, E.P., Gamble, B.M., and Coonrad, W.L., 2006, Reconnaissance bedrock geologic map for the northern Alaska Peninsula area southwest Alaska: U.S. Geological Survey Open-File Report 2006-1303, 114 p., scale 1:250,000. http://pubs.usgs.gov/of/2006/1303

Primary Reference: Ellis and others, 1985

Reporter(s): W.T. Ellis (Alaska Earth Sciences)

Last report date: 2016-03-15

Site name(s): Kody West

Site type: Prospect

ARDF no.: LC059

Latitude: 60.4007 **Quadrangle:** LC B-6

Longitude: 154.9423

Location description and accuracy:

The Kody West prospect is located in the Koksetna Hills approximately 20 miles northwest of Lake Clark. The prospect is on the hill southeast of hill 3017 at the headwaters of a tributary of the Koksetna River. Along the section line of the southwest 1/4 of section 25 and the northwest 1/4 of section 36 in T. 4 N., R. 33 W. of the Seward Meridian is the approximate center of the 1/2 kilometer prospect area.

Commodities:

Main: Ag, Pb, Sn, Zn

Other: As

Ore minerals: Arsenopyrite, cassiterite

Gangue minerals: Pyrite, quartz, sericite, tourmaline

Geologic description:

The area between the Koksetna and Chilikadrotna Rivers is underlain by undivided Kuskokwim Group sedimentary rocks and the Koksetna River sequence of Wallace and others (1989) that have been intruded by Cretaceous to Tertiary quartz monzonite plutons and rhyolite to dacite plugs, sills, dikes and flows (Wilson and others, 2006). The Kody West prospect lies within the Koksetna River sequence.

Hornfelsed greywacke float over a 500 by 400 meter area was found to contain abundant 0.5 to 5 centimeter wide quartz and iron oxide veins with one sample containing visible cassiterite mineralization (Scott and Ellis, 1982). The veins commonly contain gossan in void spaces and are associated with intense quartz-sericite alteration of the wall rocks with local traces of tourmaline. These veins are anomalously high in lead, zinc, silver, arsenic and tin (Ellis and others, 1985).

The observed veining and an aeromagnetic anomaly at Kody West indicate the likely presence of a shallow buried intrusive which could be related to the nearby (3 kilometers east-southeast) Kody (LC055) Sn-porphyry system (Ellis and others, 1985).

Alteration:

Abundant limonite stained quartz veins are seen cutting hornfelsed greywacke. The veins are associated with intense quartz-sericite alteration of the wall rocks with local traces of tourmaline (Ellis and others, 1985).

Age of mineralization:

Mineralization is probably related to 60.5 to 61.6 Ma intrusions dated in the Koksetna Hills (Eakins and others, 1978).

Generic deposit model:

Deposit model:

Sn-Polymetallic veins (Cox and Singer, 1986; model 20b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
20b

Production Status: None

Site Status: Inactive

Workings/exploration:

Anaconda Minerals Company (Anaconda) discovered the Kody West prospect in 1982 while following up on aeromagnetic and color anomalies. Mapping and grid rock sampling were completed. Grab samples from Kody West veins were anomalous in silver (2.3 parts per million (ppm) to 28.5 ounces per ton), lead (339 ppm to 8.55 percent), and zinc (710 to 2160 ppm). Several samples were also anomalous in arsenic, and two samples had tin values of 1150 and 3070 ppm (Scott and Ellis, 1982).

In 1983 Anaconda completed a ground magnetic survey and grid rock sampling of vein material. The quartz veins with gossan in void spaces were anomalously high in lead (100 ppm to 8.55 percent), zinc (300 to 3300 ppm), silver (1 to 912 ppm), arsenic (100 to over 1000 ppm), and tin (50 to 3070 ppm). The 21 line kilometer magnetic survey detected a shallow (less than 250 meter) 600 gamma anomaly under the topographic peaks at Kody West (Ellis and others, 1985).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Eakins, G.R., Gilbert, W.G., and Bundtzen,T.K., 1978, Preliminary bedrock geology and mineral resource potential of west-central Lake Clark quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File Report 118, 16 p., 2 sheets, scale 1:125,000. http://dggs.alaska.gov/pubs/id/34

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Wilson, F.H., Blodgett, R.B., Blome, C.D., Mohadjer, Solmaz, Preller, C.C., Klimasauskas, E.P., Gamble, B.M., and Coonrad, W.L., 2006, Reconnaissance bedrock geologic map for the northern Alaska Peninsula area southwest Alaska: U.S. Geological Survey Open-File Report 2006-1303, 114 p., scale 1:250,000. http://pubs.usgs.gov/of/2006/1303

Primary Reference: Ellis and others, 1985

Reporter(s): W.T. Ellis (Alaska Earth Sciences)

Last report date: 2016-03-15

Site name(s): Sawtooth Mountain

Site type: Mine

ARDF no.: LG006

Latitude: 65.376 **Quadrangle:** LG B-6

Longitude: 149.524

Location description and accuracy:

Cobb (1972, MF-413), loc. 2; NW1/4SW1/4 sec. 1, T. 6 N., R. 10 W., of the Fairbanks Meridian. This deposit is on Sawtooth Mountain. It is marked on the Livengood (B-6) quadrangle by a prospect symbol at the end of a trail up Buckeye Creek from the landing strip to the saddle on Sawtooth Mountain. The location is commonly believed to be accurate within about 50 meters.

Commodities:

Main: Sb

Other: Ag, Au

Ore minerals: Arsenopyrite, gold, stibnite

Gangue minerals: Quartz

Geologic description:

Massive stibnite occurs as a vertical cylinder about 3 m wide; it is hosted in argillite of Jurassic or Cretaceous flysch near a contact with Cretaceous granitic rock (Nokleberg and others, 1987; R. M. Chapman, written communication, 1985). The quartz monzonite has been K-Ar dated at 91.0+/-0.9 Ma (Weber and others, 1992). Grab samples from the dump have up to 46.2 percent Sb, 0.7 g/ton Au and 15.1 g/ton Ag (Nokleberg and others, 1987). The vein produced 590 tonnes of ore with 58 percent stibnite through 1970, with minor production in 1984 and 1985.

Alteration:

Age of mineralization:

The granitic rock has been K-Ar dated at 91.0+/-0.9 Ma (Weber and others, 1992).

Generic deposit model:

Deposit model:

Stibnite vein (Cox and Singer, 1986; model 27d).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

27d

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

A shaft reached a depth of 83 feet (Saunders, 1958; ATDM PE 49-14).

Production notes:

The vein produced 590 tonnes of ore with 58 percent stibnite through 1970, with minor production in 1984 and 1985 (Nokleberg and others, 1987).

Reserves:

None.

Additional comments:

References:

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Cobb, E.H., 1972, Metallic mineral resources map of the Livengood quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-413, 2 sheets, scale 1:250,000.

Cobb, E.H., 1973, Placer deposits of Alaska: U.S. Geological Survey Bulletin 1374, 213 p.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Livengood quadrangle, Alaska: U.S. Geological Survey Open-File Report 76-819, 241 p.

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Joesting, H.R., 1943, Strategic mineral occurrences in interior Alaska, supplement to pamphlet no. 1: Alaska Territorial Department of Mines Pamphlet 2, 26 p.

Nokleberg, W.J., Bundtzen, T.K., Berg, H.C., Brew, D.A., Grybeck, D.J., Robinson, M.S., Smith, T.E., and Yeend, W., 1987, Significant metalliferous lode deposits and placer districts of Alaska: U.S. Geological Survey Bulletin 1786, 104 p., 2 plates, scale 1:5,000,000.

Saunders, R.H., 1957 (1958), Report on the Sawtooth Mountain antimony prospect, Livengood quadrangle: Alaska Territorial Department of Mines Prospect Evaluation 49-14, 12 p. (1 sheet, scale 1:36,680).

Weber, F.R., Wheeler, K.L., Rinehart, C.D., Chapman, R.M., and Blodgett, R.B., 1992, Geologic map of the Livengood quadrangle, Alaska: U.S. Geological Survey Open-File Report 92-562, 19 p., scale 1:250,000.

Primary Reference: Nokleberg and others, 1987

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); F.H. Wilson (USGS)

Last report date: 2016-03-15

Site name(s): Lillian

Site type: Prospect

ARDF no.: LG011

Latitude: 65.511 **Quadrangle:** LG C-4

Longitude: 148.543

Location description and accuracy:

The Lillian prospect is near the head of Lillian Creek about 3/4 of a mile south of Livengood and 3/4 of a mile northwest of Money Knob. It is about 0.5 mile northeast of the center of section 22, T. 8 N., R. 5 W.

Commodities:

Main: Au

Other: Ag, Hg, Sb

Ore minerals: Cinnabar, gold, stibnite, unknown Ag

Gangue minerals: Scorodite

Geologic description:

This small old prospect is now part of the large International Tower Hills, Livengood prospect (LD202) that has been intensely studied and drilled since 2006. The Lillian prospect has largely now lost its identity and the data in this record has been integrated into the Livengood record. This record has not been updated since the exploration stated on the Livengood prospect and the pre-Livengood information here is retained in its original form for historical reference.

Narrow auriferous arsenopyrite-quartz-scorodite veins occur in and near a limonite-stained dike in altered and contorted graywacke-argillite country rock; samples contained from 0.5 to 48 ppm Au (Foster, 1968). Joesting (1942, ATDM Pamph. 1), reported a mineralized zone in a cut bank that contains stibnite and traces of cinnabar and gold.

Alteration:

Dike is limonite-stained.

Age of mineralization:

Generic deposit model:

Deposit model:

Auriferous arsenopyrite-quartz-scorodite veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Amax Gold Exploration, Inc., drilled on the Lillian Creek property in 1990 (Swainbank and others, 1991).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1972, Metallic mineral resources map of the Livengood quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-413, 2 sheets, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Livengood quadrangle, Alaska: U.S. Geological Survey Open-File Report 76-819, 241 p.

Foster, R.L., 1968, Descriptions of the Ruth Creek, Lillian Creek, Griffin, Old Smoky, Sunshine No. 2, and Olive Creek lode prospects, Livengood district, Alaska: U.S. Geological Survey Open-File Report 68-104, 21 p.

Foster, R.L., and Chapman, R.M., 1967, Locations and descriptions of lode prospects in the Livengood area, east-central Alaska: U.S. Geological Survey Open-File Report 275, 5 p.

Joesting, H.R., 1942, Strategic mineral occurences in interior Alaska: Alaska Territorial Department of Mines Pamphlet 1, 46 p.

Joesting, H.R., 1943, Strategic mineral occurrences in interior Alaska, supplement to pamphlet no. 1: Alaska Territorial Department of Mines Pamphlet 2, 26 p.

Mertie, J.B., Jr., 1918, Lode mining in the Fairbanks district, Alaska: U.S. Geological Survey Bulletin 662-H, p. 403-424.

Overbeck, R M., 1920, Placer mining in the Tolovana district: U.S. Geological Survey Bulletin 712-F, p. 177-184.

Primary Reference: Foster, 1968

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation)

Last report date: 1999-05-04

Site name(s): Ruth Creek

Site type: Prospect

ARDF no.: LG012

Latitude: 65.51 **Quadrangle:** LG C-4

Longitude: 148.532

Location description and accuracy:

The Ruth Creek prospect is on a spur west of Ruth Creek; it extends from an elevation of 1,400 feet south to the top of the spur on the northwest side of Money Knob. It is about 0.5 mile northwest of the center of section 23, T. 8 N., R. 5 W.

Commodities:

Main: Au

Other: Ag, Cr

Ore minerals: Arsenopyrite, chromite, gold, pyrite

Gangue minerals:

Geologic description:

This small old prospect is now part of the large International Tower Hills, Livengood prospect (LD202) that has been intensely studied and drilled since 2006. The Ruth Creek prospect has largely now lost its identity and the data in this record has been integrated into the Livengood record. This record has not been updated since the exploration stated on the Livengood prospect and the pre-Livengood information here is retained in its original form for historical reference.

Gold is found in numerous, nearly vertical quartz veinlets striking S. 20-60 E.; they contain pyrite and arsenopyrite (Mertie, 1918). Some of these veins contain up to 0.58 ounces of gold per ton (Mertie, 1918). The quartz veinlets are cut by calcite veins carrying some gold and sulfides (Mertie, 1918). Contiguous mineralized zones are up to 36 inches wide in altered dolomite-calcite-quartz-sulfide rock (Foster and Chapman, 1967). Small pits expose chromite in serpentinite, and a stibnite vein was uncovered in a placer cut (Joesting, 1942 [ATDM Pamph. 1]; Mertie, 1918).

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Gold-quartz veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Small excavations exposed chromite in serpentinite and a stibnite vein was uncovered in a placer cut (Joesting, 1942, ATDM Pamph. 1; Mertie, 1918).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1972, Metallic mineral resources map of the Livengood quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-413, 2 sheets, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Livengood quadrangle, Alaska: U.S. Geological Survey Open-File Report 76-819, 241 p.

Foster, R.L., 1968, Descriptions of the Ruth Creek, Lillian Creek, Griffin, Old Smoky, Sunshine No. 2, and Olive Creek lode prospects, Livengood district, Alaska: U.S. Geological Survey Open-File Report 68-104, 21 p.

Foster, R.L., and Chapman, R.M., 1967, Locations and descriptions of lode prospects in the Livengood area, east-central Alaska: U.S. Geological Survey Open-File Report 275, 5 p.

Joesting, H.R., 1942, Strategic mineral occurences in interior Alaska: Alaska Territorial Department of Mines Pamphlet 1, 46 p.

Joesting, H.R., 1943, Strategic mineral occurrences in interior Alaska, supplement to pamphlet no. 1: Alaska Territorial Department of Mines Pamphlet 2, 26 p.

Mertie, J.B., Jr., 1918, Lode mining in the Fairbanks district, Alaska: U.S. Geological Survey Bulletin 662-H, p. 403-424.

Overbeck, R M., 1920, Placer mining in the Tolovana district: U.S. Geological Survey Bulletin 712-F, p. 177-184.

Primary Reference: Mertie, 1918

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation)

Last report date: 1999-05-04

Site name(s): Griffin

Site type: Prospect

ARDF no.: LG013

Latitude: 65.508 **Quadrangle:** LG C-4

Longitude: 148.533

Location description and accuracy:

The Griffin prospect is about 1/2 mile northwest of Money Knob in the NW1/4 section 23, T. 8 N., R. 5 W., It is about 1 mile south of Livengood, near the trail marked on the southeast corner of the Livengood (C-4) quadrangle.

Commodities:

Main: Au

Other: Cr, Ni

Ore minerals: Chromite, gold, pentlandite?, pyrite

Gangue minerals:

Geologic description:

This small old prospect is now part of the large International Tower Hills, Livengood prospect (LD202) that has been intensely studied and drilled since 2006. The Griffin prospect has largely now lost its identity and the data in this record has been integrated into the Livengood record. This record has not been updated since the exploration stated on the Livengood prospect and the pre-Livengood information here is retained in its original form for historical reference.

The Griffin prospect consists of a massive, sulfide-bearing, green-stained silica-carbonate-talc rock veined by quartz ; samples contain as much as 3.9 ppm Au, 1,000 ppm Ni, and 1,000 ppm Cr (Foster, 1968, p. 2, 10-11). A fire assay of one sample showed 5.6 ppm Au (Foster, 1968, p. 10-11). The nature of the contact between pyritiferous metasedimentary country rock and silica-carbonate-talc rock is not known (Foster, 1968.) Small pits expose chromite in serpentinite, and a stibnite vein was uncovered in a placer cut (Joesting, 1942 [ATDM Pamph. 1]; Mertie, 1918).

Alteration:

Deposit stained green by weathering of disseminated sulfides.

Age of mineralization:

Generic deposit model:

Deposit model:

Quartz veins associated with silica-carbonate-talc rock.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

In 1955, the workings on the property included a shaft filled with water, an adit and several pits and trenches (Saunders, 1955).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1972, Metallic mineral resources map of the Livengood quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-413, 2 sheets, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Livengood quadrangle, Alaska: U.S. Geological Survey Open-File Report 76-819, 241 p.

Foster, R.L., 1968, Descriptions of the Ruth Creek, Lillian Creek, Griffin, Old Smoky, Sunshine No. 2, and Olive Creek lode prospects, Livengood district, Alaska: U.S. Geological Survey Open-File Report 68-104, 21 p.

Foster, R.L., and Chapman, R.M., 1967, Locations and descriptions of lode prospects in the Livengood area, east-central Alaska: U.S. Geological Survey Open-File Report 275, 5 p.

Joesting, H.R., 1942, Strategic mineral occurences in interior Alaska: Alaska Territorial Department of Mines Pamphlet 1, 46 p.

Joesting, H.R., 1943, Strategic mineral occurrences in interior Alaska, supplement to pamphlet no. 1: Alaska Territorial Department of Mines Pamphlet 2, 26 p.

Mertie, J.B., Jr., 1918, Lode mining in the Fairbanks district, Alaska: U.S. Geological Survey Bulletin 662-H, p. 403-424.

Overbeck, R M., 1920, Placer mining in the Tolovana district: U.S. Geological Survey Bulletin 712-F, p. 177-184.

Saunders, R.H., 1955, Report on the Griffin nickel prospect, Livengood quadrangle: Alaska Territorial Department of Mines Prospect Evaluation 49-13, 8 p.

Primary Reference: Foster, 1968

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation)

Last report date: 1999-05-04

Site name(s): Old Smoky

Site type: Prospect

ARDF no.: LG014

Latitude: 65.51 **Quadrangle:** LG C-4

Longitude: 148.524

Location description and accuracy:

The Old Smoky prospect is 1/4 mile north of Money Knob, just north of the old town of Livengood, about 0.4 mile north of the center of section 23, T. 8 N., R. 5 W.

Commodities:

Main: Au

Other: Sb

Ore minerals: Gold, stibnite

Gangue minerals:

Geologic description:

This small old prospect is now part of the large International Tower Hills, Livengood prospect (LD202) that has been intensely studied and drilled since 2006. The Old Smoky prospect has largely now lost its identity and the data in this record has been integrated into the Livengood record. This Smoky Hill record has not been updated since the exploration stated on the Livengood prospect and the pre-Livengood information here is retained in its original form for historical reference.

Trenching near the head of Olive Creek has exposed narrow, northwest-trending auriferous arsenopyrite-quartz veins in ferruginous quartzite near the intersection of an altered, porphyritic, biotite-monzonite dike, and a potassium feldspar-porphyry dike (Foster, 1968). Mineralization at the Old Smoky prospect is in Devonian sedimentary rocks composed of shale, argillite, fine-grained sandstone, and pebbly conglomerate (Allegro, 1984, p. 3). Narrow zones of thermal metamorphism occur along sheared contacts between these sedimentary rocks and hypabyssal igneous intrusive rocks (Allegro, 1984, p. 3). Similar felsic intrusive rocks throughout the Livengood Quadrangle have been potassium-argon dated at 58.0 to 88.8 m.y. (Turner and others, 1975).

Most of the intrusive rocks and some of the sedimentary host rocks have experienced variable degrees of metasomatic hydrothermal alteration followed by lower temperature supergene alteration (Allegro, 1984, p. 4). Allegro (1984) described four types of hydrothermal alteration: 1) silicification, as partial to complete replacement of the host rock by a dense network of quartz veinlets generally localized along contacts between the intrusive and sedimentary rocks; 2) sericitization, as fine- to medium-grained white mica in selvages along quartz veins, as anastomosing sericite-opaque mineral veinlets, and as patchy to massive sericitic replacement of feldspar, ferromagnesium minerals and quartz; 3) deposition of trigonal nets of needle-like rutile often associated with secondary quartz and minor feldspar; and 4) epidote +/- sericite as a replacement of calcic plagioclase and ferromagnesian minerals resulting in massive aggregates, pseudomorphs, veins, and vug fillings of epidote commonly associated with sericite, opaque minerals, and quartz.

Allegro's (1984) investigation and sample data reveal that the mineralization in the southern portion of the cut is localized along the contact zones between the biotite monzonite and the surrounding sedimentary rocks, and along a contact between biotite monzonite and feldspar porphyry. Channel and chip samples of arsenopyrite-stibnite quartz veins from these zones contained 1.0 to 29.8 ppm gold. Selected samples from

the prospect contain 3 to 13 ppm gold as determined by atomic absorption, and 1.6 to 7.0 ppm gold as determined by fire assay-atomic absorption (Foster, 1968, p. 2).

Adjacent to the sheared contact zone, the intrusive rocks are either highly silicified with abundant rutile and some epidote, sericite, arsenopyrite, and monor stibnite, or contain epidote with sericite, rutilated quartz and arsenopyrite (Allegro, 1984, p. 6). Other rocks from the contact zone show intense supergene effects such as clay alteration, covellite and iron-oxides. In some cases these zones contain gold. Green scorodite is present throughout the mineralized areas.

In the northern section of the prospect, the most abundant mineralization is located along the contact area between the feldspar porphyry and a roof pendant of sandstone and shale (Allegro, 1984). A massive 1-meter-wide stibnite lens surrounded by a bleached sericite zone occurs along the northern contact of the roof pendant. Channel samples along this contact zone range from 0.5 to 4.3 ppm gold (Allegro, 1984, p. 6). Some gold is also associated with saprolitic zones in all the intrusive phases but these zones are not limited to shear zones or contacts (Allegro, 1984, p. 6).

Alteration:

Most of the intrusive rocks and some of the sedimentary host rocks have experienced variable degrees of metasomatic hydrothermal alteration followed by lower temperature supergene alteration (Allegro, 1984, p. 4). Allegro (1984) described four types of hydrothermal alteration: 1) silicification, as partial to complete replacement of the host rock by a dense network of quartz veinlets generally localized along contacts between the intrusive and sedimentary rocks; 2) sericitization, as fine- to medium-grained white mica in selvages along quartz veins, as anastomosing sericite-opaque mineral veinlets, and as patchy to massive sericitic replacement of feldspar, ferromagnesium minerals and quartz; 3) deposition of trigonal nets of needle-like rutile often associated with secondary quartz and minor feldspar; and 4) epidote ± sericite as a replacement of calcic plagioclase and ferromagnesian minerals resulting in massive aggregates, pseudomorphs, veins, and vug fillings of epidote commonly associated with sericite, opaque minerals, and quartz.

Age of mineralization:

Felsic intrusive rocks throughout the Livengood Quadrangle, similar to those at the mineralized contact zone of the Old Smoky prospect, have been potassium-argon dated at 58.0 to 88.8 m.y. (Turner and others, 1975).

Generic deposit model:

Deposit model:

Gold-bearing shear zone at contact of hypabyssal intrusions into sediments.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Some trenching and prospect pits that have been channel and chip sampled.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Allegro, G.L., 1984, Geology of the Old Smokey prospect, Livengood C-4 quadrangle: Alaska Division of Geological and Geophysical Surveys Report of Investigations 84-1, 10 p., 1 sheet, scale 1:120.

Cobb, E.H., 1972, Metallic mineral resources map of the Livengood quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-413, 2 sheets, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Livengood quadrangle, Alaska: U.S. Geological Survey Open-File Report 76-819, 241 p.

Foster, R.L., 1968, Descriptions of the Ruth Creek, Lillian Creek, Griffin, Old Smoky, Sunshine No. 2, and Olive Creek lode prospects, Livengood district, Alaska: U.S. Geological Survey Open-File Report 68-104, 21 p.

Primary Reference: Allegro, 1984

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation)

Last report date: 1999-05-04

Site name(s): Unnamed (near Winter Creek)

Site type:

ARDF no.: LG032

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

This site as originally prepared was based on a single vague reference that actually referred to the Shorty Creek prospect (LG203) many miles away. This record is only preserved for accounting purposes.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Goodwin; Treasure Creek

Site type: Mine

ARDF no.: LG038

Latitude: 65.001 **Quadrangle:** LG A-2

Longitude: 147.729

Location description and accuracy:

Cobb (1972, MF-413), loc. 10; NW1/4SW1/4 sec. 15, T. 2 N., R. 1 W., of the Fairbanks Meridian. The coordinates given are for a shaft along Independence Gulch, about a mile east of Scrafford mine. Accuracy is within 1,500 feet.

Commodities:

Main: Sb

Other:

Ore minerals: Stibnite

Gangue minerals:

Geologic description:

Hill (1933, p. 157) describes this antimony mine as consisting of lenses of massive stibnite in crushed schist with some pyrite. The ore is in a clay-rich gouge in brecciated quartz and schist. The ore zone strikes N 80 E and dips 45 S. This is the eastern extension of the Scrafford mine stibnite zone. A sample of stibnite ore from the Goodwin mine dump contained 32.95% Sb (Killeen and Mertie, 1951, p. 12). Workings consisted of an 85-foot inclined shaft and a 60-foot tunnel (Hill, 1933, p. 157).

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Quartz-stibnite vein (Cox and Singer, 1986; model 27d).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

27d

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

Workings consisted of an 85-foot inclined shaft and a 60-foot tunnel (Hill, 1933, p. 157).

In 2016, the Treasure Creek Partnership consolidated three, separately owned properties, including numerous prospects and occurrences (LG038; LG039; FB074; FB075; FB076; FB077; FB078; FB079; FB080; FB081) in the Treasure and Any Creek watersheds that potentially host plutonic-related, lode-gold mineralization contained in shear zones north of Fairbanks. Exploration activity in 2016 included conducting field work and reviewing and updating 1990s-era exploration information (Athey and Werdon, 2017).

Production notes:

Hill (1933, p. 157) reported that ore was mined and shipped in 1916, but the amount is not known. Mulligan (1974, p. 12) reported development and an unknown amount of production in 1968-69.

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Chapman, R.M., and Foster, R.L., 1969, Lode mines and prospects in the Fairbanks district, Alaska: U.S. Geological Survey Professional Paper 625-D, 25 p., 1 plate.

Cobb, E.H., 1972, Metallic mineral resources map of the Livengood quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-413, 2 sheets, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Livengood quadrangle, Alaska: U.S. Geological Survey Open-File Report 76-819, 241 p.

Hill, J.M., 1933, Lode deposits of the Fairbanks district, Alaska: U.S. Geological Survey Bulletin 849-B, p. 29-163.

Joesting, H.R., 1943, Strategic mineral occurrences in interior Alaska, supplement to pamphlet no. 1: Alaska Territorial Department of Mines Pamphlet 2, 26 p.

Killeen, P.L., and Mertie, J.B., 1951, Antimony ore in the Fairbanks District, Alaska: U.S. Geological Survey Open-File Report 51-46, 43 p.

Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Smith, S.S., 1917, The mining industry in the territory of Alaska during the calendar year 1916: U.S. Bureau of Mines Bulletin 153, 89 p.

Primary Reference: Hill, 1933

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Treasure Creek

Site type: Occurrence

ARDF no.: LG039

Latitude: 65.007 **Quadrangle:** LG A-2

Longitude: 147.763

Location description and accuracy:

Cobb (1972, MF-413), loc 8; NE1/4NW1/4 sec. 16, T. 2 N., R. 1 W., of the Fairbanks Meridian. This gold occurence is just east of the confluence of Treasure Creek and Eagle Creek. Accuracy is within 2,500 feet.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

A gold lode was reported near the mouth of Eagle Creek, a tributary of Treasure Creek (Smith, 1913; B 525, p. 196).

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Gold-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

In 2016, the Treasure Creek Partnership consolidated three, separately owned properties, including numerous prospects and occurrences (LG038; LG039; FB074; FB075; FB076; FB077; FB078; FB079; FB080; FB081) in the Treasure and Any Creek watersheds that potentially host plutonic-related, lode-gold mineralization contained in shear zones north of Fairbanks. Exploration activity in 2016 included

conducting field work and reviewing and updating 1990s-era exploration information (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Cobb, E.H., 1972, Metallic mineral resources map of the Livengood quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-413, 2 sheets, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Livengood quadrangle, Alaska: U.S. Geological Survey Open-File Report 76-819, 241 p.

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Primary Reference: Smith, 1913 (B 525)

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): True North

Site type: Mine

ARDF no.: LG055

Latitude: 65.0459 **Quadrangle:** LG A-2

Longitude: 147.562

Location description and accuracy:

The True North Mine is about 2 miles northwest of Pedro Dome. The coordinates are near the center of several open pits which are spread over an area about 2 kilometers in diameter. The mine is near the center of section 33, T. 3 N., R. 1 E of the Fairbanks Meridian. The old Hindenburg/Markovich Mine (LG054) became part of the True North Mine.

Commodities:

Main: Au, Sb

Other:

Ore minerals: Gold, stibnite

Gangue minerals: Carbonates, quartz

Geologic description:

The True North gold mine is a structurally controlled, disseminated gold deposit on the northwest flank of Pedro Dome (Masterman, 1998). Gold was recognized on the property as early as 1913, but early production was limited to stibnite ore from the Hindenburg/Markovich Mine (ARDF site LG054), which became part of the True North Mine.

The mineralization at True North consists of thin quartz-carbonate veins, often with stibnite, in a heterogeneous, high-grade metamorphic package of calcareous eclogite, carbonaceous schist and quartzite (Swainbank and others, 1998). Gold occurs in a northeast-trending zone, 2,500 feet wide and 5.000 feet long, west of the northeast-trending Eldorado Fault. Gold-bearing ore bodies are typically 20 to 60 feet thick in gently dipping shear zones and along faulted lithologic contacts (Masterman, 1998). Alteration is characterized by quartz, manganese-oxides, ankerite, mariposite, sericite, and carbon. The gold grade averages 0.05 to 0.10 ounce of gold per ton (Masterman, 1998). The mineralization is probably 90 Ma, the same age of many deposits in the vicinity.

Exploration activities at the True North from 1991 to 1997 consisted of 9,832 top-of-bedrock soil samples, 15,621 feet of trenching, 40,133 feet of core drilling, and 153,914 feet of reverse-circulation drilling (Masterman, 1998). Soils were auger sampled in 1998 (Szumigala and Swainbank, 1999, p. 10).

In 1999, Kinross Gold Corporation acquired the True North property (Quandt and others, 2008). By 2008, the prospect consisted of a large block of State of Alaska claims that Kinross Gold Corporation had leased from several private individuals. Open-pit mining began at True North in April, 2001, and the mine eventually consisted of several large open pits spread over an area about 2 kilometers in diameter; the ore was trucked to the Fort Knox mill (FB115). In 2004, mining was suspended. From 2001 to 2004, the True North Mine had shipped 11,026,722 tons of ore to the mill. By 2009, permits had been submitted to close the mine, all the mine buildings had been removed, and revegetation of the mine workings had begun.

Quandt and others (2008) estimated that the True North deposit had an indicated resource of 3.464 million tons with a grade of 1.49 grams of gold per tonne. This estimate was done to modern industry standards. These figures were published after the mine had ceased production and was in the process of being closed.

Alteration:

Alteration is characterized by quartz, manganese-oxides, ankerite, mariposite, sericite, and carbon.

Age of mineralization:

About 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Disseminated carbonate-replacement gold mineralization associated with intrusion- and schist-hosted crushed veins and low-angle shears.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

The following history of exploration is based on an abstract presented by Steve Masterman, Newmont Exploration Limited, at the 1998 Alaska Miners Association Meeting. In 1990, Dick Swainbank brought the property to the attention of AMAX Gold, Inc. (AGI). AGI acquired the claims and conducted soil sampling, trenching, and 6,332 feet of reverse-circulation (RC) drilling. In 1994, after drilling 14 more RC holes under an exploration agreement, LaTeko acquired the property from AGI. During the summer of 1994, LaTeko expanded the soil grid, excavated additional trenches, drilled 52,000 feet of RC and 2,040 feet of HQ core. In 1995, Newmont Exploration Ltd. began exploration on the property,after entering into a joint venture with LaTeko. Exploration activities on the True North property from 1991 to 1997 consisted of 9,832 top-of-bedrock soil samples, 15,621 feet of trenching, 40,133 feet of core drilling, and 153,914 feet of RC drilling (Masterman, 1998). In 1998, most exploration work consisted of soil sampling by auger (Szumigala and Swainbank, 1999, p. 10).

In 1999, Kinross Gold Corporation acquired the True North property (Quandt and others, 2008). By 2008, it consisted of a large block of State of Alaska claims that Kinross Gold Corporation had leased from several private individuals. Mining began at True North in April, 2001 and the ore was trucked to the Fort Knox mill (FB115). Mining was suspended in 2004.

In 2009, final reclamation at True North began (Szumigala and others, 2010).

Production notes:

From 2001 to 2004, the last year of production, the True North Mine had shipped 11,026,772 tons of ore to the mill.

In 2009, Fairbanks Gold Mining, Inc., the operator of True North Mine, made the decision to forego further mining and exploration at the site, and began final reclamation (Fairbanks Gold Mining, Inc, 2012, and Alaska Department of Natural Resources, 2014).

Reserves:

Quandt and others (2008) estimated that the True North deposit had an indicated resource of 3.464 million tons with a grade of 1.49 grams of gold per tonne. This estimate was done to modern industry standards. These figures were published after the mine had ceased production and was in the process of being closed.

Additional comments:

In 2009, Fairbanks Gold Mining, Inc., the operator of True North Mine, made the decision to forego further mining and exploration at the site, and began final reclamation. In 2010, 149 acres of the site were graded, growth media was placed on 52 acres, and 270 acres were scarified, seeded, and fertilized. By 2011, the major earthwork was completed leaving a small area of materials to be salvaged. As of summer 2014 the site was essentially fully revegetated and will be monitored for several more years to assure long-term

stability (Fairbanks Gold Mining, Inc, 2012, and Alaska Department of Natural Resources, 2014).

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Primary Reference: Quant, Ekstrom, and Triebel, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-09-01

Site name(s): Fox Creek

Site type: Mine

ARDF no.: LG061

Latitude: 64.9999 **Quadrangle:** LG A-2

Longitude: 147.61716

Location description and accuracy:

At least two miles of Fox Creek has been mined; part is in the Fairbanks quadrangle, part is in the Livengood quadrangle. Most of the mining or at least the mining since WWII, has been in the Livengood quadrangle. But much of the information of record about placer mining on Fox creek cannot be assigned to one of the quadrangles, For convenience, all of the information on Fox Creek has been consolidated into this record. This site is about 3.0 miles north of Fox in section 18, T. 2 N., R. 1 E. The location is accurate.

Commodities:

Main: Au

Other: W

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

Placer gold was being mined from Fox Creek by 1908 (Prindle, 1908; Prindle and Katz, 1913). There is little record of the early mining but it is likely that prior to WWI, much if not all of Fox Creek was prospected and staked and mining took place at various places along it. In 1914, Mr. Ardvino located the Vino Bench and Vino claims near the head of Fox Creek and mined there until 1935 (Cornelius and Madonna, 1988). In 1985, Tillicum Mining acquired the property and in 1987 mined at the head of Fox Creek on what they considered an eluvial or residual placer (Cornelius and Madonna, 1988). Much of the gold was angular and intergrown with rusty quartz. In subsequent years, the upper mile or more of upper Fox Creek was mined and reclaimed (Janet Schaefer, field observation, 1999). Szumigala and others (2011) report that Tillicum Mining and three other operations had produced gold from open pit mines on Fox Creek in 2010. Satellite imagery available on the internet suggests that a bare area on lower Fox Creek in about the middle of section 30, T. 2 N., R. 1 E. (in the Fairbanks quadrangle) may be one of those mines.

Early studies report that the depth to bedrock on Fox Creek was 10 to 19 feet, and that granite is exposed near the head of the creek (Prindle and Katz, 1909; Prindle and Katz, 1913). Bedrock in the Fox Creek drainage is mainly quartz-muscovite schist, quartzite, and chlorite-quartz schist, which is intruded by Cretaceous granite, tonalite, and quartz diorite at the head of the creek (Newberry and others, 1996). Placer concentrates near the head of the creek contained an estimated 90 percent scheelite (Joesting, 1943; Byers, 1957.

About 1,500 ounces of gold was produced from Fox Creek from 1905 to 1910 (Prindle and Katz, 1913). Production figures for more recent mining are not available in the public record.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer gold deposit (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Undetermined

Site Status: Inactive

Workings/exploration:

Placer gold was being mined from Fox Creek by 1908 (Prindle, 1908; Prindle and Katz, 1913). There is little record of the early mining but it is likely that prior to WWI, much if not all of Fox Creek was prospected and staked and mining had taken place at various places along it. In 1914, Mr. Ardvino located the Vino Bench and Vino claims near the head of Fox Creek and mined there until 1935 (Cornelius and Madonna. 1988). In 1985, Tillicum Mining acquired the property and in 1987 mined at the head of Fox Creek on what they considered an eluvial or residual placer (Cornelius and Madonna, 1988). In subsequent years, the upper mile or more of upper Fox Creek was mined and reclaimed (Janet Schaefer, field observation, 1999). Szumigala and others (2011) report that Tillicum Mining and three other operations had produced gold from open pit mines on Fox Creek in 2010. Satellite imagery available on the internet suggests that a bare area on lower Fox Creek in about the middle of section 30, T. 2 N., R. 1 E. (in the Fairbanks quadrangle) may be one of those mines.

Production notes:

About 1,500 ounces of gold was produced from Fox Creek from 1905 to 1910 (Prindle and Katz, 1913). Production figures for more recent mining are not publicly available.

Reserves:

None.

Additional comments:

References:

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Primary Reference: This record

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Newsboy

Site type: Mine

ARDF no.: LG100

Latitude: 65.0561 **Quadrangle:** LG A-1

Longitude: 147.4737

Location description and accuracy:

The Newsboy Mine is just south of the saddle between Cleary Creek and Last Chance Creek. It is at an elevation of about 1,750 feet, approximately two miles north-northeast of Pedro Dome in the SE1/4 section 26, T. 3 N., R. 1 E., of the Fairbanks Meridian. It is located with within the Golden Summit Project area. The location is accurate within 500 feet.

Commodities:

Main: Ag, Au

Other: Cu, Pb, Sb, Zn

Ore minerals: Arsenopyrite, chalcopyrite, gold, pyrite, sphalerite, stibnite

Gangue minerals: Quartz

Geologic description:

The Newsboy mine was one of the major producers in the Cleary Hill area. Production began in 1911 and continued intermittently until World War II. The Newsboy mine was first staked June 25, 1909 (Times Publishing Company, 1912). The Newsboy shear zone was traced for several hundred feet on the surface and additional claims were staked. In October, 1911, a 5-stamp Joshua Hendy Mill was erected (Brooks, 1912; Smith, 1913a and 1913b). The mill operated for only a few months due to lack of water. Brooks (1912) indicated that by mid-1911 the Newsboy Mine shaft had reached the 200-foot level and working drifts had been driven on the 60-foot and 115-foot levels. By the end of 1911 the bottom of the shaft was at the 315-foot level and drifting was being conducted on a 4-foot-wide shear zone on the 215-foot and 315-foot levels.

By May 12, 1912, the mill had been moved to placer claim #11 above Discovery on Cleary Creek, about 4,000 feet northeast of and 600 feet lower than the Newsboy Mine. Water for the mill was taken from a 100-foot-deep 6-inch well, located near the mill (Smith, 1913a).

By 1913, the Newsboy Mine was being developed on the 60-, 115-, 168-, 215- and 315-foot levels. The 115-foot level extended 140 feet southwest and 100 feet northeast of the shaft and much of the ore between this level and the 168-foot level had been mined (Chapin, 1914). A few feet east of the shaft on the 115-foot level the shear zone was mined over a 14 foot width. The 315-foot level was accessed by 250 feet of drifts, but this level of the mine was flooded in 1913 (Chapin, 1914).

Surface trenching was conducted along the shear zone in 1923 but the mine was idle (Stewart, 1923). During 1931, renovation was completed on the mine and the old mill on upper Cleary Creek (Pilgrim, 1932; Smith, 1933a and 1933b), and the shaft was opened to the 160-foot level (Hill, 1933). In October, the nearly retrofitted mill burned to the ground. Development work continued in the mine and de-watering was begun in the lower mine levels (Pilgrim, 1932; Stewart, 1933; Hill, 1933).

In 1932, a diesel-powered 180-cubic-foot-capacity Sullivan compressor was installed at the mine. One-hundred and fifty tons of ore from above the 215-foot level was shipped seven miles to the Tom Gilmore Mill on Fairbanks Creek. The 215-foot level was reopened in 1932 and minor exploratory work was conducted in 1933 (Smith, 1934). The Newsboy mill was rebuilt in 1933. New grinding and flotation equipment was added to the mill in 1935 and mining resumed underground (Smith, 1938). In 1938, the

mine was de-watered at the 215-foot level (Reed, 1939). A 1200-foot-long surface trench was emplaced and drifting on the 165-foot level took place in 1938; no ore was produced in 1938 (Stewart, 1939). In December, 1940, the prospect was idle (Stewart, 1941).

In 1995, Placer Dome drilled a 1,113-foot core hole that intersected a 20-foot zone that contained 0.066 ounces of gold per ton (Freeman, 2008). The bottom of the hole contained lead-zinc mineralization associated with a stratabound(?) massive sulfide lenses in black chloritic schist. In 1998, Freegold Ventures Ltd., drilled a core hole about 900 feet west of the Newsboy shaft; it cut a 10-foot section that contained 0.096 ounce gold per ton and a 10-foot section that contained 0.065 ounce of gold per ton. Freeman suggests that the Newsboy vein and other nearby prospects are part of a northeast-trending 'vein swarm'. As of 2008, the Newsboy Mine was part of the Golden Summit project of Freegold Ventures Ltd.

The mine is in dark green, massive to tightly foliated chlorite-actinolite schist of basaltic origin. The country rocks trend N60-80E and dip 0 to 30NW (Robinson and others, 1990). The mine dumps indicate much of the mining was in quartz-biotite-mica schist and quartz-sericite schist with abundant white to granular, quartz stockwork and pervasive flood silica (Freeman, 1992). The deposit is on the Newsboy shear zone which features several generations of mainly strike-slip faulting with some dip-slip displacement. However, the dip-slip displacement is difficult to unravel due to the intensity and complexity of the movements (Freeman, 1992). The Newsboy shear zone is on the northwest limb of the Cleary antiform and is cut by a series of poorly understood, east-trending faults which predominantly dip 57-80N. These structures truncate the mineralization and despite several hundred feet of drilling and exploratory drifting, the continuation of the shear zone could not be located (Freeman, 1992).

Mineralization at the Newsboy Mine consists primarily of native gold plus arsenopyrite, some of it auriferous, with lesser amounts of stibnite, chalcopyrite, sphalerite and ubiquitous pyrite (Fairbanks Exploration Inc., unpublished report, 1986). The ore is similar to that at the nearby Tolovana Mine (LG110), about one mile east and 650 feet lower in elevation than the Newsboy shaft. Shear zones and stockworks with abundant white quartz are from 2 to 14 feet wide; they average about 4 to 5 feet wide in the upper 200 feet of workings (Hill, 1933; Stewart, 1931). The mineralization is probably mid-Cretaceous based on similarities to other deposits in the area (McCoy and others, 1997).

Samples collected in 1986 from the Newsboy Mine dumps contain high arsenic and gold coupled with erratic but generally low antimony and silver (Fairbanks Exploration Inc., unpublished report, 1986). Samples contain from 260 parts per billion (ppb) gold to 4.180 ounces of gold per ton. Sulfide-rich samples from mill concentrates and tailings near the old Newsboy mill contain much gold with abundant arsenopyrite and pyrite. Sulfide-rich mill concentrates contained from 1.433 to 3.377 ounces of gold per ton. The mill tailings contained 0.087 to 0.163 ounce of gold per ton (Fairbanks Exploration Inc., unpublished report, 1986). A significant amount of gold (810 to 5,700 ppb) was detected in quartz-sericite schist derived from rhyolite tuff and exhalite (Fairbanks Exploration Inc., unpublished report, 1986).

Alteration:

Quartz, sericite, and ankerite (Freeman, 1992).

Age of mineralization:

Probably mid-Cretaceous based on similarities with other deposits in the area (McCoy and others, 1997).

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The Newsboy mine was first staked June 25, 1909 (Times Publishing Company, 1912). The Newsboy shear zone was traced for several hundred feet on the surface and additional claims were staked. In October, 1911, a 5-stamp Joshua Hendy Mill was erected (Brooks, 1912; Smith, 1913a and 1913b). The mill operated for only a few months due to lack of water. Brooks (1912) indicated that by mid-1911 the Newsboy Mine shaft had reached the 200-foot level and working drifts had been driven on the 60-foot and 115-foot levels. By the end of 1911 the bottom of the shaft was at the 315-foot level and drifting was being conducted on a 4-foot-wide shear zone on the 215-foot and 315-foot levels.

By May 12, 1912, the mill had been moved to placer claim #11 above Discovery on Cleary Creek, about 4,000 feet northeast of and 600 feet lower than the Newsboy Mine. Water for the mill was taken from a 100-foot-deep 6-inch well, located near the mill (Smith, 1913a and 1913b).

By 1913, the Newsboy Mine was being developed on the 60-, 115-, 168-, 215- and 315-foot levels. The 115-foot level extended 140 feet southwest and 100 feet northeast of the shaft and much of the ore between this level and the 168-foot level had been mined (Chapin, 1914). A few feet east of the shaft on the 115-foot level the shear zone was mined over a 14 foot width. The 315-foot level was accessed by 250 feet of drifts, but this level of the mine was flooded in 1913 (Chapin, 1914).

Surface trenching was conducted along the shear zone in 1923 but the mine was idle (Stewart, 1923). During 1931, renovation was completed on the mine and the old mill on upper Cleary Creek (Pilgrim, 1932; Smith, 1933a and 1933b), and the shaft was opened to the 160-foot level (Hill, 1933). In October, the nearly retrofitted mill burned to the ground. Development work continued in the mine and de-watering was begun in the lower mine levels (Pilgrim, 1932; Stewart, 1933; Hill, 1933).

In 1932, a diesel-powered 180-cubic-foot-capacity Sullivan compressor was installed at the mine. One-hundred and fifty tons of ore from above the 215-foot level was shipped seven miles to the Tom Gilmore Mill on Fairbanks Creek. The 215-foot level was reopened in 1932 and minor exploratory work was conducted in 1933 (Smith, 1934). The Newsboy mill was rebuilt in 1933. New grinding and flotation equipment was added to the mill in 1935 and mining resumed underground (Smith, 1938). In 1938, the mine was de-watered at the 215-foot level (Reed, 1939). A 1200-foot-long surface trench was emplaced and drifting on the 165-foot level took place in 1938; no ore was produced in 1938 (Stewart, 1939). In December, 1940, the prospect was idle (Stewart, 1941).

In 1995, Placer Dome drilled a 1,113-foot core hole (Freeman, 2008). In 1998, Freegold Ventures Ltd., drilled a core hole about 900 feet west of the Newsboy shaft;. As of 2008, the Newsboy Mine is part of the Golden Summit project of Freegold Ventures Ltd.

In 2012, Freegold collected 218 soil samples (Abrams and Giroux, 2013).

Production notes:

In May of 1911, the Newsboy Mine produced a 66 ton ore shipment which yielded $5008.20 in gold, or about 244 ounces of gold. An additional 7.5 tons of ore was shipped in 1911 to the Garden Island Mill in Fairbanks and was reported to contain $104 gold per ton (5 ounces of gold per ton) in free milling gold (Brooks, 1913; Smith, 1913). Drifting and mining continued at the Newsboy Mine in 1913 although no production figures for the year are available (Chapin, 1914). Despite production of nearly $150,000 worth of gold (7250 troy ounces), the mine was shut down in 1915. In 1932, 150 tons of ore from above the 215-foot level was shipped 7 miles to the Tom Gilmore Mill on Fairbanks Creek. The total estimated production from 175 feet to the surface is 35,937 tons of ore and 8,125 tons of waste from which 35,937 troy ounces of gold were recovered (Freeman, 1992).

Reserves:

The following discussion of reserves is taken from Freeman (1992) and is based on analysis of old mine maps. Ore reserves blocked out between the 350-foot and 175-foot levels are estimated at 21,875 tons of ore and 10,937 tons of waste rock, with a resource of 21,875 ounces of gold in place. The estimated reserves along the Newsboy shear zone system are considerably larger. Based on the past production figures, an estimated 75 percent of the reserves will consist of 4 feet of shear zone in a 6 foot heading; the remaining 25 percent of the reserves are figured on a 14-feet -wide shear zone on 14 feet of heading. The reserves are based on free gold at a grade of 0.5 ounce of gold per ton. Sulfide-encapsulated fine gold is expected to contribute a significant amount to the total gold; however, since reliable figures on the average amount of sulfide-encapsulated gold are not available, no value is given to this form of gold in the geologic reserves.

The adjusted total geologic reserves takes into account the 44,062 tons of ore and waste estimated to have been mined from the Newsboy shaft. Based on the above assumptions, the total geologic reserve of the Newsboy shear zone system to the 1200 level is 813,938 tons at a grade of 0.5 ounce of gold per ton. It should be noted that the reserves are hypothetical reserves and as such no dilution or recovery factors have been included in the calculations.

Additional comments:

References:

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Stewart, B.D., 1931, Report on cooperation between Territory of Alaska and the United States in making mining investigations: Alaska Territorial Department of Mines, Annual Report 1931.

Times Publishing Company, 1912, Tanana Magazine, Quartz Edition: Fairbanks, Alaska, Times Publishing Company, 76 p.

Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-23

Site name(s): Stibnite

Site type: Prospect

ARDF no.: LG105

Latitude: 65.0625 **Quadrangle:** LG A-1

Longitude: 147.4574

Location description and accuracy:

The Stibnite prospect is located just above the junction of Willow Creek and Cleary Creek in the NE1/4NW1/4 sec. 25, T. 3 N., R. 1 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, Pb, Sb

Other: Au

Ore minerals: Argentiferous galena, pyrite, stibnite

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG207).

By 1916, the Stibnite prospect was being explored by the Eldorado Mining and Milling Company and it consisted of an open cut and a 40-foot shaft (Mertie, 1918). A 3- to 12-inch-thick shear zone contained 'commercial grade' lead and silver with minor gold. The principal ore minerals are argentiferous galena, stibnite and pyrite. The ore is in quartzite and is parallel to the schistosity of the country rock.

Alteration:

Not stated.

Age of mineralization:

About 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Lead, silver, antimony and gold mineralization in quartzite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

By 1916, the Stibnite prospect was being explored by the Eldorado Mining and Milling Company and it consisted of an open cut and a 40-foot shaft (Mertie, 1918).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Freeman, C.J., 2008, Executive summary report for the Golden Summit project, Fairbanks Mining District, Alaska: Unpublished Technical Report for Freegold Ventures Ltd., 112 p. (posted on www.sedar.com, March 31, 2008).

Mertie, J.B., Jr., 1918, Lode mining in the Fairbanks district, Alaska: U.S. Geological Survey Bulletin 662-H, p. 403-424.

Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Johnson; Johnson and Martin

Site type: Prospect

ARDF no.: LG106

Latitude: 65.0637 **Quadrangle:** LG A-1

Longitude: 147.4577

Location description and accuracy:

The Johnson prospect is near the mouth of Willow Creek, a headwater tributary of Cleary Creek. It is in the NW1/4NE1/4 sec. 25, T. 3 N., R. 1 E., of the Fairbanks Meridian. The location is accurate to within 1,000 feet.

Commodities:

Main: Sb

Other: W

Ore minerals: Arsenopyrite, pyrite, scheelite, stibnite

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this prospect is part of a larger mineralized system that is described as a separate ARDF site (LG207).

In 1942, a placer cut on Willow Creek exposed high-grade stibnite in several parts of a shear zone (Joesting, 1943). The stibnite is in a vertical vein with occasional quartz and other sulfides; it is 6 to 8 inches wide and was traced N40E for 75 feet (Killeen and Mertie, 1951). Nearby in 1912, a shaft was sunk 16 feet on a narrow quartz stringer carrying stibnite (Killeen and Mertie, 1951). Massive stibnite and coarse grained scheelite were identified on the dumps at the Johnson and Martin prospect (Byers, 1957). The prospect was examined by Metz and Robinson (1980) who noted that massive stibnite and scheelite were in quartz muscovite schist that strikes N60E and dips 25NW. Ore exposed in a 28-inch-thick horizon in a small pit contained abundant coarse- to fine-grained stibnite, discrete bands of coarse scheelite grains to 0.8 inch across, and minor pyrite and arsenopyrite. By volume, stibnite constitutes 95 percent of the lens, scheelite 4 percent, and arsenopyrite and pyrite about 1 each.

In 1986 the prospect was examined by Fairbanks Exploration Inc. (Fairbanks Exploration Inc., unpublished report, 1986). They reported disseminated to massive coarse-bladed stibnite with scheelite crystals disseminated in the stibnite. Gold values ranged from 420 parts per billion (ppb) to 2,450 ppb; silver values ranged from a trace to 2.21 ounces of silver per ton, antimony values were greater than 10,000 parts per million (ppm), and arsenic values ranged from 600 to 800 parts per million. Extensive trenching was conducted by the Yukon Tanana Mining Company in the vicinity of the Johnson and Martin prospect in 1988 but the results of this work are not known (Freeman, 1992).

Alteration:

Age of mineralization:

About 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Stibnite vein (Cox and Singer, 1986; model 27d).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

27d

Production Status: Undetermined

Site Status: Active

Workings/exploration:

In 1912, a shaft was sunk 16 feet on a narrow quartz stringer carrying stibnite (Killeen and Mertie, 1951). Extensive trenching was conducted by the Yukon Tanana Mining Company in the vicinity of the Johnson and Martin prospect in 1988 (Freeman, 1992).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Byers, F.M., Jr., 1957, Tungsten deposits in the Fairbanks district, Alaska: U.S. Geological Survey Bulletin 1024-I, p. 179-216.

Chapman, R.M., and Foster, R.L., 1969, Lode mines and prospects in the Fairbanks district, Alaska: U.S. Geological Survey Professional Paper 625-D, 25 p., 1 plate.

Cobb, E.H., 1972, Metallic mineral resources map of the Livengood quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-413, 2 sheets, scale 1:250,000.

Cobb, E.H., 1975, Mineral resources of Alaska, in Yount, M.E., ed., U.S. Geological Survey Alaska Program, 1975: U.S. Geological Survey Circular 722, p. 37.

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Freeman, C.J., 1992, 1991 Golden Summit project final report, volume 2: Historical summary of lode mines and prospects in the Golden Summit project area, Alaska: Avalon Development Corp., 159 p. (Report held by Freegold Recovery Inc. USA, Vancouver, British Columbia.)

Freeman, C.J., 2008, Executive summary report for the Golden Summit project, Fairbanks Mining District, Alaska: Unpublished Technical Report for Freegold Ventures Ltd., 112 p. (posted on www.sedar.com, March 31, 2008).

Joesting, H.R., 1943, Strategic mineral occurrences in interior Alaska, supplement to pamphlet no. 1: Alaska Territorial Department of Mines Pamphlet 2, 26 p.

Killeen, P.L., and Mertie, J.B., 1951, Antimony ore in the Fairbanks District, Alaska: U.S. Geological Survey Open-File Report 51-46, 43 p.

Metz, P.A., and Robinson, M.S., 1980, Investigations of mercury-antimony-tungsten metal provinces in Alaska: University of Alaska, Fairbanks, Mineral Industry Research Laboratory Open-File Report 80-8, 39 p., map.

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Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Herschberger; Beall; Phipps

Site type: Prospect

ARDF no.: LG108

Latitude: 65.0626 **Quadrangle:** LG A-1

Longitude: 147.4546

Location description and accuracy:

This prospect is along Willow Creek, a headwater tributary of Cleary Creek. It is about 1.2 miles north-northwest of Cleary Summit in the SW1/4NE1/4 sec. 25, T. 3 N., R. 1 E., of the Fairbanks Meridian. The location is accurate to within 2,000 feet.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG207).

The only published information on this prospect states that some rich gold ore was extracted prior to 1910 (Brooks, 1911). The prospect was clearly distinct from the nearby Tolovana mine (ARDF no. LG110) at that time, but may have been developed with the Tolovana mine later. No information is available on the character of mineralization.

Alteration:

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Gold-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Undetermined

Site Status: Active

Workings/exploration:

Brooks (1911, p. 34), reported that some ore was taken out in the course of development work in 1910.

Production notes:

Brooks (1911, p. 34), reported that some ore was taken out in the course of development work in 1910.

Reserves:

None.

Additional comments:

References:

Brooks, A.H., 1911, The mining industry in 1910, in Brooks, A.K., and others, Mineral resources of Alaska, report on progress of investigations in 1910: U.S. Geological Survey Bulletin 480-B p. 21-43.

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Freeman, C.J., 2008, Executive summary report for the Golden Summit project, Fairbanks Mining District, Alaska: Unpublished Technical Report for Freegold Ventures Ltd., 112 p. (posted on www.sedar.com, March 31, 2008).

Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Willow Creek

Site type: Prospect

ARDF no.: LG109

Latitude: 65.0617 **Quadrangle:** LG A-1

Longitude: 147.4552

Location description and accuracy:

This prospect is in the bed of Willow Creek, a tributary of Cleary Creek about 100 yards from its mouth. It is in the NE1/4 sec. 25, T. 3 N., R. 1 E., of the Fairbanks Meridian. The location is accurate

Commodities:

Main: Sb

Other: As, Au, Zn

Ore minerals: Arsenopyrite, gold, pyrite, sphalerite, stibnite

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG207).

This antimony prospect was uncovered during placer mining operations and was described by Henry Joesting in a report to the Alaska Territorial Department of Mines in 1942. The antimony ore occurs as stibnite in a zone of white quartz and gouge that strikes east-west across the valley of Willow Creek (Joesting, 1942; ATDM PE 49-7). In the hydraulic cut where the overburden and gravel had been removed, high-grade ore could be traced continuously from the west side of the cut to the creek, a distance of about 75 feet. Ore is also found on the east side of the cut, about 100 feet from the creek. Between these two showings of ore, the zone consists mainly of quartz and gouge, with minor amounts of stibnite and pyrite, and occasionally arsenopyrite. Some pieces of high-grade stibnite found on the surface measured about a foot across. Most of the ore is fine-grained and massive with a minor portion made up of coarse-bladed crystals of stibnite. The higher grade portions contained 56 percent antimony. Small amounts of pyrite and arsenopyrite occur in the lower grade material.

The bedrock is mainly a soft, badly weathered biotite schist, with considerable clay. The schist strikes east and dips steeply north. Several thin limestone beds were noted. A few of these beds about 100 feet upstream from the stibnite prospect contain sphalerite and pyrite. Numerous small veins and lenses of glassy quartz were also noted in the bedrock. Some contain small amounts of pyrite, arsenopyrite, and sphalerite.

Alteration:

Not stated.

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:
Stibnite-quartz vein (Cox and Singer, 1986; model 27d).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
27d

Production Status: None

Site Status: Active

Workings/exploration:
The vein was exposed by a hydraulic cut during placer mining operations.

Production notes:
No record of production.

Reserves:
None.

Additional comments:

References:

Brooks, A.H., 1916, Mineral resources of Alaska, report on progress of investigations in 1915: U.S. Geological Survey Bulletin 642, 279 p.

Chapin, Theodore, 1914, Lode mining near Fairbanks, Alaska: U.S. Geological Survey Bulletin 592-J, p. 321-355.

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Joesting, H.R., 1942, Antimony and tungsten deposits in the Fairbanks and adjacent districts: Alaska Department of Mines Miscellaneous Report 194-11, 25 p.

Joesting, H.R., 1942, Preliminary report on an antimony prospect on Willow Creek, Fairbanks district:

Alaska Territorial Department of Mines Prospect Evaluation 49-7, 2 p.

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Killeen, P.L., and Mertie, J.B., 1951, Antimony ore in the Fairbanks District, Alaska: U.S. Geological Survey Open-File Report 51-46, 43 p.

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Prindle, L.M., 1906, Yukon placer fields: U.S. Geological Survey Bulletin 284, p. 109-127.

Prindle, L.M., 1908, The Fairbanks and Rampart quadrangles, Yukon-Tanana region, Alaska, with a section on the Rampart placers, by F.L. Hess, and a paper on the water supply of the Fairbanks region, by C.C. Covert: U.S. Geological Survey Bulletin 337, 102 p.

Prindle, L.M., and Katz, F.J., 1913, Detailed description of the Fairbanks district, in Prindle, L.M., A geologic reconnaissance of the Fairbanks quadrangle, Alaska: U.S. Geological Survey Bulletin 525, p. 59-152.

Smith, P.S., 1939, Mineral industry of Alaska in 1937: U.S. Geological Survey Bulletin 910-A, p. 1-113.

Smith, P.S., 1939, Mineral industry of Alaska in 1938: U.S. Geological Survey Bulletin 917-A, p. 1-113.

Smith, P.S., 1941, Mineral industry of Alaska in 1939: U.S. Geological Survey Bulletin 926-A, p. 1-106.

Smith, P.S., 1942, Mineral industry of Alaska in 1940: U.S. Geological Survey Bulletin 933-A, p. 1-102.

Smith, S.S., 1917, The mining industry in the territory of Alaska during the calendar year 1915: U.S. Bureau of Mines Bulletin 142, 66 p.

Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Tolovana

Site type: Mine

ARDF no.: LG110

Latitude: 65.0626 **Quadrangle:** LG A-1

Longitude: 147.4518

Location description and accuracy:

The Tolovana Mine is about 25 feet above Willow Creek at an elevation of 1,300 feet. It is approximately 1/8 of a mile upstream from the junction of Willow Creek and Cleary Creek, in the NW1/4NE1/4 sec. 25, T. 3 N., R. 1 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Pb, Sb, W

Ore minerals: Arsenopyrite, galena, gold, pyrite, scheelite, stibnite, tetrahedrite

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG207).

The Tolovana Mine is an old property that was discovered before 1910. It operated intermittently until at least 1949, and was the site of considerable work in the 1980s. By 1910, an 85 foot adit had been driven at the Tolovana Mine. In July, 1911 a Huntington disc mill was installed and began operation on the prospect. The mill ran continuously through mid-November when lack of water forced it to close. The mill began operating again in March, 1912 after a well and pump had been installed on Willow Creek (Times Publishing Company, 1912). In July, 1912 a two-stamp Nissen mill was erected and began crushing ore on August 23, 1912.

In 1912, the mine consisted of a 400-foot adit from which several short drifts were driven; small stopes were also developed (Smith, 1913). The adit extends along the main shear zone for 130 feet where it intersects a vertical fault. (Note by compiler: In much of the early literature on this mine, the term 'shear zone' usually referred to a fault zone with parallel mineralized quartz veins, stringers, or pods, i.e., in other words what others here and elsewhere might have referred to as a sheared quartz vein or lode. The description that follows generally reflects the old 'shear zone' terminology.) The workings turned north for 30 feet and then turn east again, along the offset extension of the shear zone. Approximately 100 feet from the portal of the adit, a winze was sunk to a depth of 50 feet and drifts were driven to the east and west. A second winze, inclined 60 degrees to the south, was driven from the east end of the drift but was flooded in 1912. A third winze, located 330 feet from the portal, was sunk from the adit level to a depth of 100 feet (Loftus, 1927). A shaft near the portal of the adit had been sunk to a depth of 100 feet and a drift driven on the 50-foot level connects with the winze in the adit. Due to the flooding of the shaft near the Tolovana adit in late 1912, work was shifted to the Willow Creek-Bedrock Creek divide where a 55-foot shaft, the Scheuyemere #1 shaft, was sunk on a 12- to 14-inch-thick shear zone (Times Publishing Company, 1912). This shaft is sometimes referred to as the Tolovana Stibnite prospect (Chapin, 1914).

By 1913, the shaft and the winze had been connected by a drift on the 100-foot level and the ore between the adit and the 100 foot level was mined (Chapin, 1914). Additional stoping took place above the adit level. By 1913, the Scheuyemere #1 shaft had been sunk to a depth of 100 feet and drifts were driven 50

feet to the east and 30 feet to the west on the 50-foot level (Chapin, 1914). A raise, 24 feet west of the shaft, connected with the surface and the block of ground between the shaft and the raise had been stoped from the 50-foot level to the surface.

In 1913, a new shear zone was discovered and shaft sinking was in progress (Chapin, 1914). This shaft, the South shaft, was connected to the Tolovana adit by a crosscut.

In 1922, the Tolovana adit was 530 feet long. A drift had also been driven from the 50-foot level of the winze for 30 feet to the east where it intersected a fault which offsets the shear zone (Stewart, 1922; Davis, 1922). In the South shaft, drifting at the 50-foot level went out 15 feet to the west and 20 feet to the east along the shear zone. A total of 150 feet of new drifting was completed on the Tolovana Mine in 1923 and 8 to 10 tons of ore were milled on site (Stewart, 1923).

The Tolovana mine was inactive until 1930 when exploration was renewed (Smith, 1933). The western extension of the Tolovana shear zone, on the west side of Willow Creek, was discovered in 1930 and was explored through the Parenteau adit (Stewart, 1931). This adit was driven 160 feet to the west ; 50 tons of ore was treated in the mill in 1930. The Parenteau adit was caved about 75 feet from the portal when visited in 1931 (Hill, 1933).

Antimony and gold were mined from the prospect in 1949 (Saarela, 1950). In August 1984, the Mine was explored by dozer and backhoe. A small gravity mill was constructed near the old portal of the Tolovana adit and several large open cuts were excavated in the vicinity of the Scheuyemere #1 shaft (Freeman, 1992). Surface samples from the Upper Pit area and the dump were also collected in 1986 (Fairbanks Exploration Inc., unpublished report, 1986).

Three types of metamorphic rocks are present at the Tolovana Mine (LeLacheur, 1991). The dominant rock unit is micaceous quartzite. Subordinate crenulated biotite-schist and a thin layer of amphibole-biotite schist are interlayered in the quartzite. Strongly altered plutonic rock is exposed in several trenches at the south end of the property (LeLacheur, 1991). The dominant process of ore deposition seems to have been replacement of the country rock and fault zones by quartz, sericite and sulfides, rather than quartz deposition in veins (LeLacheur, 1991, p. 50).

Initial development began on a series of 1- to 3-inch quartz veinlets with visible gold which trend N75E (Prindle, 1910). Ore in the Tolovana Mine varies from ribbon-texture quartz stringers to massive quartz veins which vary from a few inches to 3 feet in width. The mineralization had been traced for over 1,500 feet along strike. The 1- to 3-inch quartz stringers are separated by calcareous schist with disseminated pyrite. The gold-bearing quartz stringers contain euhedral stibnite but do not normally contain pyrite (Smith, 1913a). The gold through 1912, varied from 792 to 824 fine; the highest silver content was 180 parts per thousand from a sample with a gold fineness of 792 (Smith, 1913, B 525; Smith, 1913, B 542). Several generations of quartz have been noted; most of the gold occurs in the glassy quartz which postdates the more abundant milky-white quartz (Smith, 1913b).

A sheared vein was discovered in 1913, about 100 feet south of the portal of the adit; it strikes east and dips 50S (Chapin, 1914). The sheared vein is 18 inches to 36 inches wide and consists of massive white quartz with gouge along each contact. This vein is parallel to the shear exposed in the Tolovana adit. Shaft sinking was in progress in 1913. This shaft, referred to as the South shaft was later connected to the Tolovana adit by a crosscut.

The Tolovana vein (called a shear zone in the early literature) strikes N30-65E and dips 30-60SE (Smith, 1913, B 525, Smith, 1913, B 542). The western extension of the Tolovana vein was discovered in 1930 and was developed by the 160-foot Parenteau adit. The mineralization is in 1- to 12-inch-wide stringer zones similar to that mined from the Tolovana adit. The ore contained gold associated with arsenopyrite, stibnite, pyrite, galena and tetrahedrite (Stewart, 1933; Pilgrim, 1933).

The prospect was sampled by Fairbanks Exploration Inc. in 1986 (Fairbanks Exploration Inc., unpublished report, 1986). Backhoe and dozer trenches on the Tolovana prospect exposed a large section of metarhyolite tuff, exhalite, and volcaniclastic metaquartzite of the upper Cleary Sequence. These rocks contain disseminated and shear-zone-controlled arsenopyrite, pyrite, stibnite and native gold. The structures which hosted the high grade gold-quartz shear zones in the old Tolovana Mine trend predominantly N60-80E and dip steeply southeast; they transect the flat-lying, northeast-trending Cleary Sequence. Chip samples were collected in the Upper Pit across exposures of sulfide-bearing metarhyolite, cut by numerous 1-6 inch thick white quartz veins. Samples contained 520 to 3,600 parts per billion (ppb) gold. Samples from high-grade dump material at the small mill set up near the old Tolovana shaft contained 0.27 to 0.52 ounces of gold per ton. The samples consisted of white, massive, quartz vein material with 1-3 percent arsenopyrite and minor

stibnite. The country rock welded to the sheared selvages is metarhyolite similar to that seen in the Upper Pit. As a check on the efficiency of the old gravity circuit in the Tolovana mill, a sample was collected from the tailings pond below the mill. This sample consisted of coarse sand-size material, 20-30 mesh in size; it was mainly quartz, arsenopyrite, pyrite and stibnite. A sample assayed 0.458 ounce of gold per ton. This suggested that the mill did a poor job of recovering the fine gold in the ore (Fairbanks Exploration Inc., unpublished report, 1986). In 1988 and 1989, Yukon Tanana Mining conducted extensive surface trenching on the Tolovana Mine and the adjoining Chechako prospects; the work outlined an estimated 150,000 ounces of gold that could be mined from the surface pit (R. Blakestad, oral communication, 1991).

Alteration:

Pods and disseminations of jamesonite occur in an amorphous, green vuggy matrix in the walls surrounding the gouge zone (LeLacheur, 1991). Quartz, sericite, ankerite and carbon alteration also present.

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Disseminated gold in quartz veins along shear zones.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The Tolovana Mine is an old property that was discovered before 1910. It operated intermittently until at least 1949, and was the site of considerable work in the 1980s. By 1910, an 85-foot adit had been driven at the Tolovana Mine. In July, 1911 a Huntington disc mill was installed and began operation. The mill ran continuously through mid-November when lack of water forced it to close. The mill began operating again in March, 1912 after a well and pump had been installed on Willow Creek (Times Publishing Company, 1912). In July, 1912 a two-stamp Nissen mill was erected and began crushing ore on August 23, 1912.

In 1912, the mine consisted of a 400-foot adit from which several short drifts were driven; small stopes were also developed (Smith, 1913). The adit extends along the main shear zone for 130 feet where it intersects a vertical fault. (Note by compiler: In much of the early literature on this mine, the term 'shear zone' usually referred to a fault zone with parallel mineralized quartz veins, stringers, or pods, i.e., in other words what others here and elsewhere might have referred to as a sheared quartz vein or lode. The description that follows generally reflects the old 'shear zone' terminology.) The workings turned north for 30 feet and then turn east again, along the offset extension of the shear zone. Approximately 100 feet from the portal of the adit, a winze was sunk to a depth of 50 feet and drifts were driven to the east and west. A second winze, inclined 60 degrees to the south, was driven from the east end of the drift but was flooded in 1912. A third winze, located 330 feet from the portal, was sunk from the adit level to a depth of 100 feet (Loftus, 1927). A shaft near the portal of the adit had been sunk to a depth of 100 feet and a drift driven on the 50-foot level connects with the winze in the adit. Due to the flooding of the shaft near the Tolovana adit in late 1912, work was shifted to the Willow Creek-Bedrock Creek divide where a 55-foot shaft, the Scheuyemere #1 shaft, was sunk on a 12- to 14-inch-thick shear zone (Times Publishing Company, 1912). This shaft is sometimes referred to as the Tolovana Stibnite prospect (Chapin, 1914).

By 1913, the shaft and the winze had been connected by a drift on the 100-foot level and the ore between the adit and the 100 foot level was mined (Chapin, 1914). Additional stoping took place above the adit level. By 1913, the Scheuyemere #1 shaft had been sunk to a depth of 100 feet and drifts were driven 50 feet to the east and 30 feet to the west on the 50-foot level (Chapin, 1914). A raise, 24 feet west of the shaft,

connected with the surface and the block of ground between the shaft and the raise had been stoped from the 50-foot level to the surface.

In 1913, a new shear zone was discovered and shaft sinking was in progress (Chapin, 1914). This shaft, the South shaft, was connected to the Tolovana adit by a crosscut.

In 1922, the Tolovana adit was 530 feet long. A drift had also been driven from the 50-foot level of the winze for 30 feet to the east where it intersected a fault which offsets the shear zone (Stewart, 1922; Davis, 1922). In the South shaft, drifting at the 50-foot level went out 15 feet to the west and 20 feet to the east along the shear zone. A total of 150 feet of new drifting was completed on the Tolovana Mine in 1923 and 8 to 10 tons of ore were milled on site (Stewart, 1923).

The Tolovana mine was inactive until 1930 when exploration was renewed (Smith, 1933). The western extension of the Tolovana shear zone, on the west side of Willow Creek, was discovered in 1930 and was explored through the Parenteau adit (Stewart, 1931). This adit was driven 160 feet to the west; 50 tons of ore was treated in the mill in 1930. The Parenteau adit was caved about 75 feet from the portal when visited in 1931 (Hill, 1933).

Antimony and gold were mined from the prospect in 1949 (Saarela, 1950). In August 1984, the Mine was explored by dozer and backhoe. A small gravity mill was constructed near the old portal of the Tolovana adit and several large open cuts were excavated in the vicinity of the Scheuyemere #1 shaft (Freeman, 1992).

The prospect was sampled by Fairbanks Exploration Inc. in 1986 (Fairbanks Exploration Inc., unpublished report, 1986). Backhoe and dozer trenches on the Tolovana prospect exposed a large section of metarhyolite tuff, exhalite, and volcaniclastic metaquartzite of the upper Cleary Sequence. In 1988 and 1989, Yukon Tanana Mining conducted extensive surface trenching on the Tolovana Mine and the adjoining Chechako prospects; the work outlined an estimated 150,000 ounces of gold that could be mined from the surface pit (R. Blakestad, oral communication, 1991).

Production notes:

Ore was shipped from the prospect as early as 1909 (Times Publishing Company, 1912). Production through 1912 averaged $20 to $105 per ton (1 to 5 ounces of gold per ton (Smith, 1913, B 525; Smith, 1913, B 542). In 1923, 8 to 10 tons of ore were milled on site, averaging $16 gold per ton (0.8 ounces of gold per ton) (Stewart, 1923). A small amount of ore was milled in 1924 and in 1931 (Stewart, 1923; Pilgrim, 1932; Smith, 1933, B 844). A little antimony and gold were mined in 1949 (Saarela, 1950).

Reserves:

In 1988 and 1989 Yukon Tanana Mining conducted extensive surface trenching on the Tolovana and adjoining Chechako prospects and outlined a reserve of about 150,000 ounces of gold that could be mined from a surface pit (R. Blakestad, oral commun., 1991).

Additional comments:

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Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Dolphin; Golden Summit

Site type: Prospect

ARDF no.: LG112

Latitude: 65.0617

Quadrangle: LG A-1

Longitude: 147.4466

Location description and accuracy:

The Dolphin intrusive body is an elongate northeast-trending stock, about 2,000 feet by 1,200 feet in plan view on the ridge between Willow Creek and Bedrock Creek. It is centered about 0.4 mile south of the junction of Bedrock and Cleary Creeks and about 0.5 mile northeast of the center of section 25, T. 3 N., R. 1 E., of the Fairbanks Meridian. The location is accurate within 1/4 mile. It is located within the Golden Summit Project area.

Commodities:

Main: Au

Other: Ag, Bi, Pb, Sb, Te, Zn

Ore minerals: Arsenopyrite, bismuthinite, boulangerite, chalcopyrite, galena, gold, jamesonite, maldonite, marcasite, native bismuth, pentlandite, pyrite, pyrrhotite, sphalerite, stibnite, tetradymite, tetrahedrite

Gangue minerals: Calcite, feldspar, sericite

Geologic description:

Note: As of early 2012, this site and several others nearby were being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008). Considerable mineralization has been discovered that indicates this prospect is part of a larger mineralized system that is described separately as ARDF site (LG207).

In 1995, Freegold discovered significant disseminated gold mineralization in granodiorite and tonalite of the Dolphin stock (Freeman and others, 1998). Soil sampling in 1995 and 1996 delineated a large northeast trending gold anomaly with gold values over 100 parts per billion (ppb). The anomaly coincides with the south contact of the Dolphin stock and is aligned with the Dolphin shear zone. The gold anomaly is also highly anomalous in silver, arsenic, lead, antimony and zinc. It is the southeast part of a broad gold-in-soil anomaly which extends from the west bank of Willow Creek to Bedrock Creek.

As recognized in early 2012 (Adams and Giroux, 2011, 2012), the Dolphin stock is roughly elliptical in plan view, trends northeast, and is about 2,000 feet long and up to 1,200 feet wide. At least five intrusive phases have been identified: 1) equigranular to weakly porphyritic, biotite granodiorite; 2) equigranular to weakly porphyritic, hornblende-biotite tonalite; 3) fine-grained biotite-granite porphyry; 4) fine-grained biotite rhyolite to rhyodacite porphyry, and 5) fine-grained mafic dikes. Drilling along the northern edge of the stock encountered calc-silicate skarn at a depth of 400 feet, suggesting that the north contact of the stock dips steeply north. The southern contact of the stock dips shallowly to the south. Drilling at the northeast end of the stock suggests that it branches into a dike swarm there and that the main stock may be faulted at depth. The deposit is open to the west toward Willow Creek, and is at least 1,000 feet deep, the bottom of the deepest hole. Three Ar40/Ar39 age determinations on sericite from the mineralization and from a shear zone vary from 88.3 to 90.1 Ma.

During 1995-96, Freegold completed 15,559 feet of reverse circulation drilling in 46 drill holes. In 1998, a single vertical core hole was drilled to a depth of 1,033 feet. Seven holes were drilled in 2004 and 26 more were drilled in 2011 when the Dolphin prospect was the center of exploration by Freegold in the Cleary area. Over the years, the prospect has also been covered by numerous geochemical and geophysical surveys

and has been trenched and sampled as part of Freegold extensive work in the Cleary Hill area since 1991.
Adams and Giroux (2011, 2012) classify the Dolphin deposit as an intrusion- hosted sulfide-quartz stockwork. Four distinct assemblages of ore minerals have been identified that mark the transition from early, high temperature mineralization to late low-temperature mineralization: 1) high-temperature arsenopyrite, maldonite, gold, native bismuth, bismuthinite, pyrite, and pyrrhotite; 2) low-temperature arsenopyrite and marcasite; 3) chalcopyrite, sphalerite, and galena; and 4) tetrahedrite, and jamesonite. There are also zones with more than 50 percent sulfides that include galena, tetrahedrite, and sphalerite. Up to 2 percent disseminated scheelite is locally present. Electron microprobe analyses and polished section microscopy indicate that native gold and bismuthinite occur as inclusions in arsenopyrite. Visible gold is rare and is hosted in white, quartz stockwork veins. Preliminary metallic sieve analyses suggest little or no nugget effect (Adams, 1997). Bottle roll analyses from granodiorite from the oxide zone recovered 82 percent to 92 percent of the gold; less than 10 percent of the gold was recovered in the sulfide-rich altered granodiorite.
The gold content of the Dolphin prospect is chiefly in quartz veinlets, typically less than 1 mm wide, that cut the stock (Freeman, 2008; Adams and Giroux, 2011, 2012). Vein orientations vary with no apparent preferred orientation. At least three separate hydrothermal events can be identified in the Dolphin core as seen in multiple, flooded zones of alternating silicification and sericitization, local scheelite-bearing carbonate zones, and sulfide-rich zones containing elevated base metals. Scheelite-bearing carbonate-alteration zones generally contain lower gold values and tend to form halos around the higher-grade gold mineralization. Silica flooding occurs throughout the intrusive and the rocks locally may contain up to 90 percent silica. The silica-flooded zones often contain chalcedonic green, brown, or black quartz. In some drill holes the silicification of the granodiorite almost completely obliterates the original igneous textures. Chloritic alteration is rare.
As estimated by Adams and Giroux (2012), based on drilling through 2011 and a cut-off grade of 0.3 gram of gold per ton, the Dolphin stock has an indicated resource of 17.270 million tonnes with an average grade of 0.62 grams of gold per tonne (or 341,000 ounces of gold) and an inferred resource of 64.440 million tonnes with an average grade of 0.55 gram of gold per tonne (or 1,135,000 ounces of gold).
A total of 87 holes, totaling 24,156 m, have been drilled within the resource area since 2011 (as of Dec. 2016). In 2016, 717 soil samples were collected; they delineate a gold-in-soil geochemical anomaly west of the current Dolphin deposit. Previously completed shallow rotary air blast drilling was composited and indicates better-grade oxide material may be present to the north (Athey and Werdon, 2017).

Alteration:

The Dolphin deposit is marked by multiple flooded zones of alternating silicification and sericitization, with local scheelite-bearing carbonate zones (Freeman and others, 1998). In some drill holes the silicification of the granodiorite almost completely obliterates the original igneous textures. Chloritic alteration is rare.

Age of mineralization:

Three Ar40/Ar39 age determinations on sericite from the mineralization and from a shear zone that cut the stock vary from 88.3 to 90.1 Ma.

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

During 1995-96, Freegold completed 15,559 feet of reverse circulation drilling in the Dolphin prospect in 46 drill holes. In 1998, a single vertical core hole was drilled to a depth of 1,033 feet. Seven holes were drilled in 2004 and 26 more were drilled in 2011 when the Dolphin prospect was the center of exploration by Freegold in the Cleary area. Over the years, the prospect has also been covered by numerous geochemical and geophysical surveys and has been trenched and sampled as part of Freegold's extensive work in the Cleary Hill area since 1991.

In 2012, 47 drill holes representing 48,937 feet were completed in the Dolphin/Cleary Hill area by Freegold. A revised NI 43-101 compliant gold resource was calculated (Abrams and Giroux, 2013).

In 2013, ten drill holes representing 11,392 feet were completed in the Dolphin/Cleary Hill area. A subsequent revised NI 43-101 compliant gold resource ensued (Abrams and Giroux, 2013).

A total of 87 holes, totaling 24,156 m, have been drilled within the resource area since 2011 (as of Dec. 2016). In 2016, 717 soil samples were collected; they delineate a gold-in-soil geochemical anomaly west of the current Dolphin deposit. Previously completed shallow rotary air blast drilling was composited and indicates better-grade oxide material may be present to the north (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

As estimated by Abrams and Giroux (2013), based on drilling through 2013 and a cut-off grade of 0.3 gram of gold per ton, the Dolphin stock has an indicated resource of 79.800 million tonnes with an average grade of 0.66 gram of gold per tonne (or 1.683 million ounces of gold) and an inferred resource of 248.060 million tonnes with an average grade of 0.61 gram of gold per tonne (or 4.841 million ounces of gold). Included within this new resource is an oxide component.

In January 2016, Freegold Ventures Ltd. released a preliminary economic assessment (PEA) for their Golden Summit gold property near Fort Knox mine north of Fairbanks, followed by a March 2016 technical report, which was amended and restated in May 2016 (Abrams and others, 2016). Freegold’s initial development scenario for Golden Summit includes a proposed heap-leach operation focused on the existing oxide portion of the resource, with a staged approach to a larger milling scenario. Only blocks falling within the conceptual open pit are reported as a mineral resource, and using a 0.3 gram of gold per tonne cut-off, this results in an indicated resource of 61,460,000 tonnes at 0.69 gram of gold per tonne (1,363,000 contained ounces of gold) and an inferred resource of 71,500,000 tonnes at 0.69 gram of gold per tonne (1,584,000 contained ounces of gold). Using $1,300 per ounce of gold, the PEA evaluated a two-phase, 24-year, open pit mine generating two gold streams, each operating at 10,000 tonnes per day for 2,358,000 ounces of doré produced over the life of the mine; processing operations for the oxide and sulfide mineralized materials are heap leach and bi-oxidation, respectively (Abrams and others, 2016).

Additional comments:

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Primary Reference: Adams and Giroux, 2011; Abrams and Giroux, 2013

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Crosscut

Site type: Prospect

ARDF no.: LG114

Latitude: 65.0647 **Quadrangle:** LG A-1

Longitude: 147.4486

Location description and accuracy:

The Crosscut prospect is just east of the junction of Willow Creek and Cleary Creek; it is in the NW1/4NE1/4 sec. 25, T. 3 N., R. 1 E., of the Fairbanks Meridian.

Commodities:

Main: Sb

Other: As, Sb

Ore minerals: Pyrite, stibnite

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG207).

Mineralization found in prospect pits consisted of bladed stibnite and pyrite with abundant antimony, arsenic and iron oxides (Smith, 1913). A 100-foot adit was driven below the prospect pits but did not intersect the mineralization seen in the pits.

Alteration:

Age of mineralization:

Mid-Cretaceous by analogy with other mineralization in the area.

Generic deposit model:

Deposit model:

Stibnite vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The workings consisted of prospect pits and a 100-foot adit (Smith, 1913).

Production notes:

No record of production and unlikely.

Reserves:

None.

Additional comments:

References:

Chapin, Theodore, 1914, Lode mining near Fairbanks, Alaska: U.S. Geological Survey Bulletin 592-J, p. 321-355.

Freeman, C.J., 1992, 1991 Golden Summit project final report, volume 2: Historical summary of lode mines and prospects in the Golden Summit project area, Alaska: Avalon Development Corp., 159 p. (Report held by Freegold Recovery Inc. USA, Vancouver, British Columbia.)

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Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Stepovich #1

Site type: Mine

ARDF no.: LG115

Latitude: 65.0666 **Quadrangle:** LG A-1

Longitude: 147.4446

Location description and accuracy:

The Stepovich Mine is near the junction of Bedrock Creek and Cleary Creek; it is in the SE1/4SE1/4 sec. 24, T. 3 N., R. 1 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG205).

On August 26, 1910, 2.5 tons of ore from the Stepovich prospect yielded $700 in gold (13.5 ounces of gold per ton) (Times Publishing Company, 1912). The only other reference to the Stepovich Mine is a map location shown by Chapin in 1914.

Alteration:

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Gold-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Some work in 1910-1912.

Production notes:

On August 26, 1910, 2.5 tons of ore from the Stepovich prospect yielded $700 in gold (13.5 ounces of gold per ton) (Times Publishing Company, 1912).

Reserves:

None.

Additional comments:

References:

Chapin, Theodore, 1914, Lode mining near Fairbanks, Alaska: U.S. Geological Survey Bulletin 592-J, p. 321-355.

Freeman, C.J., 1992, 1991 Golden Summit project final report, volume 2: Historical summary of lode mines and prospects in the Golden Summit project area, Alaska: Avalon Development Corp., 159 p. (Report held by Freegold Recovery Inc. USA, Vancouver, British Columbia.)

Freeman, C.J., 2008, Executive summary report for the Golden Summit project, Fairbanks Mining District, Alaska: Unpublished Technical Report for Freegold Ventures Ltd., 112 p. (posted on www.sedar.com, March 31, 2008).

Times Publishing Company, 1912, Tanana Magazine, Quartz Edition: Fairbanks, Alaska, Times Publishing Company, 76 p.

Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Bedrock Creek

Site type: Mine

ARDF no.: LG116

Latitude: 65.0663

Quadrangle: LG A-1

Longitude: 147.442

Location description and accuracy:

The coordinates are for the approximate center of placered ground on Bedrock Creek; the mine is in the NW1/4NW1/4 section 30, T. 3 N., R. 2 E., of the Fairbanks Meridian. It is unclear where the gold-quartz vein was encountered in the bedrock.

Commodities:

Main: Au, Sb

Other:

Ore minerals:

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG205).

Bedrock uncovered during early placer mining contained some auriferous quartz veins that were mined from an open cut and milled at nearby Cleary Hill Mill (Brooks, 1923).

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Gold-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Bedrock uncovered during early placer mining contained some auriferous quartz veins that were mined

from an open cut and milled at nearby Cleary Hill Mill (Brooks, 1923).

Production notes:

Bedrock uncovered during early placer mining contained some auriferous quartz veins that were mined from an open cut and milled at nearby Cleary Hill Mill (Brooks, 1923).

Reserves:

None.

Additional comments:

References:

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Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Bedrock Creek

Site type: Mine

ARDF no.: LG117

Latitude: 65.0655 **Quadrangle:** LG A-1

Longitude: 147.4414

Location description and accuracy:
The coordinates are the approximate center of placered ground on Bedrock Creek, in the NW1/4NW1/4 sec. 30, T. 3 N., R. 2 E., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Au

Other: Sn, W

Ore minerals: Cassiterite, gold, scheelite

Gangue minerals:

Geologic description:
As least some placer mining was done on Bedrock Creek as can be seen by the gravels there but details are lacking. Some placer gold was probably produced; cassiterite is common, but scheelite is scarce (Joesting, 1942; ATDM Pamphlet. 1, p. 32).

Alteration:

Age of mineralization:
Quaternary.

Generic deposit model:
Placer deposits (Garnett and Bassett, 2005)

Deposit model:
Gold (with cassiterite and scheelite) placer (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: Undetermined

Site Status: Active

Workings/exploration:
As least some placer mining took place as can be seen by the gravels there, but details are lacking.

Production notes:
As least some gold was probably produced but details are lacking.

Reserves:

None.

Additional comments:

References:

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Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Wyoming

Site type: Mine

ARDF no.: LG118

Latitude: 65.0635 **Quadrangle:** LG A-1

Longitude: 147.4376

Location description and accuracy:

The Wyoming Mine is about 400 yards south of the Cleary Hill Mine (ARDF no. LG119) on the east side of Bedrock Creek. It is in the NW1/4NW1/4 section 31, T. 3 N., R. 2 E., of the Fairbanks Meridian.

Commodities:

Main: Ag, Au

Other: As, Pb, Sb, W, Zn

Ore minerals: Arsenopyrite, boulangerite, jamesonite, gold, scheelite, stibnite

Gangue minerals: Calcite, quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG205).

The Wyoming Mine is along a shear zone with quartz veins up to 2 feet thick that contain gold, stibnite and scheelite. Scheelite was particularly abundant in the wall rocks and along the margins of the shear zone (Moffit, 1927). The shear zone strikes N 80 E and dips 50 S (Hill, 1933). Ore in the main stope averaged about $6.00 of gold per ton (0.3 ounces of gold per ton) and consisted of 12 to 14 inches of hard white quartz and brecciated schist with minor iron-oxide staining (Hill, 1933).

The Wyoming prospect was investigated in 1943 as a possible source of tungsten (Byers, 1957). Scheelite is present in limestone lenses found east of the north-trending fault in both the Wyoming and Lower adits. By 1943, the Wyoming adit consisted of 350 feet of drift west of the north-trending fault, a 100-foot crosscut to the south on the east side of the north-south fault, and 200 feet of drift along the Wyoming shear zone from the end of the 100-foot crosscut (Byers, 1957). A 70-foot section of the 200-foot drift east of the fault averaged 0.3 percent tungsten oxide over 6 inches. In a sublevel stope above the same zone, a 1-foot by 3-foot area averaged 20 percent tungsten oxide in a limestone replacement body (Byers, 1957). Samples found on the Lower adit dump, and samples collected in place from the Wyoming shear zone in the Lower adit contained 0.28 to 1.64 percent tungsten oxide with trace molybdenum, manganese, antimony and arsenic.

Fairbanks Exploration Inc. conducted 11 man-days of field work on the Wyoming prospect in 1987. Nineteen rock samples were collected and the alteration zones were mapped. Several samples were collected from bedrock exposures and dumps in and around the mine (Fairbanks Exploration Inc., unpublished report, 1987). These samples contained low gold, antimony, and silver, and elevated arsenic. Gold values were higher where jamesonite and/or boulangerite are visible in the shear zone. Most of the dump material on the Wyoming dump is sulfide-free, white quartz, attesting to close grade control during mining. Stratiform arsenopyrite lenses up to 4 inches thick were discovered on bedrock exposures in a placer cut below the dump of the Lower adit. These occurrences are associated with rhyolitic tuff beds; samples had unexpectedly low gold values (Fairbanks Exploration Inc., unpublished report, 1987).

In 1989, Fairbanks Exploration Inc. conducted 10 man-days of field work on the prospect and collected eighteen rock samples (Fairbanks Exploration Inc., unpublished report, 1989). Exposures in the old placer

cut on lower Bedrock Creek consist of pale-yellow to gray, thinly bedded, felsic volcanic tuff and siliceous exhalite containing quartz, sericite, minor chlorite, and disseminated pyrite and lesser arsenopyrite. These units are correlative with the upper third of the Cleary Sequence. Foliation in this area trends N60-80E and dips 10 to 20SE. The rocks are heavily jointed and appear to have undergone minor dip-slip deformation along sericite-rich bedding planes. Sulfide mineralization is concentrated along stratiform horizons which vary from one inch to over six inches in thickness. Visible gold was found in one of these horizons early in 1989 after heavy rains exposed new outcrops in this area. The sulfide contents of the exhalite are from 5 to 25 percent of the rock; the ground mass consists of fine-grained quartz, and clay after feldspar.

Sample results from the 1989 program indicate that highly anomalous gold and arsenic, and weakly anomalous antimony, lead and zinc are associated with felsic tuff and exhalite over the entire area exposed along the creek bottom and the banks of lower Bedrock Creek (Fairbanks Exploration Inc., unpublished report, 1989).

Alteration:

The rocks in the old placer cut on lower Bedrock Creek are heavily jointed and appear to have undergone minor dip-slip deformation along sericite rich bedding planes.

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Gold-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Active

Workings/exploration:

By 1909, development work had begun on the Wyoming shear zone (Prindle, 1910). By the end of 1910, 300 feet of adit had been driven on the Wyoming shear and 50 feet of shaft had been sunk on the Carlisle Fraction claim which was adjacent to the Cleary Hill mine (Brooks, 1911). At the 80-foot station of the Wyoming adit, a 50-foot winze was sunk at an angle of 60 degrees south, but was flattened to 49 degrees south near the bottom of the winze (Smith, 1913b). An unknown amount of material from the winze was custom milled and reportedly returned high values in gold.

In 1913, the Wyoming prospect. was being mined at the surface. Four tons of ore were custom milled at the Blue Moon Mazeppa Mine on Chatham Creek and another 4.5 tons was stockpiled (Chapin, 1914). No production records are available for these two shipments. Limited development was carried out at the Wyoming prospect in 1914. In 1915, development activities continued on the Wyoming shear and were expanded to the Colorado shear located about 500 feet north of and parallel to the Wyoming shear (Stewart, 1915). Thirty-nine tons of ore from these two shear zones were custom milled at the Blue Moon Mazeppa mill on Chatham Creek but no production figures are available. Development of the Wyoming prospect was discontinued by 1916 (Brooks, 1918), but limited mining was conducted on the prospect in 1917 (Martin, 1919).

Development work on the Wyoming adit began again in 1921 when the adit was lengthened and a 60-foot winze sunk from the adit level (Brooks, 1921). The Wyoming shear was traced onto the adjacent Alabama claim in 1922 (Davis, 1922; Stewart, 1922). By 1923, the Wackwitz brothers erected a small, ball mill and mined a limited amount of high grade ore from the Wyoming adit. The ore averaged averaged $10-20 of gold per ton (0.5 to 1.0 ounce of gold per ton) with recovery estimated at 85 percent (Loftus, 1927). The prospect was operated by the Gustafson brothers in 1924 and produced a small amount of gold (Smith,

1926). A new ball mill was installed in 1925 and operated for one month.

By 1927, the Wyoming shear was accessible through three adits, the Lower, Wyoming (upper) and Crawford adits; these totaled 500 feet of workings over 150 vertical feet of shear zone (Loftus, 1927). Production continued in 1927, and ore was milled at the nearby Cleary Hill mill (Smith, 1930). Development work increased and surface facilities were improved in 1928 (Smith, 1930). Minor production from the prospect continued in 1929 and 1930 (Smith, 1932; Smith, 1933). By 1930, developments at the Wyoming mine consisted of the 165- foot- long Wyoming adit and a Lower adit 1,000 feet long, approximately 100 feet lower than the Wyoming adit (Pilgrim, 1931; Stewart, 1931). The Crawford adit was 75 feet long and approximately 40 feet above the Wyoming adit. By 1931, a fourth adit had been driven 60 feet on a sheared gold-quartz parallel to the Wyoming shear zone (Pilgrim, 1931; Stewart, 1933).

In 1931, the Wyoming adit was caved and inaccessible. The Lower adit followed the Wyoming shear zone for 300 feet where the shear was faulted about 100 feet to the south (Hill, 1933). A raise connected the Lower and Wyoming adits. A stope that extended for about 70 feet along strike connected the Lower adit to the Wyoming adit and appears to rake about 45 degrees to the west (Hill, 1933). Development work in the Crawford adit followed a north-dipping shear zone which is separate from the Wyoming shear.

Reed (1939) reported that in 1938 Fred and Ernest Wackwitz completed 30 feet of drifting, 20 feet of crosscuts, 125 feet of adit, and milled 56 tons of ore with an average grade of $47 of gold per ton (1.34 ounces of gold per ton). The ore was milled on site in a 20-ton Herman ball mill. By 1943, the Wyoming adit consisted of 350 feet of drift west of the north-south fault, a 100 foot crosscut to the south on the east side of the north-trending fault, and 200 feet of drift along the Wyoming shear from the end of the 100-foot crosscut (Byers, 1957).

In 1987, Fairbanks Exploration Inc. conducted eleven man-days of field work on the Wyoming prospect. Nineteen rock samples were collected and an alteration map prepared. Several samples were collected from bedrock exposures and dumps in and around the Wyoming mine site (Fairbanks Exploration Inc., unpublished report, 1987). In 1989, Fairbanks Exploration Inc. conducted ten man-days of field work on the prospect and collected eighteen rock samples (Fairbanks Exploration Inc., unpublished report, 1989). The alteration in the old placer cut on lower Bedrock Creek was also studied and mapped.

Production notes:

Smith (1913b) reported that an unknown amount of ore was custom milled in 1913 from the Wyoming adit. In 1913, the Wyoming was mined at the surface. In 1913, four tons of ore were custom milled at the Blue Moon Mazeppa mine on Chatham Creek and another 4.5 tons was stockpiled (Chapin, 1914). In 1915, thirty-nine tons of ore were custom milled at the Blue Moon Mazeppa mill on Chatham Creek but no production figures are available.

By 1923, the Wackwitz brothers erected a small, ball mill and mined a limited amount of high grade ore from the Wyoming adit. Ore grades averaged $10-20 of gold per ton (0.5 to 1.0 ounces of gold per ton) with recovery estimated at 85 percent (Loftus, 1927). Production continued in 1927, and ore was milled at the nearby Cleary Hill mill (Smith, 1930). Minor production from the prospect continued in 1929 and 1930 (Smith, 1932; Smith, 1933). Reed (1939) reported that 56 tons of ore were milled with an average grade of $47 of gold per ton (1.34 ounces of gold per ton).

Reserves:

None.

Additional comments:

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Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Cleary Hill; Summit; Cleary; Freegold

Site type: Mine

ARDF no.: LG119

Latitude: 65.0666 **Quadrangle:** LG A-1

Longitude: 147.4386

Location description and accuracy:

The coordinates are near the main portal of the Cleary Hill Mine, which is labeled on the Livengood (A-1) quadrangle. The mine is north of Bedrock Creek, a tributary of Cleary Creek, in section 19, T. 3 N., R. 2 E., of the Fairbanks Meridian. The underground workings extend east-southeast from the portal for at least 2,000 feet. It is located with within the Golden Summit Project area. The location is accurate within 100 feet.

Commodities:

Main: Au

Other: Ag, Cu, Pb, Sb, W, Zn

Ore minerals: Arsenopyrite, boulangerite, chalcopyrite, covellite, galena, gold, jamesonite, pyrite, scheelite, silver, sphalerite, stibnite, tetrahedrite

Gangue minerals: Quartz

Geologic description:

As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008). Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG205).

In the early 1900s, visible gold was reported in quartz veins within schist at what would become the Cleary Hill Mine (Prindle, 1910). The Cleary Hill Mine operated intermittently from 1911 to 1950. The Cleary Hill mine was the largest lode-gold producer in the Fairbanks Mining District, prior to the development of the Fort Knox mine.

The Cleary Hill Mine is in mafic volcanics, quartzites and quartz muscovite schists on the north flank of the Cleary antiform (Freeman and others, 1998). Mineralization style is characterized as schist-hosted shear zones with discrete and/or crushed gold-arsenic-antimony- quartz vein. The Cleary Hill vein strikes N70-80W and dips 45 to 70S. The dip of the vein varies according to the host rock, with steeper dips in more competent rocks and shallow dips in less competent rocks (Freeman and others, 1998). The mine consisted of over six levels that produced ore from quartz veins that contained coarse free gold, and minor arsenopyrite, pyrite, boulangerite, and tetrahedrite. Higher grade intervals have gold values from the hundreds to the thousands of ounces of gold per ton. These intervals are commonly associated with acicular needles and felted masses of boulangerite and jamesonite that occur in white to gray quartz veins that are 1 to 5 feet thick (Freeman and others, 1998).

During the 1986 field season, the waste dumps of the Cleary Hill Mine were examined and grab samples were collected by Fairbanks Exploration Inc. (Fairbanks Exploration Inc., unpublished report, 1986). Quartz vein samples on the Penrose and Upper adit dumps are associated with chlorite-actinolite schist of mafic volcanic origin, that are typical of the the lower third of the Cleary Sequence. Dump samples contained arsenopyrite, pyrite, stibnite, jamesonite, native gold, and minor scheelite from quartz-bearing shear zones and stockworks with thin argillized selvages. Significant ankerite occurs in some shear zones and weathers to a bright ocherous, red color. Visible gold is usually associated with jamesonite needles and rosettes similar to mineralization in the Christina adit (LG146) and the Nordale adit of the Homestake mine

(LG157). Along the shear zones, up to one-half percent scheelite is finely disseminated in chlorite-actinolite schist and less commonly forms coarse-grained aggregates in sulfide-free quartz. Gold values vary up to 0.558 ounce of gold per ton and appear to be higher in samples of siliceous exhalite, metarhyolite tuff and carbonaceous quartzite from the lower dumps at the mine. Reserve estimates of the waste dump made by Fairbanks Exploration Inc. in 1988 indicated the Cleary Hill mine dumps contain 71,176 tons of rock with an average grade of 0.159 ounce of gold per ton and 0.099 ounce of silver per ton (Fairbanks Exploration Inc., unpublished report, 1987; Fairbanks Exploration Inc., unpublished report, 1988).

Complete production records are not available for the Cleary Hill mine, however, existing published and private records indicate the Cleary Hill mine produced more than 100,000 fine ounces of gold from approximately 77,000 tons of material with an average grade of 1.3 ounces of gold per ton (Porterfield and Croff, 1986; Metz and others, 1987). This ranks the Cleary Hill mine as the largest lode-gold producer in the Fairbanks Mining District, prior to the development of the Fort Knox mine.

Alteration:

Deposition of quartz, sericite and ankerite in alteration zones (Freeman and others, 1998).

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby (Freeman, 2008).

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: Yes; medium

Site Status: Active

Workings/exploration:

Mineralization was first discovered on the Freegold claim prior to 1910, near the junction of Cleary and Bedrock Creeks. Shortly after, rich surface outcrops were discovered at the surface at what would become the Cleary Hill Mine; selected samples assayed up to 5,950 ounces of gold per ton.

By the summer of 1910, the Main adit had been driven 630 feet on the Freegold claim and a 50-foot shaft with 90 feet of drift was also driven on the main shear zone approximately 800 feet uphill from the portal of the main adit (Brooks, 1911). In 1911, a five stamp Joshua Hendy mill, the first private mill in the Fairbanks Mining District, was put into operation on the Freegold claim. By the end of 1911, there were about 1,200 feet of underground workings (Brooks, 1912). By 1912, the Main adit had been driven over 1,050 feet and a second adit, the 215-foot-long Penrose adit, had been driven from a portal 140 feet higher than the Main adit (Cunningham, 1912). The two adits were connected by a 170-foot raise driven 900 feet from the portal of the Main adit. Twenty stopes were developed on the Main-adit level. A 30-foot winze was sunk 650 feet from the portal of the Main adit but water hampered sinking it. By the end of 1912, the winze exposed ore 300 feet below the surface (Cunningham, 1912). By the end of 1913, Brooks and others (1914) stated that the Main adit was 1,280 feet long, the Penrose adit was 280 feet long, and the Upper adit was 200 feet long. A total of 1,000 feet of workings were accessible from the main winze with working drifts at the 70- and 112-foot levels.

Funding allowed only 200 feet of new drifting in 1915 and the mine closed in September, 1915 (Brooks, 1916; Smith, 1917). The Cleary Hill mine remained closed until 1924 when it was amalgamated with the neighboring Wyoming mine (Stewart, 1923).

Efforts to reopen the Cleary Hill mine began in the fall of 1923 and continued through 1929 (Smith, 1926; Moffit and others, 1927; Smith, 1930, B 813). This work included a 400-foot adit to reach the ore bodies at the 70-foot level of the Main winze. This Lower adit was collared at the elevation of Bedrock Creek near

the mill site (Moffit and others, 1927). In addition, the Upper adit was extended to a length of 900 feet; 538 feet of crosscuts and a 40-foot raise extended from this adit (Stewart, 1931). The Penrose adit was extended 45 feet to a total length of 325 feet, and three crosscuts totaling 595 feet were driven from it. A 89-foot raise was driven to connect the Penrose and Upper adits. The Main adit was extended 192 feet to a total length of 1,472 feet , 51 feet of drift was driven on the Powder House shear zone, and 154 feet of drift was driven on the Doget shear zone. Near the mill a shaft was sunk 185 feet and a crosscut was driven from the bottom of the shaft for 280 feet. A shaft was also sunk on the ridge above the Upper adit. This shaft, known as the Deep shaft, was 50 feet deep; it had a 80-foot crosscut at the bottom (Stewart, 1931).

The mine resumed production in 1929 and rapidly became one of the largest operations in the district (Smith, 1930, B 810; Smith, 1932). In 1930, mining was concentrated in the Penrose adit (Stewart, 1931) and the Cleary Hill mine was again the largest producer in the Fairbanks Mining District (Pilgrim, 1931). The mill operated for 7 months during 1932 and development was concentrated below the Main adit level (Pilgrim, 1933). In 1938 the Cleary Hill mine drove 250 feet of new drifts and crosscuts, sank 100 feet of winze, and drilled 4,200 feet of AX diamond core.

No other work was conducted at the Cleary Hill mine until 1969 when International Minerals and Chemicals excavated two bull dozer trenches on the surface projection of the Cleary Hill shear zone (Pilkington, 1970). Samples were only weakly anomalous in gold and silver.

The dumps of the mine were sampled by Fairbanks Exploration Inc. in 1986 (Fairbanks Exploration Inc., unpublished report, 1986). In 1988, Tri-Con Mining bulk sampled the upper and lower dumps to determine if this material could be processing economically.

Freegold Ventures Ltd. conducted drilling at Clear Hill mine area from 2011 to 2013. Cleary Hill area was included in with Dolphin zone for revised NI 43-101 compliant resource estimates created each year following drilling (Abrams and Giroux, 2013).

Production notes:

Waste dump reserve estimates made by Fairbanks Exploration Inc. in 1988 indicated the Cleary Hill mine dumps contained 71,176 tons of rock that averaged 0.159 ounce of gold per ton and 0.099 ounce of silver per ton (Freeman and others, 1987; Freeman and others, 1988).

Prior to World War II, 280,000 ounces of gold were mined from Cleary Hill (Abrams and Giroux, 2013).

Reserves:

As estimated by Abrams and Giroux (2013), based on drilling through 2013 and a cut-off grade of 0.3 gram of gold per ton, the Dolphin stock has an indicated resource of 79.800 million tonnes with an average grade of 0.66 gram of gold per tonne (or 1.683 million ounces of gold) and an inferred resource of 248.060 million tonnes with an average grade of 0.61 gram of gold per tonne (or 4.841 million ounces of gold). Included within this new resource is an oxide component.

Additional comments:

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Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-23

Site name(s): Paupers Dream

Site type: Prospect

ARDF no.: LG120

Latitude: 65.0645

Quadrangle: LG A-1

Longitude: 147.4296

Location description and accuracy:

The Paupers Dream prospect is on the divide between Bedrock Creek and Chatham Creek, approximately one-quarter mile southeast of the Cleary Hill mine; it is in the NE1/4NW1/4 sec. 30, T. 3 N., R. 2 E., of the Fairbanks Meridian.

Commodities:

Main: Au

Other: As

Ore minerals: Arsenopyrite, gold

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG205).

The date of discovery of this prospect is not known however Anthony Goessman began prospecting in the area in 1905. In December of 1908, Mr. Goessman transferred his interest in the Wyoming, Paupers Dream, Texas, Alabama, California, New Year's Fraction, Idaho, Colorado and Apex Fraction claims to the Tanana Quartz and Hydraulic Mining Company (Times Publishing Company, 1912).

The Paupers Dream prospect is a north-trending shear zone which extends from the Paupers Dream claim (MS1639) on the south, through the California claim (MS1639), and onto the Texas claim. Where exposed on the Paupers Dream claim, the shear zone dips steeply west and has a high sulfide content, primarily arsenopyrite (Smith, 1913; B 525). Free gold was particularly abundant in weathered portions of the shear zone. This shear trends across the California prospect to the east of the eastern-most shaft on the California prospect (LG121).

Alteration:

Not noted.

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Gold-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Undetermined

Site Status: Active

Workings/exploration:

Smith (1913) describes the shear zone of the Paupers Dream prospect as extending through the California and Texas claims, but there is no detailed description of the workings.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): California

Site type: Prospect

ARDF no.: LG121

Latitude: 65.0677 **Quadrangle:** LG A-1

Longitude: 147.4298

Location description and accuracy:

The California prospect is on the divide between Bedrock Creek and Chatham Creek, approximately one-quarter mile east of the Cleary Hill mine. It is in the SE1/4SW1/4 sec. 19, T. 3 N., R. 2 E., of the Fairbanks Meridian.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG205).

A shaft was sunk on the California prospect on what was believed to be the extension of the Cleary Hill shear zone which was mined extensively on the adjacent Free Gold claim (LG119). The shaft was sunk along the shear zone for 20 feet at a 60S inclination; it then flattened to 40S. for an additional 40 feet (Smith, 1913). A 1- to 3-foot-wide quartz-bearing zone extends nearly to the bottom of the shaft where it is cut off by a flat-lying fault. The ore was reportedly of lower grade than other shear zones in the area; production records are not available. A second shaft was sunk to an unknown depth east of the first shaft but was not accessible in 1912 when visited by Smith (1913). Dump material at this shaft included quartz-feldspar granite which was reportedly associated with a gold-bearing shear zone in the shaft.

Alteration:

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Gold-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Undetermined

Site Status: Active

Workings/exploration:

A shaft was sunk on the California prospect on what was believed to be the extension of the Cleary Hill shear zone (LG119). The shaft was sunk 20 feet at a 60S inclination along the shear zone and then flattened to 40S for an additional 40 feet (Smith, 1913). A second shaft was sunk to an unknown depth east of the first shaft but was not accessible in 1912 when visited by Smith (1913).

Production notes:

There is no record of production but there may have been a small amount.

Reserves:

None.

Additional comments:

References:

Freeman, C.J., 1992, 1991 Golden Summit project final report, volume 2: Historical summary of lode mines and prospects in the Golden Summit project area, Alaska: Avalon Development Corp., 159 p. (Report held by Freegold Recovery Inc. USA, Vancouver, British Columbia.)

Freeman, C.J., 2008, Executive summary report for the Golden Summit project, Fairbanks Mining District, Alaska: Unpublished Technical Report for Freegold Ventures Ltd., 112 p. (posted on www.sedar.com, March 31, 2008).

Smith, P.S., 1913, Lode mining near Fairbanks, in Prindle, L.M., A geologic reconnaissance of the Fairbanks quadrangle, Alaska: U.S. Geological Survey Bulletin 525, p. 153-216.

Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Christina; Vetter; Shelden

Site type: Mine

ARDF no.: LG146

Latitude: 65.069 **Quadrangle:** LG A-1

Longitude: 147.378

Location description and accuracy:

Cobb (1972), loc. 43; SE1/4 section 20, T. 3 N., R. 2 E., of the Fairbanks Meridian. This deposit is on the divide separating Chatham Creek and Wolf Creek. The location accuracy is within 2,000 feet. It is located within the Golden Summit Project area.

Commodities:

Main: Au

Other: Ag, Sb

Ore minerals: Gold, stibnite

Gangue minerals:

Geologic description:

In the 1950s through the 1970s, almost 20,000 ounces of gold was mined from surface and underground workings on the Christina prospect. Exploration continued throughout the 1980s, when several holes were drilled to explore the extent of mineralization in the Christina system. Based on the drilling conducted in the 1980s, reserves have been estimated at over 68,000 ounces of gold. Mineralization is characterized as schist-hosted auriferous shear systems with discrete and/or crushed veins and skarn.

The following geologic description is based on mapping conducted by Fairbanks Exploration Inc. (unpublished report, 1988): The Christina prospect consists of a N 70-80 W, 75 S shear zone. The Christina shear separates Cleary sequence rocks to the north from Fairbanks Schist to the south. The Cleary sequence forms the footwall and consists of interbedded rhyolite metatuff, laminated graphitic quartzite, black graphitic schist and chloritic calc-schist. The hanging wall is composed of biotite-quartz-mica schist, and micaceous quartzite. Both the hanging wall and foot wall are gently folded into east-west trending open folds whose axes plunge 10 to 20 degrees to the west. Amplitudes of the open folds range from 4 to 8 feet and wavelengths range from approximately 10 to 40 feet.

On an outcrop scale, the Christina structure contains a series of parallel quartz veinlets which pinch and swell and form a sinuous outcrop pattern along strike (Freeman and others, 1998). For example, the Christina shear on the west end consists of two discrete, quartz-rich zones with a total thickness of approximately 2 feet. Within 60 feet of strike length to the east, the quartz-rich zones merge and pinch down to a thickness of a few inches. In general, the Christina shear contains less massive quartz and more stockwork quartz to the east.

Hypogene and supergene alteration of the shear and adjacent wallrock has produced reddish hematite after pyrite, greenish scorodite after arsenopyrite, and yellow to white antimony oxides after stibnite, jamesonite and boulangerite. Sulfide and oxide alteration typically form envelopes paralleling the shear. Alteration in the footwall reaches at least 40 feet from the shear in the lower sample area near the Vetter shaft while alteration in the hanging wall is minor. Scorodite and hematite alteration were most prevalent in the western portion of sample area. Antimony oxide alteration becomes pervasive in the central portion of the vein where quartz-free pods of massive, striated stibnite occur.

In 1981, Placid Oil Company completed 4661 feet of diamond drilling in 16 holes on the Christina and Orange Free shear zones. The Orange Free shear zone has a northeast strike nearly perpendicular to the

Christina shear zone. In 1985, Placid Oil utilized reverse circulation rotary drilling techniques to complete 4623 feet of drilling in 18 holes on the Christina shear zone. At a 5-foot mining width, the Christina system had drill indicated reserves of 39,600 tons grading 0.660 ounces of gold per ton and 1.74 ounces of silver per ton in one block; another block containing 73,900 tons grading 0.370 ounce of gold per ton and 0.71 ounce of silver per ton. The Spirit shear zone, located in the hanging wall of the Christina shear zone, contained an estimated reserve of 36,900 tons grading 0.411 ounce of gold per ton and 0.40 ounce of silver per ton over a five-foot mining width (Porterfield and Croff, 1986). The average grade of the Christina shear zone was 0.551 ounce of gold per ton and 0.61 ounce of silver per ton while the Orange Free shear zone averaged 0.167 ounce of gold per ton and 15.4 ounces of silver per ton (Bentzen, 1982).

Alteration:

Hypogene and supergene alteration of the shear and adjacent wallrock has produced reddish hematite after pyrite, greenish scorodite after arsenopyrite, and yellow to white antimony oxides after stibnite, jamesonite and boulangerite. Sulfide and oxide alteration typically form envelopes paralleling the shear. Alteration in the footwall reaches at least 40 feet from the shear near the Vetter shaft while alteration in the hanging wall is minor. Scorodite and hematite alteration were most prevalent in the western portion of the deposit. Antimony oxide alteration becomes pervasive in the central portion where quartz-free pods of massive, striated stibnite occur (Fairbanks Exploration Inc., unpublished report, 1988).

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby (Freeman, 2008).

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: Yes; small

Site Status: Active?

Workings/exploration:

Mineralization on the Kawalita claim, which adjoins the Christina prospect to the south and east, was discovered in 1908 (Smith, 1913). Between 1961 and 1963, Ed Ebbert sank an inclined shaft to a depth of 50 feet on the western end of the Kawalita claim. In 1963, this shaft was deepened to 147 feet and the haulage levels moved into the footwall to better control the heavy ground and water. The underground portion of the mine was closed in 1965, but surface mining on the Kawalita claim continued through 1966.

In late 1977, Tri-Con Mining and Mohawk Oil Company extracted shear zone material from surface cuts on the Christina claim over a strike length of 450 feet to a depth of 15 feet. In early 1978, Placid Oil Company leased the Christina prospect and began an extensive exploration and development program. Geological mapping, VLF and magnetics geophysical surveys, and soil and rock geochemical sampling surveys were followed up in 1978 with dozer trenching and completion of 5174 feet of diamond core drilling in 23 holes. Approximately 2314 feet of diamond core drilling in nine holes as well as extensive soil grid geochemical surveys were completed in 1980 on the Christina shear zone system. In 1981, approximately 1489 feet of trackless underground drifting was driven to and on the Christina shear zone system. The Christina adit was constructed at a design size of 8 feet by 8 feet, however, timbering in some areas reduced the finished dimensions of the workings. During construction of the adit a previously undiscovered shear zone, the Orange Free shear zone, was intersected approximately 300 feet from the portal. In addition to the underground workings, Placid Oil completed 4661 feet of diamond drilling in 16 holes on the Christina and Orange Free shear zone.

Activities on the Christina in 1982 consisted of 13,045 feet of diamond core drilling in 25 holes designed

to test the down-dip extension of the Christina system. In addition, 600 pound bulk samples were collected by Placid Oil Company from the Christina shear zone and the Orange Free shear zone where these shears were exposed in underground workings (Bentzen, 1982). Activities on the Christina prospect in 1983 consisted of 8512 feet of diamond core drilling in 23 holes to further outline ore shoots on the Christina shear zone (Porterfield and Croff, 1986). In 1985 Placid Oil utilized reverse circulation rotary drilling techniques to complete 4623 feet of drilling in 18 holes on the Christina shear zone. In 1986, Fairbanks Exploration Inc. conducted preliminary grab sampling of the Christina adit and Nordale adit dumps (Fairbanks Exploration Inc., unpublished report, 1986).

During July, 1988, Fairbanks Exploration Inc. extracted a bulk sample from a high grade portion of the Christina shear zone in the same area as the 1986 bulk sample and the Mohawk open cut. Initial work on the program entailed stripping overburden to prepare a 12 foot wide pad along the length of the shear zone. Ore was extracted with a backhoe by digging a trough approximately 3 feet wide and 3 feet deep. After each three-foot lift was mined, the footwall and hangingwall were stripped to expose the next lower bench for mining. Two separate areas on the Christina prospect were mined to obtain the 1988 bulk sample. Most of the tonnage (approximately 85 percent) was excavated from the upper sample area; the remaining 15 percent of the ore was extracted from the lower sample area.

During the summer and fall of 1990, Polar Mining conducted bulk sampling of the Christina shear zone near the Kawalita shaft. Unlike the Christina shear in the 1988 bulk sample area, the Polar Mining sample area contains mineralization in both the foot wall and hanging wall of the Christina shear. Polar Mining exposed this shear zone for approximately 500 strike feet. Approximately 1,000 to 1,200 tons of material were extracted from this area and treated in a one stage wet jig. This method of sampling proved unsatisfactory since tailings ponds averaged 0.14 ounce of gold per ton (P. Metz, oral communication, 1991) while the recovered grades averaged 0.030 to 0.033 ounce of gold per ton (D. May, oral communication, 1990).

From 2011 to 2012, Freegold Ventures Ltd. undertook its first drilling in the Christina area, completing 12 holes. In 2011, an induced polarization (IP) and resistivity survey was executed. In 2012, ground based geophysics and shovel soil sampling was conducted. (Abrams and Giroux, 2013).

Production notes:

Between 1957 and 1961, approximately 4900 troy ounces of gold was extracted from 500 feet of surface strike on the Kawalita claim (R. Vetter, oral commun., 1991; Saunders, 1960, ATDM MR 49-4). The shear zone material averaged one troy ounce per ton (Brown, 1962; R. Vetter, 1986, oral commun.). Between 1961 and 1966, an estimated 10,000 ounces of gold was extracted from surface and underground workings on the Christina prospect on the Kawalita claim (R. Vetter, oral commun.1986). In 1963 and 1964, Scott Haskins extracted 962 troy ounces of gold from shear zone material which averaged 1.96 ounces per ton over 350 feet of strike to a depth of 10 feet (S. Haskins, 1986, oral commun.). Mr. Haskins also sunk a 90 foot shaft on the shear zone but production from this shaft was insignificant. In 1967 and 1968 approximately 250 troy ounces of gold was extracted from a 35-foot-deep shaft and 110 feet of surface workings (R. Vetter, oral commun., 1986). In late 1977, Tri-Con Mining and Mohawk Oil Company leased the Christina claim and extracted shear zone material from surface cuts over a strike length of 450 feet to a depth of 15 feet. Material from this open cut averaged approximately 3 troy ounces of gold per ton (R. Vetter, oral commun., 1986). Total production by Tri-Con-Mohawk is estimated at 3375 troy ounces of gold.

Prior to World War II, 20,000 ounces of gold were mined from Christina (Abrams and Giroux, 2013).

Reserves:

None.

Additional comments:

References:

Abrams, M.J., and Giroux, G.H., 2013, Technical Report for the Golden Summit Project, Fairbanks Mining District, Alaska: www.sedar.com (posted on August 8, 2013) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00004004&fileName=/csfsprod/data

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Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

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Freeman, C.J., 2008, Executive summary report for the Golden Summit project, Fairbanks Mining District, Alaska: Unpublished Technical Report for Freegold Ventures Ltd., 112 p. (posted on www.sedar.com, March 31, 2008) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00004004&fileName=/csfsprod/data88/filings/01242796/00000001/k%3A%5CSedar%5Cfilings%5Clivework%5Cwkout%5C19016%5CCS_tech.pdf (as of December 23, 2014).

Porterfield, J. and Croff, C., 1986, Summary report for the Cleary Project, Fairbanks district, Alaska - 1985: Placid Oil Company report, 36 p.

Saunders, R.H., 1960, Notes to accompany prospect map of the Fairbanks-Wolf Creek divide: Alaska Territorial Department of Mines Miscellaneous Report 49-4, 3 p., 2 sheets, scale 1:1200.

Smith, P.S., 1913, Lode mining near Fairbanks, in Prindle, L.M., A geologic reconnaissance of the

Primary Reference: Freeman and others, 1998

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-23

Site name(s): McCarty Shaft

Site type: Mine

ARDF no.: LG150

Latitude: 65.0627

Quadrangle: LG A-1

Longitude: 147.3626

Location description and accuracy:

The McCarty Mine was mined from a shaft on the McCarty vein. It is the westernmost shaft in a group of six claims of the McCarty and American Eagle Mine group (LG152) that lie at the head of Fairbanks Creek, just east of the Wolf Creek divide. The shaft is about 0.5 mile west-southwest of the McCarty Mine labeled on the U.S. Geological Survey Livengood A-1 SW, topographic map. It is in the NW1/2 section 28, T. 3 N., R. 2 E., of the Fairbanks Meridian.

Commodities:

Main: Au

Other:

Ore minerals: Arsenopyrite, gold, stibnite

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG206).

The vein exposed at the McCarty shaft varies from a few inches to five feet wide; it strikes N70W and dips 65SW. It has been traced for 1,200 feet and samples from the surface pits along the whole distance carry gold. There has been considerable shearing along the vein walls and several small faults have been noted. The vein filling is a milky quartz that often contains arsenopyrite (W.J. McCarty, unpublished report, 1932).

By 1930, the McCarty shaft was sunk 60 feet on the south-dipping McCarty shear zone (Stewart, 1931). A drift from the 60-foot level of the shaft extended 135 feet east and 369 feet west. Two raises had been driven to the surface from the 60-foot level, one at the 135-foot station in the east drift and one at the 284-foot station of the west drift. The shaft was being deepened in 1930. Work continued in 1932 to deepen the shaft from 80 to 150 feet and drive production drifts at that level (Pilgrim, 1933). Stopes above the 60-foot level produced a little more than 1,000 tons of ore by 1930. This ore was processed at the nearby McCarty mill northeast of the McCarty shaft. There was at least some production through the 1930s but the details are unknown.

Alteration:

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Gold-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Active

Workings/exploration:

By 1930, the McCarty shaft was sunk 60 feet on the south-dipping McCarty shear zone (Stewart, 1931). A drift from the 60-foot level of the shaft extended 135 feet east and 369 feet west. Two raises had been driven to the surface from the 60-foot level, one at the 135-foot station in the east drift and one at the 284-foot station of the west drift. The shaft was being deepened in 1930. Work continued in 1932 to deepen the shaft from 80 to 150 feet and drive production drifts at that level (Pilgrim, 1933).

Production notes:

Stopes above the 60-foot level produced a little more than 1,000 tons of ore by 1930. This ore was processed at the nearby McCarty mill northeast of the McCarty shaft. There was at least some production through the 1930s but the details are unknown.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1972, Metallic mineral resources map of the Livengood quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-413, 2 sheets, scale 1:250,000.

Freeman, C.J., 2008, Executive summary report for the Golden Summit project, Fairbanks Mining District, Alaska: Unpublished Technical Report for Freegold Ventures Ltd., 112 p. (posted on www.sedar.com, March 31, 2008).

Pilgrim, E.R., 1933, Progress of lode mining in interior Alaska, 1932: Alaska Territorial Department of Mines Miscellaneous Report 194-4, 11 p.

Stewart, B.D., 1931, Report on cooperation between Territory of Alaska and the United States in making mining investigations: Alaska Territorial Department of Mines, Annual Report 1931.

Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Saddle

Site type: Prospect

ARDF no.: LG151

Latitude: 65.0645

Quadrangle: LG A-1

Longitude: 147.3646

Location description and accuracy:

The Saddle prospect is located on the divide between Wolf Creek and Fairbanks Creek. It is in the NW1/4 sec. 28, T. 3 N., R. 2 E., of the Fairbanks Meridian.

Commodities:

Main: Au

Other: Ag, Sb

Ore minerals: Gold, silver, stibnite

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG206).

Prior to 1969, the divide between Fairbanks and Wolf Creeks was host to several producing mines and numerous prospects. The mineralization sought in all of these mines and prospects was high grade gold mineralization that occurred in several veins along several large northwest- and northeast-trending shear zones. Low grade mineralization was known to be present at the McCarty (LG152), Pioneer (LG155) and Pennsylvania (LG156) mines nearby, along the margins of higher grade portions of the shear zones. However, these lower grade zones could not be profitably worked using the existing technology of the 1980s (W. McCarty, oral communication, 1988). In 1969, International Minerals and Chemicals (IMC) began an exploration program designed to test the possibility of surface mining the lower grade material in this area. IMC conducted trenching and rotary drilling targeted at low-grade zones adjacent to previously mined high grade shear zones. hese activities resulted in discovery of the Saddle prospect (Pilkington, 1970).

IMC's initial exploration efforts on the Saddle prospect consisted of geological mapping and sampling of four, previously excavated trenches and open cuts. IMC also excavated 5 new trenches totaling 4,299 feet. Initial sampling was conducted in three trenches previously excavated by Keystone Mines Inc. One of these trenches was located in the footwall of the Pennsylvania shear zone, approximately 1,300 feet northeast of the Pioneer shaft (LG155). This trench exposed a schist-hosted quartz-bearing shear zone oriented N 35 E, 65NW. One-foot channel samples collected in the hanging wall of this shear included 9 feet that with 0.9 part per million (ppm) gold and 58.3 ppm silver. The rocks in the trench consisted of iron-, arsenic- and antimony-oxide-stained silver-gray schist.

IMC also sampled two trenches previously excavated by Keystone Mines approximately 500 feet west of the Pioneer shaft. These trenches cut the Pioneer shear zone which trends N 70 W and dips 50 S. The first trench had 17 feet that assayed 0.54 ppm gold and 75.6 ppm silver; the rocks in the trench consisted of brecciated and silicified quartz-mica schist with minor iron- and antimony-oxide staining. The second trench had 25 feet that assayed 5.68 ppm gold and 142.6 ppm silver in silicified and brecciated quartz-mica schist with weak iron-oxide staining.

To test the down-dip extent of the northeast-trending mineralization identified in the trenches, IMC drilled

using a 5-inch rotary drilling rig (Pilkington, 1970). Two vertical holes totaling 485 feet were drilled.
Based on the results from their trenching and drilling, IMC inferred reserves of 2,111,000 tons with a grade of 0.037 ounces of gold per ton and 0.46 ounces of silver per ton (Pilkington, 1970). These reserves were considered subeconomic at then-current price of gold and silver and IMC terminated its lease with Keystone Mines Inc. in 1970.
In 1987, Keystone Mines leased their holdings to Fairbanks Exploration Inc. In 1988, BP Minerals, acting as operator of a joint venture with Fairbanks Exploration Inc. drilled 7 holes totaling 3,465 feet to confirm the earlier IMC work (Klessig, 1988).

Alteration:

Not specifically noted.

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Gold-quartz veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

In 1969 International Minerals and Chemicals (IMC) began an exploration program designed to address the possibility of surface mining the lower grade material in this area. IMC carried out trenching and rotary drilling targeted at several low-grade zones adjacent to previously mined high-grade shear zones. This resulted in discovery of the Saddle prospect (Pilkington, 1970).
IMC's initial exploration efforts on the Saddle prospect consisted of geological mapping and sampling of four previously excavated trenches and open cuts. IMC also excavated five new dozer trenches totaling 4,299 feet. Initial sampling was conducted in three trenches previously excavated by Keystone Mines Inc. IMC also sampled two dozer trenches previously excavated by Keystone Mines approximately 500 feet west of the Pioneer shaft. IMC used a 5-inch rotary drilling rig to drill two vertical holes that totaled 485 feet (Pilkington, 1970).
In 1987, Keystone Mines leased their holdings to Fairbanks Exploration Inc. In 1988, BP Minerals, acting as operator of a joint venture with Fairbanks Exploration Inc. drilled 7 holes totaling 3,465 feet to confirm the earlier IMC work (Klessig,1988).

Production notes:

None.

Reserves:

Based on the results from their trenching and drilling, IMC inferred reserves of 2,111,000 tons with a grade of 0.037 ounces of gold per ton and 0.46 ounces of silver per ton (Pilkington, 1970). These reserves were considered subeconomic at then-current price of gold and silver and IMC terminated its lease with Keystone Mines Inc. in 1970.

Additional comments:

References:

Freeman, C.J., 1992, 1991 Golden Summit project final report, volume 2: Historical summary of lode mines and prospects in the Golden Summit project area, Alaska: Avalon Development Corp., 159 p. (Report held by Freegold Recovery Inc. USA, Vancouver, British Columbia.)

Freeman, C.J., 2008, Executive summary report for the Golden Summit project, Fairbanks Mining District, Alaska: Unpublished Technical Report for Freegold Ventures Ltd., 112 p. (posted on www.sedar.com, March 31, 2008).

Klessig, P., 1988, 1987-1988 Summary report for the Cleary Summit JV: BP Minerals America, 9 p.

Pilkington, H.D., 1970, Keystone Mines Inc. exploration program summary: International Minerals and Chemicals Corporation, 61 p. , 1 plate.

Primary Reference: Pilkington, 1970; Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): McCarty; American Eagle

Site type: Mine

ARDF no.: LG152

Latitude: 65.0646 **Quadrangle:** LG A-1

Longitude: 147.3536

Location description and accuracy:

The McCarty Mine is labeled on the Livengood A-1 quadrangle; it is in the headwaters of Fairbanks Creek at an elevation of about 1970 feet; it is in the NW1/4NE1/4 section 28, T. 3 N., R. 2 E., of the Fairbanks Meridian.

Commodities:

Main: Au, Sb

Other: Ag, As, Pb, Zn

Ore minerals: Arsenopyrite, gold, jamesonite, pyrite, sphalerite, stibnite

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG206).

The McCarty Mine, also known as the American Eagle Mine, was one of the most productive gold mines in the district. The American Eagle shear zone was mined through the American Eagle adit and American Eagle shaft. Although the old stamp mill and head-frame of the McCarty Mine were still standing in 1992, the underground workings of the mine were inaccessible (Freeman, 1992).

The rocks in the area are mainly quartz-mica schist, but quartzite and calcareous schist also are present locally. The wall rocks adjacent to the vein are sericitized (Joesting, 1941).

Most ore came from the American Eagle vein, which is from one to three feet thick, strikes N60W and dips 55-60SW; it consists of coarsely crystalline quartz with free gold and small amounts jamesonite, stibnite, arsenopyrite and sphalerite (Joesting, 1941, p. 3). Large kidneys of high-grade stibnite with up to 61 percent antimony, occur in segments of the vein (Joesting, 1941, p. 3).

During the winter of 1914-1915, a 450-foot adit was driven on the American Eagle claim and significant of ore were mined during the summer of 1915 (Stewart, 1915). By 1915, the American Eagle shaft had been sunk to a depth of 107 feet (Brooks, 1915). In 1936, United States Smelting Refining and Mining Company (USSR&M) began drifting along the 135-foot level through the American Eagle shaft (Smith, 1939). Extensive development continued in 1938 but the results of sampling were not encouraging (Smith, 1939). In 1938, USSR&M sank 120 feet of shaft in the American Eagle vein, shaft, put in 625 feet of raise, and drove 1,816 feet of drift, crosscuts and adit (Reed, 1939). Mining continued in 1939 when USSR&M completed 465 feet of drifts and crosscuts and nearly 400 feet of raises. The ore was treated in a 2-stamp Nissen mill and the tailings were impounded for later upgrading (Smith, 1941). Mining continued in 1940 when 639 feet of drifts and crosscuts were driven as well as 545 feet of raises. The American Eagle shaft was deepened to 250 feet giving access to over a mile of drifts and 1,750 feet of raises, with workings on the 28-, 135-and 235-foot levels (Smith, 1942). Mining continued in 1941 when USSR&M sank a 65-foot winze from the east end of the 235 level. USSR&M maintained the properties until 1958 but no further mining was reported (Porterfield and Croff, 1986). The stamp mill at the McCarty Mine also processed ore from the Henry Ford group of claims which included ore from both the McCarty vein (LG150) and the

Henry Ford vein (LG153).

In 1984, Placid Oil Company drilled 6,137 feet in 23 diamond core holes. Based on this work, the deposit was estimated to have 15,000 tons of reserves with an average grade of 0.80 ounces of gold per ton. During this period Alaska Mineral Services also constructed a small carbon-in-pulp leach plant (the Haskins mill) at the McCarty Mine to treat mill tailings from the McCarty mine and the Hi Yu mine.

In 1986, Fairbanks Exploration Inc. collected bulk samples from the mill tailings and waste dump. The average gold grades of the mill tailings was 0.091 to 0.168 ounces of gold per ton. However, a portion of the samples was taken from mill tailings which had been re-treated in a cyanide mill erected on the prospect in the early 1980s. Therefore, the results are not an accurate estimate of gold grades for the bulk of the American Eagle mill tailings. Channel sampling of American Eagle mill tailings in 1987 indicated an average grade of 0.123 ounces of gold per ton and 0.74 ounces of silver per ton (Fairbanks Exploration Inc., unpublished report, 1987). The mill tailings were estimated to contain about 3,000 tons of material in 1987. At least some of these mill tailings were processed by Tri-Con Mining after mid-August 1988. The average gold grade of the mine dumps of the McCarty Mine range from 0.132 to 0.158 ounces of gold per ton (Fairbanks Exploration Inc., unpublished report, 1988).

Through 1917, the American Eagle vein produced approximately 967 ounces of gold with an average grade of about one ounce of gold per ton (J. McCarty, unpublished report, 1932). Rock mined during development in 1929 and 1930 produced 1,274 ounces of gold from 1,225 tons of ore (J. McCarty, unpublished report, 1932; Hill, 1931). During 1931, approximately 34 ounces of gold was recovered from 27 tons of material excavated from a surface cut on the American Eagle shear zone (J. McCarty, unpublished report, 1932). Smith (1933b) reported that the McCarty mine was the largest producer in the Fairbanks Creek basin in 1931. A total of 600 tons of ore was milled in 1938 at a rate of 240 tons per month (Reed, 1939). The McCarty mine ceased operations in 1942 due to War Production Board Limitation Order L208. However, about 15 tons of high-grade stibnite ore was shipped from the prospect in 1942. This ore contained 60.66 percent antimony (Joesting, 1942). An additional 5 tons of stibnite ore with 45 percent antimony was shipped from the mine in 1942 (Joesting, 1943; Killeen and Mertie, 1951).

Estimates of the total mine production vary from 26,800 ounces of gold from 16,750 tons of ore (Porterfield and Croff, 1986), to 60,000 ounces of gold (Metz and others ,1987).

Alteration:

Sericitization of country rock.

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Gold-stibnite vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The McCarty Mine, also known as the American Eagle Mine, was one of the most productive gold mines in the district. The American Eagle shear zone was mined through the American Eagle adit and American Eagle shaft. Although the old stamp mill and head-frame of the McCarty Mine were still standing in 1992, the underground workings of the mine were inaccessible (Freeman, 1992).

During the winter of 1914-1915, a 450-foot adit was driven on the American Eagle claim and significant of ore were mined during the summer of 1915 (Stewart, 1915). By 1915, the American Eagle shaft had

been sunk to a depth of 107 feet (Brooks, 1915). In 1936, United States Smelting Refining and Mining Company (USSR&M) began drifting along the 135-foot level through the American Eagle shaft (Smith, 1939). Extensive development continued in 1938 but the results of sampling were not encouraging (Smith, 1939). In 1938, USSR&M sank 120 feet of shaft in the American Eagle vein, shaft, put in 625 feet of raise, and drove 1,816 feet of drift, crosscuts and adit (Reed, 1939). Mining continued in 1939 when USSR&M completed 465 feet of drifts and crosscuts and nearly 400 feet of raises. The ore was treated in a 2-stamp Nissen mill and the tailings were impounded for later upgrading (Smith, 1941). Mining continued in 1940 when 639 feet of drifts and crosscuts were driven as well as 545 feet of raises. The American Eagle shaft was deepened to 250 feet giving access to over a mile of drifts and 1,750 feet of raises, with workings on the 28-, 135-and 235-foot levels (Smith, 1942). Mining continued in 1941 when USSR&M sank a 65-foot winze from the east end of the 235 level. USSR&M maintained the properties until 1958 but no further mining was reported (Porterfield and Croff, 1986). The stamp mill at the McCarty Mine also processed ore from the Henry Ford group of claims which included ore from both the McCarty vein (LG150) and the Henry Ford vein (LG153).

In 1984, Placid Oil Company drilled 6,137 feet in 23 diamond core holes. During this period Alaska Mineral Services also constructed a small carbon-in-pulp leach plant (the Haskins mill) at the McCarty Mine to treat mill tailings from the McCarty mine and the Hi Yu mine.

In 1986, Fairbanks Exploration Inc. collected bulk samples from the mill tailings and waste dump. At least some of these mill tailings were processed by Tri-Con Mining after mid-August 1988.

Production notes:

Total production from the American Eagle shear through 1917 was approximately 967 ounces of gold with an average grade of about one ounce of gold per ton (J. McCarty, unpublished report, 1932). Milling of development material in 1929 and 1930 produced 1,274 ounces of gold from 1,225 tons of ore, averaging 1.04 ounces of gold per ton (J. McCarty, unpublished report, 1932; Hill, 1931). During 1931, approximately 34 ounces of gold was recovered from 27 tons of material excavated from a surface cut on the American Eagle shear zone (J. McCarty, unpublished report, 1932). Smith (1933, B 844) reported that the McCarty mine was the largest producer in the Fairbanks Creek basin in 1931. A total of 600 tons of ore from the American Eagle workings was milled in 1938 at a rate of 240 tons per month (Reed, 1939).

The McCarty mine ceased operations in 1942 due to War Production Board Limitation Order L208. However, about 15 tons of high-grade stibnite ore was shipped from the prospect in 1942. This ore graded 60.66 percent antimony (Joesting, 1942). In addition, about 5 tons of stibnite ore grading 45 percent antimony was also shipped from the American Eagle mine in 1942 (Joesting, 1943; Killeen and Mertie, 1943).

Total production from the McCarty mine workings (American Eagle, Henry Ford and McCarty shear zones) is estimated at 26,800 ounces from 16,750 tons of ore, averaging 1.6 ounces of gold per ton (Porterfield and Croff, 1986). However, Metz and others (1987) estimate production from the McCarty mine was approximately 60,000 ounces of gold.

Reserves:

In 1984, Placid Oil Company drilled 6,137 feet in 23 diamond-core holes. Based on this work, the deposit was estimated to have 15,000 tons of reserves with an average grade of 0.80 ounces of gold per ton.

In 1986, Fairbanks Exploration Inc. collected bulk samples from the mill tailings and waste dumps. The mill tailings were estimated to contain about 3,000 tons of material in 1987. At least some of this material was processed by Tri-Con Mining after mid-August 1988.

Additional comments:

References:

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Freeman, C.J., 2008, Executive summary report for the Golden Summit project, Fairbanks Mining District, Alaska: Unpublished Technical Report for Freegold Ventures Ltd., 112 p. (posted on www.sedar.com, March 31, 2008).

Joesting, H.R., 1941, The McCarty mine, Fairbanks mining district, Alaska: Alaska Territorial Department of Mines Prospect Evaluation 49-5 , 6 p.

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Joesting, H.R., 1943, Strategic mineral occurrences in interior Alaska, supplement to pamphlet no. 1: Alaska Territorial Department of Mines Pamphlet 2, 26 p.

Killeen, P.L., and Mertie, J.B., 1951, Antimony ore in the Fairbanks District, Alaska: U.S. Geological Survey Open-File Report 51-46, 43 p.

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Pilgrim, E.R., 1933, Progress of lode mining in interior Alaska, 1932: Alaska Territorial Department of Mines Miscellaneous Report 194-4, 11 p.

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Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Henry Ford

Site type: Mine

ARDF no.: LG153

Latitude: 65.0656 **Quadrangle:** LG A-1

Longitude: 147.3574

Location description and accuracy:

The Henry Ford shaft is the northernmost shaft on a group of six claims of the McCarty/ American Eagle Mine (LG152). The shaft is at the head of Fairbanks Creek, just east of the Wolf Creek divide. It is in the NW1/2 sec. 28, T. 3 N., R. 2 E., of the Fairbanks Meridian.

Commodities:

Main: Ag, Au

Other: As

Ore minerals: Arsenopyrite, gold

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008). Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG206).

Although sometimes considered separately, by the 1930s, the Henry Ford deposit was part of or at least mined in conjunction with the the McCarty (American Eagle) Mine (LG152). The upper Henry Ford vein strikes N40E and dips northwest. The quartz vein carries free gold and considerable arsenopyrite. Concentrates from arsenopyrite-rich samples from one of the surface pits contain some gold and 1,600 ounces of silver per ton. The vein is cut in three places by quartz stringers, all of which carry gold (W. J. McCarty, unpublished report, 1932).

Alteration:

Not specified.

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Gold-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Undetermined

Site Status: Active

Workings/exploration:

Shaft on a vein.

Production notes:

Included in the production from the McCarty/American Eagle Mine (LG152).

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1972, Metallic mineral resources map of the Livengood quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-413, 2 sheets, scale 1:250,000.

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Killeen, P.L., and Mertie, J.B., 1951, Antimony ore in the Fairbanks District, Alaska: U.S. Geological Survey Open-File Report 51-46, 43 p.

Porterfield, J. and Croff, C., 1986, Summary report for the Cleary Project, Fairbanks district, Alaska - 1985: Placid Oil Company report, 36 p.

Smith, P.S., 1913, Lode mining near Fairbanks: U.S. Geological Survey Bulletin 542-F, p. 137-202.

Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Ebbert

Site type: Mine

ARDF no.: LG154

Latitude: 65.0666 **Quadrangle:** LG A-1

Longitude: 147.3613

Location description and accuracy:

The Ebbert prospect is in upper Wolf Creek approximately 2,000 feet northwest of the McCarty mine (LG152); it is in the SE1/4SW1/4 section 21, T. 3 N., R. 2 E., of the Fairbanks Meridian.

Commodities:

Main: Au

Other: Ag, As, Pb, Sb, Sn

Ore minerals: Arsenopyrite?, galena?, gold, jamesonite, stibnite

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG206).

The first work on the Ebberts Mine was done by Hugh M. Hinton, who hand trenched the prospect (Saunders, 1960). The prospect was inactive until about 1950 when it was dozer trenched by United States Smelting Refining and Mining (USSR&M). Initially the exploration was for antimony. In June 1960, Arctic Alaska Fisheries and Enterprises Inc. cut several dozer trenches on the prospect and exposed the Ebberts shear zone which is sometimes referred to as the Jamesonite shear zone (Saunders, 1960). The Ebbert deposit was mined for antimony from a shallow shaft and in open cuts from 1961 through 1964 by Ed Ebbert (R. Vetter, oral communication, 1986). The mine was idle until 1967 when Ed Ebbert reopened the shaft and trenches after finding high gold values in quartz-rich portions of the shear zone. In 1969, the Ebberts Mine was sampled by International Minerals and Chemicals (IMC) in the vicinity of the main shaft (Pilkington, 1970). IMC also excavated a dozer trench which crossed the Ebberts shear 200 feet east of the Ebberts shaft.

The deposit consists of gold-quartz-rich portions of a shear zone. The lode was sampled and mapped in 1968; it contained extremely high gold, silver, lead, antimony, arsenic and tin values (Forbes and others, 1968). The quartz veins and wall rock in old prospect trenches carry as much as 2.87 parts per million (ppm) gold (Pilkington and others, 1969). The veins predominantly trend in two directions: about N70W with a dip of 55S, and about N65E with a dip of 70S. Altered schist that extends as much as 1 foot into the footwall of the veins contain significant gold. Grab samples of the veins contained 0.05 and 2.87 ppm Au (Pilkington and others, 1969). In 1969, the Ebberts Mine was sampled by International Minerals and Chemicals (IMC) in the vicinity of the main shaft. Here the, the shear zone trends N85W and dips 60S; it consists of narrow quartz stockwork zones on the hanging wall and foot wall, separated by altered schist. Stibnite and jamesonite occur on the hanging wall and in kidney shaped masses. The mineralized zone is 13 feet wide and averaged 0.06 ounce of gold per ton and 8.4 ounces of silver per ton (Pilkington, 1970). IMC also excavated a dozer trench which crossed the Ebberts shear 200 feet east of the Ebberts shaft. Samples from the trench contained 0.046 ounce of gold per ton and 0.32 ounce of silver per ton over 25 feet.

Alteration:

Schist is altered near the veins.

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Gold-silver(-arsenic-antimony) vein along shear zone and antimony vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The first work on the Ebberts deposit was done by Hugh M. Hinton who hand trenched the prospect (Saunders, 1960). The prospect was inactive until about 1950 when it was dozer trenched by United States Smelting Refining and Mining (USSR&M). In June 1960, Arctic Alaska Fisheries and Enterprises Inc. cut several dozer trenches on the prospect and exposed the Ebberts shear zone which is sometimes referred to as the Jamesonite shear zone (Saunders, 1960). The mine was idle until 1967 when Ed Ebbert reopened the shaft and trenches (Anderson and Johnson, 1970). In 1969, the Ebberts Mine was sampled by International Minerals and Chemicals (IMC) in the vicinity of the main shaft (Pilkington, 1970). IMC also excavated a dozer trench which crossed the Ebberts shear 200 feet east of the Ebberts shaft.

Production notes:

The Ebbert prospect was mined for antimony from a shallow shaft and open cuts from 1961 through 1964 by Ed Ebbert (R. Vetter, oral commun., 1986).

Reserves:

None.

Additional comments:

References:

Forbes, R.B., Pilkington, H.D., and Hawkins, D.B., 1968, Gold gradients and anomalies in the Pedro Dome-Cleary Summit area, Fairbanks district, Alaska: U.S. Geological Survey Open-File Report 324 (68-108), 43 p.

Freeman, C.J., 2008, Executive summary report for the Golden Summit project, Fairbanks Mining District, Alaska: Unpublished Technical Report for Freegold Ventures Ltd., 112 p. (posted on www.sedar.com, March 31, 2008).

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Primary Reference: Pilkington, 1970; Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Pioneer

Site type: Mine

ARDF no.: LG155

Latitude: 65.0676

Quadrangle: LG A-1

Longitude: 147.3573

Location description and accuracy:

The Pioneer Mine is on the divide between Fairbanks Creek and Wolf Creek along the old Circle-Fairbanks trail; it is in the SE1/4SW1/4 sec. 21, T. 3 N., R. 2 E., of the Fairbanks Meridian. The property consists of several claims: the War Eagle, Leroy, Pioneer, Iron Mask, Black Warrior and Willie. Most production came from the Pioneer claim.

Commodities:

Main: Au

Other: Sb

Ore minerals: Gold, stibnite

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG206).

In 1904, Angus McDougall was the first to prospect in the vicinity of the Pioneer Mine (Times Publishing Company, 1912). He and his partners Julius Hoffman, Mr. McGowan and Mr. Clark, eventually staked the Pioneer group which consisted of the War Eagle, Leroy, Pioneer, Iron Mask and Black Warrior claims (Times Publishing Company, 1912). The adjacent Willie claim was staked in 1909 by Lawrence J. McCarty. By 1910, the Willie claim was owned by Frank Lawson and Lawrence McCarty and an unspecified amount of ore had been custom milled from the prospect (Brooks, 1910). In the winter of 1910, shaft sinking began on the Willie claim by Lawrence McCarty's sons, Lawrence Junior, age 9 and Willie, age 7. The two boys were assisted by their older sister who acted as surface superintendent (Times Publishing Company, 1912).

By 1912, the Pioneer shaft had been sunk to a depth of 120 feet and two other shafts sunk to depths of 49 and 85 feet. Additional prospect pits exposed the shear zone along 800 feet along strike. In early 1912, a 50-foot-shaft was sunk on the Iron Mask claim. By mid-1912, the westernmost claim of the Pioneer group, the War Eagle claim was traced in several 8- to 10-foot deep pits (Smith, 1913; B 525). On the Leroy claim, two shafts were sunk on one of the lodes that was exposed on the War Eagle claim. Development work on the Pioneer claim included about 200 feet of drifts to the east and west at the 110-foot level (Smith, 1913a). Fifty feet of drift was completed from the 75-foot level in the next shaft to the east, and still further east, a 38-foot-deep shaft was sunk. The farthest east claim of the Pioneer group, the Black Warrior claim was explored by test pits, 12- to 15-feet deep every 50 feet, along 400 to 500 feet of strike. By 1916, two shafts had been sunk on the Pioneer claim on an inch-thick antimony-bearing shear zone (Mertie, 1918).

In 1951, dozer trenching at the Pioneer Group exposed the tops of the old drifts on the antimony-bearing, shear zone (Saunders, 1960). A shaft was sunk an additional 20 feet to determine if high grade stibnite mineralization was present (Saunders, 1960). In 1969, the Pioneer group of claims were examined by dozer trenching and rotary drilling. Placid Oil Company was active in 1984 and 1985 they drilled 2,154.7 feet of core hole at 13 sites near the Pioneer and Pennsylvania mines (Porterfield and Croff, 1986). In 1988, BP

Minerals did some reverse-circulation drilling in the Pioneer mine area (Freeman, 1992).

The Pioneer shafts and prospect pits exposed a shear zone that extends for over 800 feet along strike. By 1912, $22,000 worth of gold (1,064 ounces) had been mined; the average width of the vein was 34 inches, and the average grade was 2.2 ounces of gold per ton. The highest value was obtained from a 22 ton shipment to the Chena mill which returned an average of $180 gold per ton (8.7 ounces of gold per ton) (Times Publishing Company, 1912). By 1916, two shafts had been sunk on the Pioneer claim on an 18-inch-thick antimony-bearing shear zone oriented N85E, 80 N. (Mertie, 1918). Five hundred feet west of the antimony-bearing zone, three gold-bearing quartz stockworks along shear zones were exposed. Two of these zones were from 12- to 14-inches-thick and were oriented N35-45E, 60-80NW. The third zone had an east strike and a dip of 45S. These exposures averaged about $10 gold per ton or 0.5 ounces of gold per ton (Mertie, 1918).

The Willie claim had a 4- to 5-foot-wide iron-oxide-stained quartz stockwork zone oriented N50E, 80SE (Prindle, 1910). Free gold could be panned for 1,000 feet along its strike. Shaft sinking in 1910 revealed a 10-inch-thick high-grade portion of the shear zone.

The Iron Mask claim contained an eight-foot-wide mineralized shear zone oriented east that dipped 65S. A 50-foot shaft was sunk on this claim by late 1912 and the ore averaged $25 gold per ton (about 1.2 ounces of gold per ton) (Times Publishing Company, 1912). A three-foot-wide, high-grade zone was also exposed on the Iron Mask claim. This zone has a hanging wall of bleached, white, decomposed rock believed to be a fine-grained intrusive (Smith, 1913, B 525, Smith, 1913, B 542). The gold-bearing portion of the lode is in fault contact with the decomposed intrusive rock. On the Iron Mask claim, an 8-inch-thick stibnite-bearing shear zone was exposed which strikes N80W and dips 75SW. Farther to the east but still on the Iron Mask claim, a 4-foot-thick shear zone carrying low grade gold and stibnite mineralization was exposed and traced into Fairbanks Creek. At the War Eagle claim, visible gold was found in two separate zones which averaged 1 to 2 feet wide (Smith, 1913, B 525). In the Leroy claim, the high grade portion of the shear zone averaged 1 foot wide (Smith, 1913, B 525). The farthest east claim, the Black Warrior, had test pits that exposed high grade. gold-quartz shear zones which averaged 8 to 10 inches wide.

The average fineness of the Pioneer group gold through 1912 was 814.5 (Smith, 1913, B 525).

Alteration:

Yellowish oxidation products of stibnite common in quartz.

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Gold and stibnite in quartz shear zones.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Active

Workings/exploration:

In 1904, Angus McDougall was the first to prospect in the vicinity of the Pioneer mine (Times Publishing Company, 1912). He and his partners Julius Hoffman, Mr. McGowan and Mr. Clark, eventually staked the Pioneer group, which consisted of the War Eagle, Leroy, Pioneer, Iron Mask and Black Warrior claims (Times Publishing Company, 1912). The adjacent Willie claim was staked in 1909 by Lawrence J. McCarty. By 1910, the Willie claim was owned by Frank Lawson and Lawrence McCarty and an unspecified amount of ore had been custom milled from the prospect (Brooks, 1910). In the winter of 1910, shaft sinking was begun on the Willie claim by Lawrence McCarty's sons, Lawrence Junior, age 9 and

Willie, age 7. The two boys were assisted by their older sister who acted as surface superintendent (Times Publishing Company, 1912).

By 1912, the Pioneer shaft had been sunk to a depth of 120 feet and two other shafts sunk to depths of 49 and 85 feet. Additional prospect pits exposed the shear zone along 800 feet along strike. In early 1912, a 50-foot-shaft was sunk on the Iron Mask claim. By mid-1912, the western-most claim of the Pioneer group, the War Eagle claim was traced in several 8- to 10-foot deep pits (Smith, 1913, B 525). On the Leroy claim, two shafts were sunk on one of the lodes that was exposed on the War Eagle claim. Development work on the Pioneer claim included about 200 feet of drifts to the east and west at the 110-foot level (Smith, 1913, B 525). Fifty feet of drift was completed from the 75-foot level in the next shaft to the east, and still further east, a 38-foot-deep shaft was sunk. The farthest east claim of the Pioneer group, the Black Warrior claim was explored by test pits, 12- to 15-feet deep, every 50 feet along 400 to 500 feet of strike. By 1916, two shafts had been sunk on the Pioneer claim on an inch-thick antimony-bearing shear zone (Mertie, 1918).

In 1951, dozer trenching at the Pioneer Group exposed the tops of the old drifts on the antimony-bearing, shear zone (Saunders, 1960). A shaft was sunk an additional 20 feet to determine if high grade stibnite mineralization was present (Saunders, 1960). In 1969, the Pioneer group of claims were examined by dozer trenching and rotary drilling. In 1984 and 1985, Placid Oil Comp was active in the area and drilled 13 holes near the Pioneer and Pennsylvania Mines that totaled 2,145.7 feet of core. In 1988, BP Minerals did some reverse-circulation drilling in the Pioneer mine area (Freeman, 1992).

Production notes:

Production from the Pioneer mine through 1931 was estimated at $14,000 (677 ounces). This production was primarily from above the 50-foot level of the main shaft (Hill, 1933).

Reserves:

None.

Additional comments:

References:

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Prindle, L.M., and Katz, F.J., 1913, Detailed description of the Fairbanks district, in Prindle, L.M., A geologic reconnaissance of the Fairbanks quadrangle, Alaska: U.S. Geological Survey Bulletin 525, p. 59-152.

Saunders, R.H., 1960, Notes to accompany prospect map of the Fairbanks-Wolf Creek divide: Alaska Territorial Department of Mines Miscellaneous Report 49-4, 3 p., 2 sheets, scale 1:1200.

Smith, P.S., 1913, Lode mining near Fairbanks, in Prindle, L.M., A geologic reconnaissance of the Fairbanks quadrangle, Alaska: U.S. Geological Survey Bulletin 525, p. 153-216.

Smith, P.S., 1913, Lode mining near Fairbanks: U.S. Geological Survey Bulletin 542-F, p. 137-202.

Times Publishing Company, 1912, Tanana Magazine, Quartz Edition: Fairbanks, Alaska, Times Publishing Company, 76 p.

Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Pennsylvania

Site type: Mine

ARDF no.: LG156

Latitude: 65.0686 **Quadrangle:** LG A-1

Longitude: 147.3575

Location description and accuracy:

The Pennsylvania Mine is on the ridge east of the head of Wolf Creek; it is in the SE1/4SW1/4 sec. 21, T. 3 N., R. 2 E., of the Fairbanks Meridian. The location is for the northwest shaft which is on the divide between the head of Wolf Creek and Fairbanks Creek.

Commodities:

Main: Au

Other: Sb

Ore minerals:

Gangue minerals: Quartz

Geologic description:

Note: As of 2008, this site and several others in the vicinity are being explored as a single entity by Freegold Ventures Inc. (Freeman, 2008) Considerable new mineralization has been discovered that indicates this is part of a larger mineralized system that is described as a separate ARDF site (LG206).

Free gold occurs at the Pennsylvania Mine associated with antimony oxides in white quartz. The mineralization is along a shear zone that strikes N76W and dips 56SW (Smith, 1913). The high grade portion of the shear zone average 12 to 15 inches thick.

The Pennsylvania claim was staked in October 1911 by Lawrence J. McCarty and soon became part of the McCarty group of claims which included the Pennsylvania, Willie, Dorothy, Marie, Kentucky and Freegold claims (Times Publishing Company, 1912).

In late 1911, an 8.5-ton sample of material from the Pennsylvania Mine averaged $100 gold per ton (4.8 ounces of gold per ton). A second lot of ore was custom milled in early 1912 and averaged $52 gold per ton (2.5 ounces of gold per ton). By 1913, the Pennsylvania shaft was 146 feet deep, and between 1922 and 1931, the west drift on the 50-foot level was 70 feet long and stoped to the surface. This work produced approximately $10,000 worth of gold (484 ounces) (Hill, 1933).

The Pennsylvania mine was examined in 1942 as a possible source of antimony. Samples from a one-half ton stockpile of oxidized stibnite near the shaft had an average grade of 57.01 percent antimony but the mine did not possess sufficient quantity of this material to warrant additional exploration or development (Killeen and Mertie, 1951).

Alteration:

Stibnite altered to antimony oxides.

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Gold-stibnite-quartz veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Active

Workings/exploration:

By late 1912, the Pennsylvania shaft was 140 feet. deep. Drifts were driven 20 feet to the northwest and southeast on the 140-foot level. At the 50- foot level, drifts extended 50 feet northwest and 50 feet southeast with a raise connected to the surface from the southeast drift (Times Publishing Company, 1912). The ore was hoisted using a Little Giant steam hoist and was shipped to the company mill constructed on upper Fairbanks Creek by L.J. McCarty and Emil C. Fursteneau. This mill began operation in September, 1912 and consisted of a Little Giant #3 roll mill which fed minus-40-mesh pulp over amalgamation plates (Times Publishing Company, 1912). The tailings were not impounded. The mill had a capacity of 8 to 20 tons of ore per day (Smith, 1913). By mid-1913, the Pennsylvania shaft was 146 feet deep (Chapin, 1914). Some time between 1922 and 1931, the western drift on the 50-foot-level was extended to a length of 70 feet and stoped to the surface. The shaft and workings were flooded in 1931.

Production notes:

In late 1911, an 8.5 ton sample of material from the Pennsylvania Mine averaged $100 per ton in gold (4.8 ounces of gold per ton). A second lot of Pennsylvania ore was custom milled in early 1912 and averaged $52 per ton (2.5 ounces of gold per ton). The mine was not in production in 1913. The mine was examined in 1922 by Stewart (1922) and Davis (1922) but was not in production at that time. Some time between 1922 and 1931, the western drift on the 50-foot level was extended to a length of 70 feet and stoped to the surface; this work produced about $10,000 in of gold (484 ounces) (Hill, 1933).

Reserves:

None.

Additional comments:

References:

Freeman, C.J., 1992, 1991 Golden Summit project final report, volume 2: Historical summary of lode mines and prospects in the Golden Summit project area, Alaska: Avalon Development Corp., 159 p. (Report held by Freegold Recovery Inc. USA, Vancouver, British Columbia.)

Hill, J.M., 1933, Lode deposits of the Fairbanks district, Alaska: U.S. Geological Survey Bulletin 849-B, p. 29-163.

Killeen, P.L., and Mertie, J.B., 1951, Antimony ore in the Fairbanks District, Alaska: U.S. Geological Survey Open-File Report 51-46, 43 p.

Smith, P.S., 1913, Lode mining near Fairbanks, in Prindle, L.M., A geologic reconnaissance of the Fairbanks quadrangle, Alaska: U.S. Geological Survey Bulletin 525, p. 153-216.

Times Publishing Company, 1912, Tanana Magazine, Quartz Edition: Fairbanks, Alaska, Times Publishing Company, 76 p.

Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Goose Creek

Site type: Prospect

ARDF no.: LG161

Latitude: 65.077 **Quadrangle:** LG A-1

Longitude: 147.36

Location description and accuracy:

The location given is the approximate center of the Goose Creek soil anomaly; it is on an unnamed creek between Goose Creek and upper Wolf Creek in the NW1/4 section 21, T. 3 N., R. 2 E., of the Fairbanks Meridian. The location is accurate within 500 feet.

Commodities:

Main: Au

Other: Ag, As, Bi, Pb, Sb, Zn

Ore minerals: Arsenopyrite, pyrite, sphalerite, stibnite, tetrahedrite

Gangue minerals: Sericite

Geologic description:

In 1996, Freegold Recovery Inc. outlined a +5,000 foot long multi-element soil anomaly on the Goose Creek prospect (Freeman and others, 1998). The core of the grid, covering an area approximately 2,000 feet by 1,000 feet, averaged over 100 parts per billion (ppb) gold, three times the mean gold value over the project area. This anomaly trends N 80 W and was extended to a length of 10,000+ feet in 1997. The anomaly is located in lower plate rocks of the Fairbanks Schist and appears to have secondary anomalies associated with district scale northeast trending structures similar to those on the Cleary Hill (ARDF no. LG119), Dolphin (ARDF no. LG112) and Wolf Creek (ARDF no. LG138) prospects. Mineralization is characterized as intrusion and schist-hosted, gold bearing stockwork veins, shears and disseminations. Initial drilling in late 1997 consisted of 5,038 feet of reverse circulation drilling in 11 holes. Preliminary assay results from one hole returned intercepts averaging up to 0.118 ounce of gold per ton over 160 feet in highly sericitized chlorite schist cut by 10 to 20 percent white quartz veins. Anomalous gold is associated with anomalous arsenic, antimony, lead, silver, and zinc. Pyrite is relatively abundant in the sericitic alteration envelope but does not appear to be correlative with gold values.

In 1998, 10 reverse circulation holes totaling 5,017 feet were drilled in the Goose Creek prospect to determine the extent and geometry of the higher grade intercepts encountered in the 1997 drill program. Results indicate that mineralization is controlled by an 85 degree south dipping structure. The gold-bearing alteration envelope around this structure is restricted in size indicating limited potential for bulk tonnage mineralization in this area (Freeman and others, 1998).

Alteration:

Sericitic alteration (Freeman and others, 1998).

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby (Freeman and others, 1998).

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

Soil sampling in 1996 lead to the discovery of a multi-element soil anomaly more than 5,000 feet long. Initial drilling in late 1997 consisted of 5,038 feet of reverse circulation drilling in 11 holes. In 1998, 10 reverse circulation holes totaling 5,017 feet were drilled (Freeman and others, 1998).

In 2011, an induced polarity (IP) and resistivity survey was completed by Freegold Ventures Ltd., indicating potential areas of mineralization. Freegold executed soil sampling between 2011 and 2012 (Abrams and Giroux, 2013).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Primary Reference: Freeman and others, 1998

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-23

Site name(s): Too Much Gold Creek

Site type: Mine

ARDF no.: LG169

Latitude: 65.067

Quadrangle: LG A-1

Longitude: 147.297

Location description and accuracy:

Too Much Gold Creek is a tributary of Fairbanks Creek, located approximately 4 miles from Cleary Summit, and accessible via the Fairbanks Creek road. The location given is near the confluence with Fairbanks Creek on the north side of the road. The location is accurate within 1,000 feet.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Evidence of recent placer mining (1980's?) near the confluence of Too Much Gold Creek and Fairbanks Creek was observed in 1999 (J. Schaefer, field observation, 1999). Bedrock in the area is quartz muscovite schist, quartzite and chlorite quartzose schist (Newberry and others, 1996). Too Much Gold Creek drains an area that includes several prospects and mines that have been worked for their gold in quartz veins (Too Much Gold Creek Divide, ARDF no. LG176; Basham, ARDF no. LG177; Excelsior, ARDF no. LG179; Plumbum, ARDF no. LG168; Governor, ARDF no. LG172; and Whitehorse, ARDF no. LG170).

The original record from 1999 reported this site as a mine. It is currently reported as a prospect. Gold mineralization on the property occurs in three main forms, including intrusive-hosted sulfide-quartz stockwork veinlets (such as the Dolphin gold deposit), auriferous sulfide-quartz veins (exploited by historic underground mines), and shear-hosted gold-bearing veinlets. All three types are considered to be part of a large-scale intrusive-related gold system (or 'IRGS') on the property. (Abrams and Giroux, 2013).

This prospect is part of the Golden Summit property (Abrams and Giroux, 2013; Walcott, 2013).

Alteration:

Not reported.

Age of mineralization:

Not reported.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au-PGE (Cox and Singer, 1986; model 39a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Undetermined

Site Status: Inactive

Workings/exploration:

The ground near the mouth of the creek, just north of Fairbanks Creek road appears to have been placer mined. The amount of vegetation suggests that this mining probably took place in the 1980s (J. Schaefer, field observation, 1999).

British Petroleum/Fairbanks Exploration performed trenching and reverse circulation drilling from 1987-1988 (Abrams and Giroux, 2013).

The original record from 1999 reported this site as a mine. It is currently reported as a prospect. Gold mineralization on the property occurs in three main forms, including intrusive-hosted sulfide-quartz stockwork veinlets (such as the Dolphin gold deposit), auriferous sulfide-quartz veins (exploited by historic underground mines), and shear-hosted gold-bearing veinlets. All three types are considered to be part of a large-scale intrusive-related gold system (or 'IRGS') on the property. (Abrams and Giroux, 2013).

Production notes:

No record of production.

Reserves:

None.

Additional comments:

References:

Abrams, M.J., and Giroux, G.H., 2013, Technical Report for the Golden Summit Project, Fairbanks Mining District, Alaska: www.sedar.com (posted on August 8, 2013) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00004004&fileName=/csfsprod/data145/filings/02094027/00000001/k%3A%5Cfilings%5Clivework%5Cwkout%5C39198%5CTech_Report.pdf (as of December 23,2014).

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Walcott, K., Freegold Ventures, 2013, Golden Summit Project Updates, Fairbanks District, Alaska: Alaska

Primary Reference: Abrams and Giroux, 2013

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-23

Site name(s): Hi Yu; Crites and Feldman

Site type: Mine

ARDF no.: LG182

Latitude: 65.0753

Quadrangle: LG A-1

Longitude: 147.2818

Location description and accuracy:

The coordinates given here for the Hi Yu Mine are at the main portal of the mine on the west side of Moose Creek, about 0.5 miles above its mouth on Fairbanks Creek. The underground workings extend west-northwest for more than 5,000 feet. The portal is about 0.5 mile east-northeast of the center of section 23, T. 3 N., R. 2 E., of the Fairbanks Meridian.

Commodities:

Main: Au

Other: Ag, Pb, Sb, Zn

Ore minerals: Argentiferous galena, arsenopyrite, boulangerite, gold, pyrite, sphalerite, stibnite

Gangue minerals: Quartz

Geologic description:

The Hi Yu Mine was one of the major producers in the Fairbanks district prior to WWII. This mine consists of several quartz veins along a prominent shear zone, and most offset by faults. The veins contain free gold and sulfides including stibnite, argentiferous galena, arsenopyrite, boulangerite, pyrite, and sphalerite. The mineralization is probably mid-Cretaceous based on its similarities to other deposits in the area (McCoy and others, 1997).

By 1913, the Hi Yu vein and shear zone had been traced for over 900 feet along strike and 625 feet down dip, and the Main adit had been driven 450 feet from the south side of Moose Creek (Prindle, 1913; Smith, 1913a). A second adit known as the Lower adit, was collared in 1913. By 1914, the northwest-trending, south-dipping shear zone and associated veins was known to be over 3,000 feet long on the surface and contained several ore shoots (Chapin, 1914). A twenty-three-ton lot of ore from the first 150 feet of the Main adit assayed 6.29 ounces of gold per ton. This gold had a fineness of 850 to 857 and contained 13 to 14 percent silver (Chapman, 1914). By 1916, the Lower adit had been abandoned and a new adit, the Hi Yu adit, was collared on the Hi Yu claim approximately 500 feet above the level of Moose Creek (Stewart, 1922). At the 350 foot station of the Hi Yu adit, the lode bifurcated. The northern branch, trends N75W and dips steeply south; underground it extended 125 feet from the split and could be followed on the surface for over 2,000 feet from the portal of the Upper adit (Mertie, 1918). By 1920, the Hi-Yu adit had been driven 1,300 feet. The average grade of the ore in 1922 was $25 to $30 gold per ton (1.21 to 1.45 ounces of gold per ton). Tailings from the stamp mill were being collected in a settling pond since they contained approximately $4.00 in gold per ton (0.20 ounce of gold per ton) (Stewart, 1922).

Production records indicate that by 1933, the Hi-Yu Mine had produced 13,560 ounces of gold from 8,200 tons of ore with an average grade of 1.65 ounces of gold per ton (Hill, 1933). In August of 1933, a rich ore shoot was discovered in the Upper adit on the Helen S claim. Between August 1933 and June, 1934, this shoot produced 3,010 ounces of gold from ore that averaged 2.1 ounces of gold per ton (Joralemon, 1934).

In the fall of 1941, a 2-foot-wide stibnite pod was relocated on the Antimony shear zone approximately 600 feet north of the portal of the Main adit. This material contained 60 to 66 percent antimony, 0.01 ounce of gold per ton, and 1 ounce of silver per ton (Joesting, 1942). Approximately 15 tons of this material was

identified in surface pits by 1942 (Joesting, 1943).
Fairbanks Exploration Inc. conducted limited sampling of the Hi-Yu mine waste dumps and stamp sand tailings ponds in 1986 (Fairbanks Exploration Inc., unpublished report, 1986). Samples of the waste dumps from both levels of the mine indicate that the mineralization is hosted by siliceous exhalite, metarhyolite tuff, and black carbonaceous quartzite of the Cleary Sequence. The mineralization in these rocks consists of fine-grained, stratiform arsenopyrite and pyrite in metavolcanic lenses and stibnite-pyrite mineralization in pelitic host rock. Intense argillic alteration is all but destroyed by the nearly complete oxidation of most samples. Samples from the dump of the Main adit dump contained 260 to 3,200 parts per billion (ppb) gold, associated with highly anomalous arsenic, antimony and silver (Fairbanks Exploration Inc., unpublished report, 1986).
Samples of mill tailings collected from the tailings pond below the mill contained up to 1.701 ounces of gold per ton, up to 6.14 ounces of silver per ton, and anomalous arsenic and antimony (Fairbanks Exploration Inc., unpublished report, 1986). A significant proportion of the gold in the mill tailings is in -30-mesh material and much of the sulfides are concentrated in lenses in the tailings. In 1988, Tri-Con Mining mined 14,600 tons of material from the mill tailings of the Hi-Yu Mine and the McCafty Mine (LG152), the material averaged 0.10 ounce of gold per ton (Freeman, 1992). During this work, Ti-Con re-milled all of the Hi Yu mill tailings.
In 1998, Freegold drilled two holes near the Hi Yu vein. One tested a zone of alteration exposed in a series of shafts and prospects along the northwest projection of the Hi-Yu vein; the other tested the projection of low-grade mineralization in the footwall of the Hi Yu vein. Neither hole went through the Hi Yu vein. As of early 2008, the Hi Yu Mine was part of Freegold Venture LImited's, Golden Summit project (Freeman, 2008).

Alteration:

Quartz, sericite and ankerite; intense argillic alteration is all but destroyed by the nearly complete supergene alteration present on most samples.

Age of mineralization:

Probably about 90 Ma based on analogy with similar gold deposits nearby.

Generic deposit model:

Deposit model:

Gold (-arsenic-antimony) vein (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: Yes; large

Site Status: Active

Workings/exploration:

The HiYu lode was discovered in 1912 (Times Publishing Company, 1912). Initial development began on the Helen S claim, and by 1913 the Main adit was 450 feet long , with a 65-foot raise connected to the surface approximately 250 feet from the portal. A second adit, 50 feet below the Main adit, known as the Lower adit, was collared in 1913. In 1914, the Main adit was lengthened to 550 feet and the Lower adit driven 450 feet (Stewart, 1922). By the end of 1915, the Main adit was 700 feet long and the Lower adit remained 450 feet long. By 1916, the Lower adit had been abandoned and a new adit, the Hi Yu adit, was collared on the Hi Yu claim approximately 500 feet above the level of Moose Creek (Stewart, 1922). By 1920 the Hi Yu adit was 1,300 feet long and a raise connected the Hi Yu adit with the surface at the 800 foot station of the adit (Stewart, 1922).
By the end of 1922, the Hi Yu Mine had stoped out all of the ore on the Helen S claim between the Lower and Main adits for about 400 feet from the portal. Similarly, all of the ore had been stoped out between the

Main and Upper adits for a distance of 800 feet from the portals. The Main adit was extended to a length of 1,000 feet. On the Hi Yu claim, all of the ore had been stoped out between the Hi Yu adit and the surface for a distance of 1,100 feet from the portal, except for a block 150 feet long near the middle of the adit (Stewart, 1922). Mill tailings were being collected in a settling pond since they contained approximately $4.00 per ton in gold (0.20 ounce of gold per ton) (Stewart, 1922).

Stewart (1923) reported the Upper adit on the Helen S claim had been extended to a length of 600 feet by 1923. This adit level is approximately 125 feet below the level of the Hi Yu adit on the Hi Yu claim. In addition, the Lower adit on the Helen S claim was extended to a length of 500 feet. In 1931 a raise was being driven between the Main adit and Upper adit (Smith, 1933, B 836; Smith, 1933, B 844; Stewart, 1933). In 1932, the Upper adit was 1,200 feet long and the Main adit was 1,525 feet long (Pilgrim, 1933). Patty (1933) indicated the Upper adit on the Helen S claim was 1600 feet long in early 1933. The Upper adit was 1,875 feet long in 1934 and a crosscut was being driven from the Upper adit to intersect the Antimony shear zone, a 4-foot-wide shear zone that was reported to average 0.5 ounce of gold per ton. In 1938, the Hi-Yu mine drove 300 feet of drifts and 250 feet of raises on the Lower adit level and in sublevels between the Lower and Main adits.

In 1984, Placid Oil Company dug several trenches and drilled a total of 8,205 feet in 19 core holes (Porterfield and Croff, 1986). Two holes totaling 515 feet were drilled in 1985 on the Hi Yu shear zone. Fairbanks Exploration Inc. conducted limited sampling of the Hi Yu waste dumps and tailings in the mill ponds in 1986 (Fairbanks Exploration Inc., unpublished report, 1986). In July, 1988, 27 samples were collected from the Hi Yu mine tailings (Fairbanks Exploration Inc., unpublished report, 1988).

Production notes:

The Hi Yu Mine, also known as the Crites and Feldman mine, was the second largest lode gold producer in the Fairbanks District prior to WWII. By September 1914, the mine was in full production, milling an average of 7 tons of ore per day, primarily from the Lower adit (Stewart, 1915; Brooks, 1916). By 1916, the Hi Yu Mine had replaced the Cleary Hill mine as the largest producer in the Fairbanks Mining District. The mine continued to be the largest producer in the district from 1924 to 1926 (Brooks and Capps, 1924; Brooks, 1924; Moffit, 1927). Smith (1930) reported only development work in 1927, but significant production was again reported in 1928 and 1929 (Smith, 1930; Smith, 1932). There was no production in 1930 and the mine was not in operation for most of 1931. During the winter of 1932-33 over $100,000 worth of gold (4,837 ounces) was produced from stopes above the Upper adit. Records from the Hi Yu and Helen S shear zones provided by the owners in 1933, indicate production of 13,560 troy ounces of gold from 8,200 tons of ore, with an average grade of 1.65 ounces of gold per ton (Hill, 1933). In August of 1933, a rich ore shoot was discovered in the Upper adit on the Helen S claim. Between August 1933 and June, 1934, this shoot produced 3,010 ounces of gold from material that averaged 2.1 ounces of gold per ton (Joralemon, 1934). The Hi Yu Mine remained the second largest producer in the Fairbanks Mining District during 1936, 1937 and 1938 (Smith, 1938; Smith, 1939, B 910; Smith, 1939, B 917). In 1938, the mine produced 2,500 tons of ore which averaged $24 in gold per ton (0.68 ounce of gold per ton) (Reed, 1939). The mine recorded continuous production in 1939 and 1940 (Smith, 1941; Smith, 1942). Killeen and Mertie (1943) reported that the Hi Yu Mine was shut down in 1942 by the War Production Board Order L208, and like most other mines in the district, the Hi Yu Mine did not reopen after World War II.

Existing records indicate the Hi-Yu mine produced approximately 22,161 ounces of gold between 1933 and 1941 (E. Brandell, written commun., 1949). In 1988, Tri-Con Mining mined 14,600 tons of material from the mill tailings of the Hi-Yu Mine and the McCafty Mine (LG152), the material averaged 0.10 ounce of gold per ton (Freeman, 1992). During this work, Ti-Con re-milled all of the Hi Yu mill tailings.

Reserves:

Ore reserve estimates of the Hi Yu Mine are limited to the dump at the Main adit where sampling in 1986 indicated 34,530 tons of material with an average grade of 0.397 ounce of gold per ton and 1.60 ounce of silver per ton. However, these estimates are not representative of the true grades in the dumps since the 1986 sampling was restricted to material with visible sulfides or quartz. The true grade of the Hi Yu waste dumps is probably 0.05 to 0.10 ounce of gold per ton (Freeman, 1992).

Additional comments:

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Primary Reference: Freeman, 2008

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Gil

Site type: Prospect

ARDF no.: LG200

Latitude: 65.0258 **Quadrangle:** LG A-1

Longitude: 147.1084

Location description and accuracy:

The Gil prospect is on a large block of claims with several areas of mineralization, but most of the the work has been concentrated in a small area targeted as two potential open pit mines. The coordinates are centered there, about 0.9 mile southeast of the mouth of All Gold Creek on Fish Creek. The prospect is about 0.3 mile southeast of the center of section 3, T. 2 N., R. 3 E. of the Fairbanks Meridian.

Commodities:

Main: Au, Bi, Te

Other: Ag, Mo, W

Ore minerals: Arsenopyrite, pyrite

Gangue minerals: Calcite, quartz

Geologic description:

The rocks in the area are mainly quartz-mica schist and micaceous quartzite of the lower Paleozoic, Fairbanks Schist. The mineralization at Gil is mostly in the Cleary Sequence, which consists of calc-silicate hornfels, amphibolite, actinolite-white mica schist, felsic schist, and biotite-chlorite schist (Avalon Development Corp., 2005). The Cleary Sequence strikes northeast and dips steeply north. The metamorphic rocks are intruded by several nearby mid-Cretaceous granitic plutons.

Three phases of deformation are recognized at Gil resulting in large-scale asymmetric folds and faults trending northeast with variable dip. The oldest of these faults are low angle reverse faults. Conjugate to the northeast-striking faults are northwest-striking strike-slip faults that dip to the southwest or are vertical. Distinct, close-spaced northwest-striking near vertical joint sets cross cut nearly all lithologies and foliation. These joints are important controls to mineralization (Sims, 2015).

The mineralization at the Main Gil locality is stratabound in calc-silicate hornfels; it consists mainly of auriferous quartz and quartz-calcite veins in shear zones and in limonite-stained fractures. The veins contain 1 to 3 percent sulfides, mainly arsenopyrite. Samples show a strong bismuth-tellurium association, with some molybdenum, arsenic, and tungsten (Avalon Development Corp., 2005). Alteration is seen as an intense retrograde assemblage of calc-silicate minerals (Sims, 2015).

The North Gil locality consists of auriferous quartz veins less then 2 inches thick. The veins are in quartz-white mica schist interlayered with calcareous biotite-white mica schist, felsic schist, and marble. The veins contain less than 1 percent sulfides, mainly pyrite and arsenopyrite (Avalon Development Corp., 2005). Alteration is vein-controlled and consist of sericitc to potassic (secondary biotite) alteration along vein margins (Sims, 2015).

Alteration:

At the Main Gil alteration is seen as an intense retrograde assemblage of calc-silicate minerals. At North Gil alteration is vein-controlled and consist of sericitc to potassic (secondary biotite) alteration along vein margins (Sims, 2015).

Age of mineralization:

Probably around 92 Ma based on age of mineralization and intrusion of the nearby Fort Knox deposit (Selby and others, 2002).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins in skarns (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

The Gil prospect was acquired by Teryl Resources Corp. (Teryl) in 1989 and in 2008 was being explored as a joint venture between Teryl and Kinross Gold Corp. (Kinross) until Kinross acquired Teryl's remaining interest in Gil in 2011 (Teryl Resources Corp., 2008; Sims, 2015).

Since the early 1990s exploration work on the Gil prospect has included soil sampling, geologic mapping, rock sampling, ground magnetic and resistivity surveys, trenching, reverse circulation (RC) drilling, core drilling, airborne magnetic and electromagnetic (EM) surveys, and metallurgical testing (Avalon Development Corp., 2005). Kinross drilled 581 RC holes totaling 52,180 meters and 154 core holes totaling 21,582 meters between 1993 and 2014 (Sims, 2015).

Production notes:

None.

Reserves:

Quandt and others (2008) indicate that the Gil deposit has an indicated mineral resource to modern industry standards of 3.548 million tonnes of material with a grade of 1.03 grams of gold per tonne.

The Gil mineral resource was updated in 2015 with an indicated resource of 29,515.8 million tonnes with a grade of 0.56 grams per tonne (g/t) gold and an inferred resource at 4,026 million tonnes of material with a grade of 0.49 g/t gold. This resource was estimated using a cutoff grade of 0.21 g/t gold based on a gold price of US$1,400 per ounce (Sims, 2015).

Additional comments:

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Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer (Avalon Development Corporation); D.J. Grybeck (Port Ludlow, WA); N.V. King (Alaska Earth Sciences)

Last report date: 2016-02-25

Site name(s): Livengood; Old Smoky; Ruth Creek; Lillian Creek

Site type: Prospect

ARDF no.: LG202

Latitude: 65.5091 **Quadrangle:** LG C-4

Longitude: 148.5335

Location description and accuracy:

Since 2006, International Tower Hill Mines Ltd. has extensively studied and drilled the Livengood prospect which covers a northeast trending area at least 2 by 3 kilometers in size. The center of the area is about 0.5 mile north of Money Knob and about 0.6 mile west-northwest of the center of section 23, T. 8 N., R. 5 W.

Commodities:

Main: As, Au, Fe, Sb

Other:

Ore minerals: Arsenopyrite, cinnabar, gold, pyrite, scorodite, stibnite

Gangue minerals: Calcite, quartz

Geologic description:

In 2006, International Tower Hill Mines Ltd., began work at the Livengood prospect (Klipfel, Carew, and Pennstrom, 2009). The prospect covers a northeast-trending area at least 2 by 3 kilometers in size near Money Knob and includes several smaller and older prospects including the Griffin, Lillian Creek, Ruth Creek, and Old Smoky. Individually these older prospects are now mainly of interest for their geological relevance to the large body of mineralization that International Tower Hill has defined and was studying and drilling in 2011 (Brechtel and others, 2011).

The Lillian Creek prospect (about 0.7 mile northwest of Money Knob) consists of narrow auriferous arsenopyrite-quartz-scorodite veins in and near a limonite-stained dike in altered and contorted graywacke-argillite country rocks. Samples of the veins contained 0.5 to 48 parts per million (ppm) gold (Foster, 1968). Joesting (1942), reported a mineralized zone in a cut bank that contains stibnite and traces of cinnabar and gold. The Ruth Creek prospect (about 0.4 mile northwest of Money Knob) consists of numerous, nearly vertical quartz veinlets striking S 20-60 E, that contain pyrite and arsenopyrite (Mertie, 1918). Some of these veins assayed up to 0.58 ounce of gold per ton. The veinlets are cut by calcite veins carrying some gold and sulfides (Mertie, 1918). Contiguous mineralized zones up to 36 inches wide are in altered dolomite-calcite-quartz-sulfide rock (Foster and Chapman, 1967).

The best known of the old prospects near Money Knob is the Old Smoky prospect, about 0.3 mile north of Money Knob. Trenching near the head of Olive Creek exposed narrow, northwest-trending auriferous arsenopyrite-quartz veins near the intersection of an altered, porphyritic, biotite-monzonite dike, with a potassium feldspar-porphyry dike (Foster, 1968). The mineralization is in shale, argillite, fine-grained sandstone, and pebbly conglomerate (Allegro, 1984; Athey, Szumigala, and others, 2004; Athey, Werdon, Newberry, and others, 2004; Athey, Werdon, Szumigala, and others, 2004; Athey and Craw, 2004). Narrow zones of thermal metamorphism are along sheared contacts between the sedimentary rocks and hypabyssal intrusive rocks.

Most of the intrusive rocks and some of the sedimentary host rocks at the Old Smoky prospect have experienced variable degrees of metasomatic hydrothermal alteration followed by lower-temperature supergene alteration (Allegro, 1984). Allegro described four types of hydrothermal alteration: 1) silicification, as partial to complete replacement of the host rock by a dense network of quartz veinlets

generally localized along contacts between the intrusive and sedimentary rocks; 2) sericitization, as fine- to medium-grained white mica in selvages along quartz veins, as anastomosing sericite-opaque mineral veinlets, and as patchy to massive sericitic replacement of feldspar, ferromagnesian minerals and quartz; 3) deposition of trigonal nets of needle-like rutile often associated with secondary quartz and minor feldspar; and 4) epidote +/- sericite as a replacement of calcic plagioclase and ferromagnesian minerals resulting in massive aggregates, pseudomorphs, veins, and vug fillings of epidote commonly associated with sericite, opaque minerals, and quartz.

Since the mid-1970s a succession of companies have explored the area around Money Knob (Brechtel and others, 2011). Homestake Mining Company drilled 6 holes in 1976; Occidental Petroleum drilled 6 holes in 1981; Amax Exploration drilled 3 holes in 1991 and did surface geochemistry and sampling; Placer Dome drilled 9 holes in 1995 and 1996; and Cambior Inc. explored in 2001-2002.

In 2003, AngloGold Ashanti (USA) Exploration began work and drilled 12 holes. In 2006, International Tower Hill Mines Ltd. (ITH) acquired the property from AngloGold and began an aggressive exploration program that was ongoing as of August 2011. By late 2011, ITH had drilled 550 reverse-circulation holes and 94 core holes, covered the property with several geochemical surveys as well as by aerial and ground geophysical surveys, and collected and analyzed a multitude of samples. They have also commissioned a series of twelve, detailed, increasingly sophisticated 43-101 reports that describes the geology in detail, lays out development scenarios for the property, and for some years has quantified the resources of the property. The latest of these is by Brechtel and others (2011); the earlier ITH 43-101 reports that are largely superseded by it are included in the reference list. Almost all of the description that follows comes from those reports. As of late 2011, ITH had outlined a deposit that they propose to mine from a large open pit about 3,000 feet long and 1,500 feet wide.

The oldest rocks at the prospect are late Proterozoic to early Paleozoic basalt, mudstone, chert, dolomite, and limestone of the Amy Creek sequence. A Cambrian ophiolite sequence of mafic and ultramafic rocks is in thrust contact above the Amy Creek sequence. The ophiolitic rocks are overlain by Devonian shale, siltstone, conglomerate, and volcanic and volcaniclastic rocks; the Devonian rocks are the main host for the mineralization. The Devonian rocks are overthrust by more Cambrian ophiolitic rocks. All are intruded by 92 to 93 Ma (Cretaceous) monzonite, diorite, and syenite stocks, dikes, and sills that are considered to be genetically related to the mineralization. The host rocks are part of fold-thrust belt of Paleozoic and/or Cretaceous age and the complex thrust-fold architecture is apparently the key to the emplacement of the Cretaceous stocks, sills, and dikes, and forms the pathways for the mineralizing hydrothermal fluids.

The mineralization occurs in two styles: as multiphase quartz veins spread through the ore body, and as disseminated ore minerals. The disseminated low-grade mineralization is pervasive; many of the drill holes are mineralized for 50 percent or more of their length. The stages of mineralization from early to late are: 1) intrusion of feldspar porphyry dikes and sills; 2) arsenopyrite-pyrite-gold mineralization accompanied by biotite alteration; 3) arsenopyrite-pyrite-gold mineralization accompanied by albite-quartz alteration; 4) arsenopyrite-pyrite-gold mineralization accompanied by sericitic alteration; and 5) late stibnite-gold mineralization accompanied by propylitic alteration and the intrusion of late, biotite porphyry dikes and sills.

As of August, 2011, at a cutoff grade of 0.22 gram of gold per tonne, the Livengood deposit has a measured and indicated resource of 933 million tonnes with an average grade of 0.55 gram of gold per tonne (or 16.5 million ounces of gold). At the same cutoff, there is an additional inferred resource of 257 million tonnes with an average grade of 0.50 gram of gold per tonne. The estimation of a reserve was not possible at that time.

In October 24, 2016, International Tower Hill Mines Ltd. (ITH) released a prefeasibility study for its advanced-exploration-stage, Livengood gold project (Hardie and others, 2016). ITH’s initial, proposed optimized project configuration includes a conventional surface mine utilizing large-scale mining equipment in a blast/load/haul operation. Mill feed would be processed in an estimated 47,700 tonne-per-day comminution circuit consisting of primary and secondary crushing, wet grinding in a single semi-autogenous (SAG) mill and single ball mill, and followed by a gravity gold circuit and a conventional carbon-in-leach circuit. The prefeasibility study’s mine plan is estimated to provide sufficient ore (life-of-mine gold head grade of 0.71 gram of gold per tonne) to support an average annual production rate during years 1-5 of 378,300 ounces of gold per year, and an annual production rate of approximately 294,100 ounces of gold per year over an estimated 23-year mine life, producing a total of approximately 6.8 million ounces of gold.

On December 28, 2016, International Tower Hill Mines Ltd. announced the closing of a non-brokered, private-placement financing of $22.0 million, with Paulson & Co. Inc., Tocqueville Asset Management, L.P., and AngloGold Ashanti (U.S.A.) Exploration Inc. owning 34.2, 19.7, and 9.5 percent of ITH shares, respectively. ITH intends to use the net proceeds of the private placement for full satisfaction of the final payment due in January 2017 for acquisition of certain mining claims and related rights in the vicinity of the Livengood gold project (approximately $14.7 million), continuation of optimization studies to further improve and de-risk the project, required environmental baseline studies, and for general working capital purposes. ITH's 2017 work program is designed to follow up on improvements outlined in their prefeasibility study (Athey and Werdon, 2017).

Alteration:

From early to late in the mineralization process, it is associated with a sequence of biotite alteration, albite-quartz alteration, sericitic alteration, and porphyritic alteration.

Age of mineralization:

Associated with and probably genetically tied to 92-93 Ma porphyry dikes, sills, and plugs.

Generic deposit model:

Deposit model:

Intrusion-related gold deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Since well before WWII, several small prospects were known in the area that would become this prospect; these include the Griffin, Lillian Creek, Ruth Creek, and Old Smoky prospects. Beginning in the mid-1970s, a succession of companies have explored the area around Money Knob by mapping, and geochemical and geophysical surveys in the search for a large, bulk-mineable gold deposit (Brechtel and others, 2011). Homestake Mining Company drilled 6 holes in 1976; Occidental Petroleum drilled 6 holes in 1981; Amax Exploration drilled 3 holes in 1991; Placer Dome drilled 9 holes in 1995 and 1996; and Cambior Inc. explored in 2001 and 2002.

In 2003, AngloGold Ashanti (USA) Exploration began work and drilled 12 holes. In 2006, International Tower Hill Mines Ltd. (ITH) acquired the property from AngloGold and began an aggressive exploration program that was ongoing as of August 2011. By late 2011, ITH had drilled 550 reverse-circulation holes and drilled 94 core holes; covered the property with several geochemical surveys as well as by aerial and ground geophysical surveys; and collected and analyzed a multitude of samples. They have also commissioned a series of twelve, detailed, increasingly sophisticated 43-101 reports that among other things discuss the geology in detail, lay out development scenarios for the property, and quantify the resources of the prospect.

Production notes:

None.

Reserves:

As of August, 2011, at a cutoff grade of 0.22 gram of gold per tonne, the Livengood deposit has a measured and indicated resource of 933 million tonnes with an average grade of 0.55 gram of gold per tonne (or 16.5 million ounces of gold). At the same cutoff, there is an additional inferred resource of 257 million tonnes with an average grade of 0.50 gram of gold per tonne. The estimation of a reserve was not possible

at that time.

As of August 2016, the Livengood gold project's mineral resource, based on 783 drill holes totaling 218,674 m, is estimated at 497.3 million measured tonnes at an average grade of 0.68 gram of gold per tonne (10.84 million ounces), and 28.0 million indicated tonnes at an average grade of 0.69 gram of gold per tonne (0.62 million ounces), for a total measured and indicated resource of 525.4 million tonnes at an average grade of 0.68 gram of gold per tonne (11.5 million ounces). Inferred resources include 52.8 million tonnes at an average grade of 0.66 gram of gold per tonne (1.1 million ounces). A portion of these mineral resources have been converted into proven reserves (measured mineral resources contained within the pit shape, above cut-off grades) of 377.7 million tonnes at an average grade of 0.71 gram of gold per tonne (8.62 million ounces) and probable reserves (indicated mineral resources contained within pit designs, above cut-off grades) of 14.0 million tonnes at an average grade of 0.72 gram of gold per tonne (0.353 million ounces), for total proven and probable reserves of 391.7 million tonnes at an average grade of 0.71 gram of gold per tonne (8.97 million ounces) (Hardie and others, 2016).

Additional comments:

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Technical report for International Tower Hill Mines. Ltd., 144 p. (posted on www.sedar.com, November 27, 2009).

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Primary Reference: Brechtel and others, 2011

Reporter(s): D.J. Grybeck (Contractor, USGS); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Shorty Creek; Hill 1710

Site type: Prospect

ARDF no.: LG203

Latitude: 65.4516 **Quadrangle:** LG B-4

Longitude: 148.5448

Location description and accuracy:

This is the original Shorty Creek prospect that was drilled in 1972 (Freeman, 2010). Since 2005, it is one of several prospects often referred to as part of the Shorty Creek project which covers a large area and several other prospects. Conversely, in discussing the Shorty Creek project, this prospect is often referred to as the Hill 1710 prospect (e.g., in Freeman, 2010). The prospect is about 4.9 mile south of Livengood on a north-south ridge at the hill 1710 at the headwaters of Shorty Creek and Ranney Hollow 0.4 mile northeast of the center of section 10, T. 7 N., R. 5 W. of the Fairbanks Meridian.

Commodities:

Main: Ag, Cu, Mo

Other: As, Bi, Pb, Sb, Sn, W, Zn

Ore minerals: Arsenopyrite, bornite, chalcopyrite, molybdenite, pyrite, pyrrhotite

Gangue minerals: Quartz

Geologic description:

The rocks in the Shorty Creek area are mainly the Lower Cretaceous Wilber Creek sequence of folded black carbonaceous siltstone, gray feldspathic sandstone and silty sandstone, black shale, and polymictic conglomerate (Albanese, 1983a; Weber and others, 1992). The sequence disconformably overlies Lower Paleozoic carbonate, volcanic, and pelitic rocks. Several small plutons, mostly of granodiorite composition, are in the Shorty Creek area. Biotite hornfels and lesser diopside hornfels is widespread. Although outcrops of the plutonic rocks crop are sparse, the widespread hornfels suggests large intrusions nearby or at depth. The structure of the area is dominated by northwest-directed, northeast-trending thrust faults and northeast-trending, open to recumbent isoclinal folds (Freeman, 2010).

The Shorty Creek prospect is in a strong geochemical soil anomaly marked by the association of silver, arsenic, bismuth, molybdenum, antimony, tungsten, copper, lead, zinc, and tin. This anomaly continues to the northeast for at least 1.4 miles to peak 1890. Operators drilling at the prospect in the 1970s concluded that the mineralization was associated with felsic dikes and sills that intrude the Cretaceous Wilber Creek sequence (Freeman, 2010).

Hill 1710 is associated with a curvilinear magnetic high that is offset by the Ranney Hollow fault in an apparent left lateral sense (Abrams, 2015). The cause of this magnetic anomaly may be related to contact metamorphism around a buried intrusive which has undergone magnetite destructive alteration or the anomaly may be from copper-gold magnetite skarn mineralization hosted in Lower Paleozoic carbonate units dipping to the south beneath the Wilber Creek sequence.

Alteration:

Alteration observed is biotite to lesser diopside hornfels related to contact metamorphism from the intrusion of several plutons (Freeman, 2010).

Age of mineralization:

Probably related to intermediate plutons, one of which has been dated at 63 Ma (Albanese, 1983a).

Generic deposit model:

Deposit model:

Copper-molybdenum porphyry system (Cox and Singer, 1986; model 21a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

21a

Production Status: None

Site Status: Active

Workings/exploration:

The Shorty Creek prospect was first staked for antimony in 1972 (Freeman, 2010). Some additional sampling soon led to the concept that it was a copper-molybdenum deposit in a large aeromagnetic anomaly. Earth Resources Inc. staked the property and drilled 10 holes in 1972 on the south slope of Hill 1710, possibly in a joint venture with BP Minerals. Eakins (1974) collected four grab samples from drill cuttings left at the Earth Resources drill pads. The samples contained 170 to 1,050 parts per million (ppm) copper, 20 to 60 ppm lead, 105 to 640 ppm zinc, less than 0.2 to 1.1 ppm silver, and less than 100 parts per billion (ppb) gold.

There has been no further drilling on this Shorty Creek prospect. However, there is a long history of geologic mapping, geochemical sampling, aerial and ground geophysical surveys by industry and government, including drilling at one nearby prospect (Freeman, 2010). After the discovery of mineralization in 1979 along the Alyeska Pipeline service road about 2.5 miles south of the Hill 1710 prospect (Robinson and Metz, 1979), there was considerable interest and drilling at the Hill 1835 prospect (LG209) about 1.7 miles southeast of the Hill 1710 prospect. The area was largely dormant from 1990 to 2005.

In 2005, Select Resources leased a large block of claims, staked more, and in 2010 they held several large blocks that totaled more than 300 claims and included several other prospects (Freeman, 2010). In 2005, they did considerable rock and soil sampling on their claims which they collectively call the Shorty Creek project or just Shorty Creek.

Freegold Ventures Limited (Freegold) completed 28.6 kilometers of induced polarization (IP) surveying and collected 354 soil samples in 2014 covering the prospect areas of Hill 1710 and Hill 1835 (LG209). Soil samples with anomalous copper and molybdenum were associated with lower chargeabilities over Hill 1710 (Abrams, 2015).

Freegold Ventures Limited’s 2016 drilling program at their intrusion-related Shorty Creek property included 7 holes totaling 3,038 m; 2 holes were drilled in the 'Hill 1835' area, and 5 holes were drilled in the '1710' area to test copper-molybdenum targets. ‘Hill 1835’ mineralization is spatially associated with a magnetic high defined by airborne- (Burns and others, 2015) and ground-based surveys, as well as magnetic highs in inverted profiles. Drilling highlights include 434.5 meters averaging 0.57 percent copper-equivalent, and 409.6 meters averaging 0.41 percent copper-equivalent. In the ‘1710’ area, 5 drill holes totaling 2,019.8 m, tested a copper-molybdenum soil anomaly and magnetic high. Drill hole SC 16-07 intersected 0.11 percent copper and 0.011 percent molybdenum from 0-159 m, including 0.15 percent copper and 0.009 percent molybdenum from 0-70.8 meters within quartz-feldspar porphyry. The entire 396-meter-long drill hole averaged 0.08 percent copper and 0.006 percent molybdenum. Additionally, Freegold conducted new ground-based geochemical sampling, geophysical surveys, and claim staking in 2016, and identified the new Quarry and Steel Creek target areas (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

The new Steel Creek geophysically defined target does not correspond to ARDF description LG027 (Steel Creek).

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Primary Reference: Abrams, 2015

Reporter(s): D.J. Grybeck (Contractor, USGS); N.V. King (Alaska Earth Sciences); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Coffee Dome

Site type: Prospect

ARDF no.: LG204

Latitude: 65.0957 **Quadrangle:** LG A-1

Longitude: 147.0827

Location description and accuracy:

The Coffee Dome prospect is on a large block of claims that cover about 16 square miles. However, most of the known mineralization is in an elongate north-trending area about 0.8 mile long and 0.3 mile wide near the center of section 11, T. 2 N., R. 3 E. The coordinates are at about the center of this area, about 2 miles east of Coffee Dome. The location is accurate.

Commodities:

Main: Au, Bi, Te

Other: Cu, Pb, Sb, Zn

Ore minerals: Arsenopyrite

Gangue minerals: Quartz

Geologic description:

In early 2010, the Coffee Dome prospect was being explored by International Tower Hill Mines, Ltd. (2008) who staked the property from 2004 to 2006. Through 2006, the work on the property was mainly stream sediment and soil geochemical surveys and some sampling of surface mineralization. The property was first identified from anomalous gold, tellurium, and bismuth geochemical anomalies and mineralized samples collected at the surface. The mineralized samples consist of banded quartz veins 10 to 30 cm thick with scorodite and occasionally arsenopyrite. During 2007, International Tower Hill (2007) dug several trenches over the main target area that exposed veins with grades of up to 168 grams of gold per tonne and high silver, arsenic, antimony, bismuth, and tellurium. Soil surveys defined two large areas anomalous in gold that are thought to reflect a large gold system over 3 kilometers long and 1 kilometer wide. They consider the deposit analogous to the Pogo mine (BD033) and probably close to an intrusive source. The rocks in the area consist mainly of middle to early Paleozoic and(or) Late? Proterozoic quartz and pelitic schist of the Yukon-Tanana Upland (Wilson and others, 1998).

In 2009, International Tower Hill Mines (2009) drilled 5 holes on the Coffee Dome project. The holes targeted a northeast-trending structural zone that is marked at the surface by resistivity and soil-geochemistry anomalies. Multiple thick zones of low-grade gold mineralization were cut. Notable intercepts were 17 meters with 0.3 gram of gold per tonne and 22 meters with 0.21 gram of gold per tonne. Few sulfides were seen in the holes.

Alteration:

No data.

Age of mineralization:

Generic deposit model:

Deposit model:

Arsenopyrite-gold-quartz veins with tellurium and bismuth.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

In early 2010, the Coffee Dome prospect was being explored by International Tower Hill Mines, Ltd. (2008) who staked the property from 2004 to 2006. Through 2006, the work on the property was mainly stream sediment and soil geochemical surveys and some sampling of surface mineralization. During 2007, International Tower Hill (2007) dug several trenches that exposed mineralization and they extended their soil surveys. They drilled 5 holes in 2009.

Production notes:

None.

Reserves:

None.

Additional comments:

The claims that cover the Coffee Dome prospect are both State of Alaska mining claims and land leased from the University of Alaska; as of 2007, most of the known mineralization is on the University of Alaska lands.

References:

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International Tower Hill Mines, Ltd., 2008 (Coffee Dome), http://ith.pubco.net/s/CoffeeDome.asp (as of March 4, 2008).

International Tower Hill Mines Ltd., 2009; ITH's Coffee Dome drilling intersects gold system 17 kilometers east of Fort Knox Mine, Alaska: http://www.ithmines.com/s/NewsReleases.asp?ReportID=375183&_Type=News-Releases&_Title=ITHs-Coffee-Dome-Drilling-Intersects-Gold-System-17-Kilometres-East-of-Fort.. (News release, December 4, 2009).

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Primary Reference: International Tower Hill Mines Ltd., 2008

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Cleary Hill (Freegold)

Site type: Mine

ARDF no.: LG205

Latitude: 65.065 **Quadrangle:** LG A-1

Longitude: 147.4387

Location description and accuracy:

This record covers an area about 3,000 feet long and several thousand feet wide, centered about 0.2 mile south of the Cleary Hill Mine buildings near the mouth of Bedrock Creek. The site represents a major exploration program by Freegold Ventures Ltd. that began in 1996 and was ongoing in 2008 (Freeman, 2008). The area includes several old prospects and the Cleary Hill Mine (LG114-116 and LG118-121) that were previously described individually in ARDF. These individual records are retained in ARDF for their geologic detail and history. The work by Freegold, however, has revealed much new mineralization in the area and the company now interprets the deposits in the area as a single system of veins, what they call the 'Cleary Hill vein swarm'.

Commodities:

Main: Ag, Au

Other: Ag, As, Au, Cu, Sb, Pb, Zn

Ore minerals: Arsenopyrite, boulangerite, jamesonite, pyrite, stibnite, tetrahedrite

Gangue minerals: Quartz

Geologic description:

The ARDF record for the Cleary Hill Mine (LG119) gives many of the details of the mining and geology of the best known and most productive of the deposits within this site. To summarize from Freeman (2008), the Cleary Hill Mine produced about 281,000 ounces of gold from 1908 to 1942 at an average grade of about 1.3 ounces of gold per ton. The mineralization consists of quartz veins with varying amounts of arsenopyrite, pyrite, boulangerite, jamesonite, tetrahedrite, and stibnite. The veins cut interbedded Paleozoic volcanic rocks, quartzite, and quartz mica schists on the north flank of the Cleary antiform. Most of the production was from the Cleary Hill vein system that strikes about N70-80W and dips about 45-70 degrees south. The system consists of a set of subparallel veins that were exposed on 6 levels. Regionally, the deposit is part of a east-northeast-trending mineral belt at least six miles long that is related to a series of parallel, northeast-trending fault zones spaced about 8,000 feet apart. The mineralization is middle Cretaceous (McCoy and others, 1997).

Although it was examined intermittently by several generations of geologists, there was little exploration in the area from 1942 to 1996. In 1996, Freegold Ventures Ltd., drilled 7 reverse-circulation holes that totaled 2,080 feet. The drilling confirmed that the mineralization at the Cleary Hill Mine persisted below the lowest underground workings. In 1997 and 1998, they core drilled another 9 holes. Geochemical soil sampling indicated that the mineralization was much more extensive than just in the old mine workings. In 2000, one hole cut a previously unknown, mineralized shear zone, the Currey Zone. The Currey mineralization is marked by pervasive quartz veining and sericitic alteration and consists of coarse-grained pyrite and fine-grained sulfides and sulfosalts in the quartz. Several intercepts are characterized by a strong arsenic and antimony signature. In 2002, Freegold did 4.5 line miles of ground geophysical surveys. From 2002 to 2006, Freegold drilled at least 6 more core holes and dug several thousand feet of trenches over the Cleary Hill Mine workings and adjacent areas; this revealed many new veins and mineralized shear zones. In 2006, they collected 9,900 tons of bulk samples from surface exposures of 8 separate auriferous shear

zones, to analyze and characterize the ore. They also collected 3,000 tons of material from the old mine dumps. Encouraging results from these samples led to a major drilling program beginning in December, 2006; it included 504 rotary-air-blast holes that totaled 28,602 feet along 14 fences of holes. The detailed results of this drilling and other Freegold exploration since 1996 is available in Freeman (2008).

As a result of this work, Freeman (2008) has outlined a system of pervasive mineralization and veins-many previously unrecognized -that extend for over 3,000 feet along strike to a depth of 1,000 feet. The mineralization is open at both ends and at depth. The mining before WWII was mainly on a few structurally continuous, high-grade quartz veins in a master shear zone. The newly revealed mineralization is much more extensive and structurally complex, featuring both pre- and post-mineralization faulting and several stages of deposition. Consequently, it is difficult to correlate the veins mined underground at the Cleary Hill Mine with those those newly discovered in the recent surface workings and drill holes.

Alteration:

Sericitic alteration adjacent to the quartz veins.

Age of mineralization:

Middle Cretaceous by analogy with other mineralization in the area.

Generic deposit model:

Deposit model:

Gold-arsenic-antimony quartz veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; medium

Site Status: Active

Workings/exploration:

The ARDF record for the Cleary Hill Mine (LG119) that was in operation from 1908 to 1942 gives many of the details of the mining and the geology of the best known of the deposits within this site. Although it was examined intermittently by several generations of geologists, there was little exploration in the area from 1942 to 1996. In 1996, Freegold Ventures Ltd., drilled 7 reverse-circulation holes that totaled 2,080 feet. The drilling confirmed that the mineralization at the Cleary Hill Mine persisted below the lowest underground workings. In 1997 and 1998, they core drilled another 9 holes. Geochemical soil sampling indicated that the mineralization was much more extensive than just in the old mine workings. In 2000, one hole cut a previously unrecognized mineralized shear zone, the Currey Zone. In 2002, Freegold did 4.5 line miles of ground geophysical surveys done. From 2002 to 2006, Freegold drilled at least 6 more core holes and dug several thousand feet of trenches over the Cleary Hill Mine workings and adjacent areas; this revealed many new veins and mineralized shear zones. In 2006, they collected 9,900 tons of bulk samples of surface exposures from 8 separate auriferous shear zones to analyze and characterize the ore. They also collected 3,000 tons of material from the old mine dumps. Encouraging results from these samples led to a major drilling program beginning in December, 2006; it included 504 rotary-air blast holes that totaled 28,602 feet along 14 fences of holes. The detailed results of this drilling and other Freegold exploration since 1996 is available in Freeman (2008).

Production notes:

The Cleary Hill Mine (LG119) within this site produced about 281,000 ounces of gold from 1908 to 1942 at an average grade of about 1.3 ounces of gold per ton.

Reserves:

None.

Additional comments:

References:

Freeman, C.J., 2008, Executive summary report for the Golden Summit project, Fairbanks Mining District, Alaska: Unpublished Technical Report for Freegold Ventures Ltd., 112 p. (posted on www.sedar.com, March 31, 2008).

McCoy, Dan, Newberry, R.J., Layer, Paul, and others, 2007, Pluton-related gold deposits of Interior Alaska, in Goldfarb, R.J., and Miller, L.D., (editors): Economic Geology Monograph 9, p. 191-241.

Primary Reference: Freeman, 2008

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Saddle (Freegold)

Site type: Prospect

ARDF no.: LG206

Latitude: 65.0659

Quadrangle: LG A-1

Longitude: 147.3613

Location description and accuracy:

The Saddle prospect as defined by Freegold Ventures Ltd. in 2008 includes a number of prospects and the McCarty Mine (LG150-156) that were previously described individually in ARDF and these records have been retained for their geologic details and history. The center of the prospect is on the ridge at the head of Fairbanks Creek about 0.2 mile west-northwest of the McCarty Mine as shown on the U.S. Geological Survey, Livengood A-1, 1:63,360-scale topographic map.

Commodities:

Main: Ag, As, Au, Pb, Sb

Other:

Ore minerals: Arsenopyrite, boulangerite, gold, jamesonite, pyrite, stibnite

Gangue minerals: Quartz

Geologic description:

The Saddle prospect as defined by Freegold Ventures Ltd. in 2008 (Freeman, 2008) includes several old prospects and the McCarty Mine (LG150-156). These were previously described individually in ARDF and these records are retained for their geologic detail and history. The older ARDF record for the Saddle prospect (LG151) is particularly informative.

Placid Oil explored the property from 1978 to 1994 and drilled at least 23 core holes, but the results were more generally indicative of mineralization than defining ore reserves (see LG152). As of early 2008, Freegold has mainly conducted reconnaissance, surface sampling, and has examined the numerous old records in anticipation of future drilling and trenching.

Freeman (2008) redefines the Saddle prospect is a 'vein swarm' that includes several prospect and small mines (LG150-151 and LG153-156) and the McCarty (American Eagle) Mine (LG152), which produced about 60,000 ounces of gold prior to WWII from ore that contained about 1.6 ounces of gold per ton. The vein swarm at Saddle has the highest density of parallel veins along the Cleary Hill mineral belt; it extends for about 3,500 feet along strike and has a minimum width of 2,500 feet. The Saddle prospect is at the intersection of the swarm of northwest-trending, high-grade gold-quartz veins and a district-scale northeast-trending fault structure. The veins are in altered Paleozoic quartz-sericite schist; they contain variable amounts of arsenopyrite, pyrite, stibnite, native gold, boulangerite, and jamesonite. The sulfides in the veins are oxidized to a depth of at least 310 feet. Drilling has verified that the mineralization persists to a depth of at least 650 feet and remains open in all directions.

Alteration:

Age of mineralization:

Mid-Cretaceous by analogy with other mineralization in the area.

Generic deposit model:

Deposit model:

Quartz veins with arsenopyrite, As-Sb sulfosalts, and stibnite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The Saddle prospect as defined by Freegold Ventures Ltd. in 2008 (Freeman, 2008) includes several old prospects and the McCarty Mine (LG150-156). These were previously described individually in ARDF and these records are retained for their geologic detail and history. The older ARDF record for the Saddle prospect (LG151) is particularly informative.

Placid Oil explored the property from 1978 to 1994 and drilled at least 23 core holes, but the results were more generally indicative of mineralization than defining ore reserves (see LG152). As of early 2008, Freegold has mainly conducted reconnaissance, surface sampling, and has examined the numerous old records in anticipation of future drilling and trenching.

Production notes:

The McCarty/American Eagle Mine in the Freegold prospect area produced about 60,000 ounces of gold prior to WWII; several of the other deposits produced small amounts of ore that was processed through the McCarty mill. There has been no production since 1942.

Reserves:

None by modern reserve standards.

Additional comments:

References:

Freeman, C.J., 2008, Executive summary report for the Golden Summit project, Fairbanks Mining District, Alaska: Unpublished Technical Report for Freegold Ventures Ltd., 112 p. (posted on www.sedar.com, March 31, 2008).

McCoy, Dan, Newberry, R.J., Layer, Paul, and others, 1997, Pluton-related gold deposits of Interior Alaska, in Goldfarb, R.J., and Miller, L.D., (editors): Economic Geology Monograph 9, p. 191-241.

Primary Reference: Freeman, 2008

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Tolovana (Freegold)

Site type: Mine

ARDF no.: LG207

Latitude: 65.0634 **Quadrangle:** LG A-1

Longitude: 147.4504

Location description and accuracy:

The Tolovana prospect is an area of extensive exploration by Freegold Ventures Ltd. that began in 1996 within the Golden Summit Project. The area includes several old prospects and the Tolovana Mine (LG105-106, LG109-110, and LG112) that were previously described individually in ARDF. The location is accurate to within 100 feet.

Commodities:

Main: Ag, Au, Sb

Other: Cu, Pb

Ore minerals: Arsenopyrite, boulangerite, galena, gold, jamesonite, sphalerite, stibnite, tetrahedrite

Gangue minerals: Quartz

Geologic description:

The ARDF record for the Tolovana Mine (LG100) gives the details of the mining and geology of the best known and most productive of the deposits in this site. To summarize (from Freeman, 2008), the Tolovana Mine produced about 5,000 ounces of gold prior to 1942. The mineralization consists of quartz veins and stockworks with varying amounts of arsenopyrite, pyrite, boulangerite, jamesonite, tetrahedrite, and stibnite. The country rocks are Paleozoic volcanic rocks, quartzite, and garnet-biotite schist on the north flank of the Cleary antiform. The middle Cretaceous Dolphin granodiorite pluton outcrops over an area about 2,000 feet long and 1,000 feet wide on the south side of the prospect. Regionally, the deposit is part of a east-northeast-trending mineral belt at least six miles long that is related to a series of parallel, northeast-trending fault zones, spaced about 8,000 feet apart. It is also probably continuous with the mineralization at the adjacent Cleary Hill (Freegold) deposit (LG205) to the north. The mineralization is middle Cretaceous (McCoy and others, 1997).

Although the Dolphin intrusive was drilled from 1994 to 1996 and in 1998, there was little exploration of the quartz veins on the prospect from 1941 to 2004. In 2004, Freegold Ventures Ltd., dug 1,790 feet of trenches and drilled 7 core holes that totaled 3,584 feet. The 2004 drilling indicated that the mineralization is a stockwork deposit. In the eastern part of the prospect it is in metamorphic rocks; in the central and western parts it is in the Dolphin intrusive. In 2007, Freegold contracted an extensive drilling program using rotary-air-blast equipment; 170 holes were drilled, totaling 11,449 feet. Numerous samples had significant gold values. The detailed results of this drilling are available in Freeman (2008).

On the basis of their work, Freegold has defined at least two subparallel mineralized structures, the Tolovana Mine structure and the Scheuyemere vein structure, that extend east-northeast more than 1,900 feet from the old Tolovana Mine (LG110). The mineralization is open at both ends and at depth. The mining before World War II was mainly on a few structurally continuous, high-grade quartz veins in a master shear zone. Recent work indicates that the mineralization is much more extensive and structurally complex, complicated by multiple generations of folding, faulting, and mineralization. The extent of the stockwork-type mineralization in the Dolphin intrusive is unknown.

Alteration:

Chloritization, kaolinitization, silicification and sericitization. Carbonate alteration, as calcite or less commonly dolomite or iron carbonate, is found locally (Abrams and Giroux, 2013).

Age of mineralization:

Unknown, but perhaps 88.3-90.1 Ma inferred from Ar40/Ar39 radiometric age dates of two sericite samples representing two distinctly different styles of gold mineralization (Abrams and Giroux, 2013).

Generic deposit model:

Deposit model:

Polymetallic vein (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Although the Dolphin intrusive was drilled from 1994 to 1996 and in 1998, there was little exploration of the quartz veins on the prospect from 1941 to 2004. In 2004, Freegold Ventures Ltd., dug 1,790 feet of trenches and drilled 7 core holes that totaled 3,584 feet. In 2007, Freegold contracted an extensive drilling program using rotary-air-blast equipment; 170 holes were drilled, totaling 11,449 feet. Numerous samples had significant gold values.

In 2010 a ground based geophysical survey was conducted (Abrams and Giroux, 2013).

In 2011, Freegold completed its first NI-43 101 compliant resource calculation using previous drilling completed in the Dolphin/Tolovana area. Ground-based induced polarization (IP) geophysics and shovel soil sampling was also performed in 2011 (Abrams and Giroux, 2013).

In 2012, the NI-43 101 compliant resource was updated; the zone used in the calculation was deepened and extended to the northeast to include the Clearly Hill area (Abrams and Giroux, 2013).

In 2013, Freegold drilled 10 holes of 11,392 feet and updated the NI-43 101 compliant resource again (Abrams and Giroux, 2013).

Production notes:

None.

Reserves:

The 2013 resource estimate at the Dolphin/Cleary Zone is as follows: Indicated resource (total): With a gold cut-off of 0.30 gram per tonne, 79,800,000 tonnes of 0.66 gram of gold per tonne; contained 1,683,000 ounces gold. Inferred resource (total): With a gold cut-off of 0.30 gram per tonne, 248,060,000 tonnes of 0.61 gram of gold per tonne; contained 4,841,000 ounces gold. (Abrams and Giroux, 2013).

Additional comments:

The Tolovana prospect is an area of extensive exploration by Freegold Ventures Ltd. that began in 1996 within the Golden Summit Project. The area includes several old prospects and the Tolovana Mine (LG105-106, LG109-110, and LG112) that were previously described individually in ARDF. These individual records are retained in ARDF for their geologic detail and history. The work by Freegold, however, has revealed much new mineralization in the area and the company now interprets the deposits in the area as a single system of veins, that they call the 'Cleary Hill vein swarm'.

References:

Abrams, M.J., and Giroux, G.H., 2013, Technical Report for the Golden Summit Project, Fairbanks Mining

District, Alaska: www.sedar.com (posted on August 8, 2013) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00004004&fileName=/csfsprod/data145/filings/02094027/00000001/k%3A%5Cfilings%5Clivework%5Cwkout%5C39198%5CTech_Report.pdf (as of December 23,2014).

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Freeman, C.J., 2008, Executive summary report for the Golden Summit project, Fairbanks Mining District, Alaska: Unpublished Technical Report for Freegold Ventures Ltd., 112 p. (posted on www.sedar.com, March 31, 2008) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00004004&fileName=/csfsprod/data88/filings/01242796/00000001/k%3A%5CSedar%5Cfilings%5Clivework%5Cwkout%5C19016%5CCS_tech.pdf (as of December 23, 2014).

Primary Reference: Freeman, 2008

Reporter(s): D.J. Grybeck (Port Ludlow, WA); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-23

Site name(s): Hill 1870; Shorty Creek

Site type: Prospect

ARDF no.: LG208

Latitude: 65.4169 **Quadrangle:** LG B-4

Longitude: 148.5326

Location description and accuracy:

The Hill 1870 prospect is on hill 1870 about 0.5 mile southwest of the head of Shorty Creek. It is about 7.3 miles south of Livengood, about 0.5 mile west-southwest of the center of section 23, T. 7 N., R. 5 W., and about 0.2 miles west of the Alyeska Pipeline service road.

Commodities:

Main: Ag, As, Au, Cu, Mo

Other: Bi, Pb, Sb, Sn, W, Zn

Ore minerals: Arsenopyrite, bornite, chalcopyrite, gold, molybdenite, pyrite, pyrrhotite, stibnite

Gangue minerals: Quartz

Geologic description:

There is a long history of exploration by industry and government at and around this prospect on large blocks of claims that cover much of the area south of the Tolovana River in the Shorty Creek-Ranney Hollow-Steel Creek- Wilbur Creek area. Freeman (2010) describes the extensive mapping, sampling, and geophysical and geochemical surveys in this area. The exact chronology of this prospect is unclear but it known by 1985 and probably was discovered, mapped and sampled in conjunction with work at the Hill 1835 prospect (LG209) (Freeman, 2010). At the Hill 1870 prospect, hornfelsed flysch of the Wilbur unit, iron-oxide cemented breccia, and strongly altered crackle breccia were found on the flanks of hill 1870. Samples contain less than 69 to 1,063 parts per billion gold, 0.7 to 5.8 parts per million (ppm) silver, and 160 to more than 1,000 ppm arsenic. The mineralization is probably the same as that at the better known Hill 1835 prospect (LG209) prospect about a mile to the northeast. The Hill 1835 prospect was drilled in 1989 and 1990. The core from that drilling shows disseminated and fracture controlled pyrite, pyrrhotite, chalcopyrite, arsenopyrite, and bornite. The most intense hydrothermal alteration in this area is at the nearby Hill 1835 prospect (LG209). In addition to widespread biotite-diopside hornfels, late vein and flood silicification is accompanied by variable crackled to matrix supported brecciation. Widespread pervasive sericite (?) or clay (?) alteration overprints all other alteration and mineralization, giving the rocks a pale yellow to tan bleached appearance.

The area was largely dormant from 1990 to 2005. In 2005, Select Resources leased a large block of claims, staked more, and as of 2010 they held several large blocks that totaled more than 300 claims and include several other prospects including this, the original Shorty Creek prospect (Freeman, 2010). In 2005, they did considerable rock and soil sampling on their claims which they collectively call the Shorty Creek project or just Shorty Creek.

The hills south of the Tolovana River in this area are covered with sub-Arctic forest and loess; outcrop is sparse. The rocks in the area are mainly the Lower Cretaceous Wilbur Creek sequence of folded black carbonaceous siltstone, gray feldspathic sandstone and silty sandstone, black shale, and polymictic conglomerate (Albanese, 1983 [Bedrock geology]; Weber and others, 1992). The sequence disconformably overlies Lower Paleozoic carbonate, volcanic, and pelitic rocks. Several small plutons, mostly of granodiorite composition, are in the Shorty Creek area. Biotite hornfels and lesser diopside hornfels is widespread. Although outcrops of the plutonic rocks crop are sparse, the widespread hornfels suggests large

intrusions nearby or at depth. The structure of the area is dominated by northwest-directed, northeast-trending thrust faults and northeast-trending, open to recumbent isoclinal folds.

Freeman (2010) notes that others consider the prospects in the Shorty Creek area to be intrusive-related gold (IRG) deposits. However, he concludes that the Shorty Creek mineralization is more likely a large copper-gold-molybdenum porphyry system about 8 miles in diameter. This system is manifested in three main types of deposits: 1) proximal copper-gold-molybdenum mineralization as seen in the old Shorty Creek deposit (HG203); 2) high-sulfidation epithermal gold-arsenic-bismuth-tungsten+/-copper+/-silver mineralization as seen at the Hill 1835 prospect (HG209); and 3) intermediate sulfidation epithermal gold-silver-lead-zinc+/-arsenic+/-antimony+/-manganese mineralization as seen on the ridge south of Wilbur Creek.

Alteration:

The most intense hydrothermal alteration in the area occurs at the nearby Hill 1835 prospect (HG New H1004). In addition to widespread biotite-diopside hornfels, late vein and flood silicification is accompanied by variable crackled to matrix-supported brecciation. Widespread pervasive sericite (?) or clay (?) alteration overprints all other alteration and mineralization giving the rocks a pale yellow to tan bleached appearance.

Age of mineralization:

Probably related to intermediate plutons, one of which has been dated at 63 Ma. A white mica from a drill hole at the nearby Hill 1835 prospect (HG New H1004) gave a Ar40/Ar39 age of 65-70 Ma.

Generic deposit model:

Deposit model:

Part of a copper-gold-molybdenum porphyry system (Cox and Singer, 1986; model 20c or 21a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c or 21a

Production Status: None

Site Status: Active

Workings/exploration:

There is a long history of exploration by industry and government at and around this prospect on large blocks of claims that cover much of the area south of the Tolovana River in the Shorty Creek-Ranney Hollow-Steel Creek- Wilbur Creek area. Freeman (2010) describes the extensive mapping, sampling, and geophysical and geochemical surveys in this area. The exact chronology of this prospect is unclear but it known by 1985 and probably was discovered, mapped and sampled in conjunction with work at the Hill 1835 prospect (LG209) (Freeman, 2010). The area was largely dormant from 1990 to 2005. In 2005, Select Resources leased a large block of claims, staked more, and as of 2010 they held several large blocks that totaled more than 300 claims and include several other prospects including this, the original Shorty Creek prospect (Freeman, 2010). In 2005, they did considerable rock and soil sampling on their claims which they collectively call the Shorty Creek project or just Shorty Creek.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Albanese, M.D., 1983, Bedrock geologic map of the Livengood B-4 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 83-3.

Albanese, M.D., 1983, Geochemical reconnaissance of the Livengood B-3, B-4, C-3, and C-4 quadrangles, Alaska. Alaska Division of Geological and Geophysical Surveys Report of Investigations 83-1, 55 pages, 4 maps, scale 1:63,360.

Bundtzen, T.K., 1983, Bedrock geologic outcrop map of the Livengood B-3 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys, Report of Investigations 83-6.

Eakins, G. R., 1974, Preliminary investigations, Livengood mining district: Alaska Division of Geological and Geophysical Surveys Alaska Open-File Report 40, 18 p.

Freeman, C.J., 2010, Geology and mineralization of the Shorty Creek project, Livengood-Tolovana mining district, Alaska: Unpublished NI43-101 report for Select Resources Corporation, 88 p. (posted on www.sedar.com, May 20, 2010).

Light, T.D., and Lee, G.K., 1997, Map showing distribution and occurrence of gold-bearing samples from Livengood Quadrangle, Alaska: U.S.Geological Survey Open-File Report 97-484-C, 21 p., 1 sheet, scale 1:250,000.

Robinson, M.S. and Metz, P.A., 1979, Evaluation of Mineral resources in the pipeline corridor, Phases I and II: Mineral Industry Research Laboratory, University of Alaska Open File Report 79-2, 77 p.

Szumigala, D.J., Puchner, C.C., and Myers, R.E., 2005, Geochemical data from reanalysis of stream-sediment samples collected in 1982 from the Livengood area, Tolovana mining district, Alaska: Alaska Division of Geological & Geophysical Surveys Raw Data File 2005-4, 45 p.

Weber, F.R., Wheeler, K.L., Rinehart, C.D., Chapman, R.M., and Blodgett, R.B., 1992, Geologic map of the Livengood quadrangle, Alaska. U.S.Geological Survey Open File Report 92-562, 20 p., 1 sheet, scale 1:250,000.

Primary Reference: Freeman, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Hill 1835; Shorty Creek

Site type: Prospect

ARDF no.: LG209

Latitude: 65.4309 **Quadrangle:** LG

Longitude: 148.5136

Location description and accuracy:

This prospect is on hill 1835 about 0.5 mile northeast of the head of Shorty Creek and about 7 miles south-southeast of Livengood. Since 2005, it is one of several prospects often referred to as part of the Shorty Creek project which covers a large area and several other prospects. It is southeast quarter of section 14, T. 7 N., R. 5 W of the Fairbanks Meridian. The location is accurate with a quarter mile.

Commodities:

Main: Au, Cu

Other: As, Bi, Pb, Sb, Sn, W, Zn

Ore minerals:

Gangue minerals: Quartz

Geologic description:

The hills south of the Tolovana River in this area are covered with sub-Arctic forest and loess; outcrop is sparse; however at the Hill 1835 prospect there is an absence of vegetation which is attributed to acidic soils and metal toxicity (Abrams, 2015). The rocks in the area are mainly the Lower Cretaceous Wilber Creek sequence of folded black carbonaceous siltstone, gray feldspathic sandstone and silty sandstone, black shale, and polymictic conglomerate (Albanese, 1983a; Weber and others, 1992). The sequence disconformably overlies Lower Paleozoic carbonate, volcanic, and pelitic rocks. Several small plutons, mostly of granodiorite composition, are in the Shorty Creek area. Biotite hornfels and lesser diopside hornfels is widespread. Although outcrops of the plutonic rocks are sparse, the widespread hornfels suggests large intrusions nearby or at depth.

The most intense hydrothermal alteration occurs at the Hill 1835 prospect. In addition to widespread biotite-diopside hornfels, late vein and silica flooding is accompanied by variable crackled to matrix-supported brecciation. Widespread pervasive sericite (?) or clay (?) alteration overprints all other alteration and mineralization giving the rocks a pale yellow to tan bleached appearance. The area is dominated by northwest-directed, northeast-trending thrust faults and northeast-trending, open to recumbent isoclinal folds (Freeman, 2010). Mineralization at the Hill 1835 prospect appears to be bound by northeast striking faults and part of the same structural zone exposed over one mile to the southwest on the Alyeska Pipeline access road where a shear zone several hundred feet wide contains intense brecciation, silicification, and gold-sulfide mineralization, including arsenopyrite, stibnite, galena, and chalcopyrite. Rubble and outcrop at Hill 1835 contain hornfels with large (1 centimeter) cubic molds of pyrite, often partially filled with limonite. Drill chips contain disseminated and fracture-controlled pyrite, pyrrhotite, chalcopyrite, arsenopyrite, and bornite. Vuggy, barren, stockwork quartz veins cut grain-supported and matrix-supported breccias and appear to be the last phase of silicification (Abrams, 2015). Gold values from drill holes at Hill 1835 drilled in 1989 were higher in the hornfels in the upper 100 to 150 feet of drilling while copper values were higher outside the hornfels particularly near the bottom of some holes.

Alteration:

The most intense hydrothermal alteration in the area occurs at this prospect. In addition to widespread

biotite-diopside hornfels, late vein and silica flooding is accompanied by variable crackled to matrix-supported brecciation. Widespread pervasive sericite (?) or clay (?) alteration overprints all other alteration and mineralization giving the rocks a pale yellow to tan bleached appearance (Freeman, 2010).

Age of mineralization:

Probably related to intermediate plutons, one of which has been dated at 63 Ma. A white mica from a drill hole gave a 40Ar/39Ar age of 65 to 70 Ma (Albanese, 1983a).

Generic deposit model:

Deposit model:

Copper-gold porphyry system (Cox and Singer, 1986; model 20c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c

Production Status: None

Site Status: Active

Workings/exploration:

There is a long history of exploration by industry and government at and around this prospect. Freeman (2010) describes the extensive mapping, sampling, and geophysical and geochemical surveys in this area. In 1979, massive sulfide as much as 5 inches thick were found in roadcuts along the Alyeska Pipeline service road about a half mile southwest of Hill 1835 (Robinson and Metz, 1979). This led to extensive soil and rock sampling in the area by Fairbanks Exploration Inc. (FEI).

In 1989 and 1990, FEI and Asarco Ltd. drilled 20 reverse-circulation holes that totaled 6,843 feet at this prospect. Numerous intercepts of up to 500 feet were cut that contained more than 0.1 part per million (ppm) gold; some notable intercepts were 125 feet that contained 1.776 ppm gold and 25 feet that contained 4.577 ppm gold (Freeman, 2010). The core from the 1989 to 1990 drilling shows disseminated and fracture controlled pyrite, pyrrhotite, chalcopyrite, arsenopyrite, and bornite.

The area was largely dormant from 1990 to 2005. In 2005, Select Resources leased a large block of claims, staked more, and as of 2010 they held several large blocks that totaled more than 300 claims and included several other prospects (Freeman, 2010). In 2005, they did considerable rock and soil sampling on their claims which they collectively call the Shorty Creek project or just Shorty Creek.

Freegold Ventures Limited (Freegold) completed 28.6 kilometers of induced polarization (IP) surveying and collected 354 soil samples in 2014 covering the prospect areas of Hill 1835 and Hill 1710 (LG203). A resistivity high at Hill 1835 represents the silicified hornfels and is associated with a gold-arsenic-bismuth-copper soil anomaly (Abrams, 2015).

Freegold Ventures Limited’s 2016 drilling program at their intrusion-related Shorty Creek property included 7 holes totaling 3,038 m; 2 holes were drilled in the ‘Hill 1835’ area, and 5 holes were drilled in the ‘1710’ area to test copper-molybdenum targets. ‘Hill 1835’ mineralization is spatially associated with a magnetic high defined by airborne- (Burns and others, 2015) and ground-based surveys, as well as magnetic highs in inverted profiles. Drilling highlights include 434.5 meters averaging 0.57 percent copper-equivalent, and 409.6 meters averaging 0.41 percent copper-equivalent. In the ‘1710’ area, 5 drill holes totaling 2,019.8 m, tested a copper-molybdenum soil anomaly and magnetic high. Drill hole SC 16-07 intersected 0.11 percent copper and 0.011 percent molybdenum from 0-159 m, including 0.15 percent copper and 0.009 percent molybdenum from 0-70.8 meters within quartz-feldspar porphyry. The entire 396-meter-long drill hole averaged 0.08 percent copper and 0.006 percent molybdenum. Additionally, Freegold conducted new ground-based geochemical sampling, geophysical surveys, and claim staking in 2016, and identified the new Quarry and Steel Creek target areas (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

The new Steel Creek geophysically defined target does not correspond to ARDF description LG027 (Steel Creek).

References:

Abrams, M.J., 2015, Technical report for the Shorty Creek Project, Livengood - Tolovana Mining District, Alaska: prepared for Freegold Ventures Limited, Free Gold Recovery, USA, and Grizzly Bear Gold Inc., 91 p. (posted on www.sedar.com, March 31, 2015).

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Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Burns, L.E., Geoterrex-Dighem, Stevens Exploration Management Corp., Emond, A.M., and Graham, G.R.C., 2015, Livengood mining district electromagnetic and magnetic airborne geophysical survey, data compilation: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2015-5. http://doi.org/10.14509/29412

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Robinson, M.S. and Metz, P.A., 1979, Evaluation of Mineral resources in the pipeline corridor, Phases I and II: Mineral Industry Research Laboratory, University of Alaska Open File Report 79-2, 77 p.

Weber, F.R., Wheeler, K.L., Rinehart, C.D., Chapman, R.M., and Blodgett, R.B., 1992, Geologic map of the Livengood quadrangle, Alaska. U.S. Geological Survey Open-File Report 92-562, 20 p., 1 sheet, scale 1:250,000.

Primary Reference: Abrams, 2015

Reporter(s): D.J. Grybeck (Contractor, USGS); N.V. King (Alaska Earth Sciences); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Unnamed (near Wilbur Creek); Shorty Creek

Site type: Prospect

ARDF no.: LG210

Latitude: 65.4573 **Quadrangle:** LG B-4

Longitude: 148.3715

Location description and accuracy:

There is little information about this prospect and it is here located west of the mouth of Wilbur Creek where old pits and shafts are reported. The site is about 0.7 mile southeast of the center of section 4, T. 7 N., R. 4 W. and about 7.3 miles south of Livengood.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

There is a long history of exploration by industry and government at and around this prospect on large blocks of claims that cover much of the area south of the Tolovana River in the Shorty Creek-Ranney Hollow-Steel Creek- Wilbur Creek area. Freeman (2010) describes the extensive mapping, sampling, and geophysical and geochemical surveys in this area. The only direct evidence of lode mineralization at this site are shafts and pits reported by placer miners west of the mouth of Wilbur Creek (Freeman, 2010). However, the Wilbur Creek ridge east of the creek roughly coincides with a strong geochemical anomaly in arsenic, silver, lead, zinc, and manganese.

In 2005, Select Resources leased a large block of claims, staked more, and as of 2010 they held several large blocks that totaled more than 300 claims and include several other prospects including this, the original Shorty Creek prospect (Freeman, 2010). In 2005, they did considerable rock and soil sampling on their claims which they collectively call the Shorty Creek project or just Shorty Creek.

The hills south of the Tolovana River in this area are covered with sub-Arctic forest and loess; outcrop is sparse. The rocks in the area are mainly the Lower Cretaceous Wilbur Creek sequence of folded black carbonaceous siltstone, gray feldspathic sandstone and silty sandstone, black shale, and polymictic conglomerate (Albanese, 1983 [Bedrock geology]; Weber and others, 1992). The sequence disconformably overlies Lower Paleozoic carbonate, volcanic, and pelitic rocks. Several small plutons, mostly of granodiorite composition, are in the Shorty Creek area. Biotite hornfels and lesser diopside hornfels is widespread. Although outcrops of the plutonic rocks crop are sparse, the widespread hornfels suggests large intrusions nearby or at depth. The structure of the area is dominated by northwest-directed, northeast-trending thrust faults and northeast-trending, open to recumbent isoclinal folds.

Freeman (2010) notes that others consider the prospects in the Shorty Creek area to be intrusive-related gold (IRG) deposits. However, he concludes that the Shorty Creek mineralization is more likely a large copper-gold-molybdenum porphyry system about 8 miles in diameter. This system is manifested in three main types of deposits: 1) proximal copper-gold-molybdenum mineralization as seen in the old Shorty Creek deposit (HG203); 2) high-sulfidation epithermal gold-arsenic-bismuth-tungsten+/-copper+/-silver mineralization as seen at the Hill 1835 prospect (HG New H1004); and 3) intermediate sulfidation epithermal gold-silver-lead-zinc+/-arsenic+/-antimony+/-manganese mineralization as seen on the ridge south of Wilbur Creek.

Alteration:

The most intense hydrothermal alteration in the area occurs at the nearby Hill 1835 prospect (HG New H1004). In addition to widespread biotite-diopside hornfels, late vein and flood silicification is accompanied by variable crackled to matrix-supported brecciation. Widespread pervasive sericite(?) or clay(?) alteration overprints all other alteration and mineralization giving the rocks a pale yellow to tan bleached appearance.

Age of mineralization:

Probably related to intermediate plutons, one of which has been dated at 63 Ma. A white mica from a drill hole at the nearby Hill 1835 prospect (HG New H1004) gave a Ar40/Ar39 age of 65-70 Ma.

Generic deposit model:

Deposit model:

Part of a copper-gold-molybdenum porphyry system (Cox and Singer, 1986; model 20c or 21a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c or 21a

Production Status: None

Site Status: Active

Workings/exploration:

There is a long history of exploration by industry and government at and around this prospect on large blocks of claims that that have and still do cover much of the area south of the Tolovana River in the Shorty Creek-Ranney Hollow-Steel Creek- Wilbur Creek area. See Freeman (2010) for the details and the many references to the extensive mapping, sampling, and geophysical and geochemical surveys in this area. Aside from reports of old pits and shafts west of the mouth of Wilbur Creek, the only work that has been done in vicinity of this prospect is mapping, sampling, and geochemical surveys.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Albanese, M.D., 1983, Bedrock geologic map of the Livengood B-4 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 83-3.

Albanese, M.D., 1983, Geochemical reconnaissance of the Livengood B-3, B-4, C-3, and C-4 quadrangles, Alaska. Alaska Division of Geological and Geophysical Surveys Report of Investigations 83-1, 55 pages, 4 maps, scale 1:63,360.

Bundtzen, T.K., 1983, Bedrock geologic outcrop map of the Livengood B-3 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys, Report of Investigations 83-6.

Eakins, G. R., 1974, Preliminary investigations, Livengood mining district: Alaska Division of Geological and Geophysical Surveys Alaska Open-File Report 40, 18 p.

Freeman, C.J., 2010, Geology and mineralization of the Shorty Creek project, Livengood-Tolovana mining

district, Alaska: Unpublished NI43-101 report for Select Resources Corporation, 88 p. (posted on www.sedar.com, May 20, 2010).

Light, T.D., and Lee, G.K., 1997, Map showing distribution and occurrence of gold-bearing samples from Livengood Quadrangle, Alaska: U.S.Geological Survey Open-File Report 97-484-C, 21 p., 1 sheet, scale 1:250,000.

Robinson, M.S. and Metz, P.A., 1979, Evaluation of Mineral resources in the pipeline corridor, Phases I and II: Mineral Industry Research Laboratory, University of Alaska Open File Report 79-2, 77 p.

Szumigala, D.J., Puchner, C.C., and Myers, R.E., 2005, Geochemical data from reanalysis of stream-sediment samples collected in 1982 from the Livengood area, Tolovana mining district, Alaska: Alaska Division of Geological & Geophysical Surveys Raw Data File 2005-4, 45 p.

Weber, F.R., Wheeler, K.L., Rinehart, C.D., Chapman, R.M., and Blodgett, R.B., 1992, Geologic map of the Livengood quadrangle, Alaska. U.S.Geological Survey Open File Report 92-562, 20 p., 1 sheet, scale 1:250,000.

Primary Reference: Freeman, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Saddle

Site type: Occurrence

ARDF no.: LG211

Latitude: 65.406 **Quadrangle:** LG B-6

Longitude: 149.546

Location description and accuracy:

The Saddle occurrence is located on a north-northwest trending ridge of the Sawtooth Mountains, 1.6 miles north-northwest from the peak VAMB 4494 'Tooth'; NE1/4, and about 0.2 mile east-northeast from the center of section 26, T. 7 N., R. 10 W., of the Fairbanks Meridian. The Saddle occurrence location is accurate within 300 meters.

Commodities:

Main: Au

Other: As, Sb

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

The Saddle occurrence lies near the halfway point of known mineralization on the gold mineralized trend Tooth Trend (J.R. Woodman, Senior Natural Resource Manager, Doyon Limited, written communication, 2014). The Peak and Huron prospects are located on the Tooth trend, which coincides with projection of southwest-northeast trending thrust fault contact, in Devonian sedimentary rocks (Wilson and others, 1998).

Sixty-four soil samples were collected in 1994 by ASA-Montague over a 1/4 mile square area. Three widely spaced soil samples yielded assay results greater than 0.5 part per million (ppm) gold with some anomalous arsenic and antimony. More than 80 rock grab samples were also collected in the soil grid area. (ASA-Montague, 1994).

Saddle surface sample gold mineralization is hosted in quartz monozonite,adjacent hornfels and silicified Devonian sedimentary rocks (ASA, Inc., 1992).

Alteration:

Silicification (ASA, Inc., 1992).

Age of mineralization:

Cretaceous or later based on age of the quartz monzonite (Wilson and others, 1998).

Generic deposit model:

Deposit model:

Intrusive-related gold.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Sixty-four soil samples were collected at Saddle in 1994 by ASA-Montague over a 1/4 mile square area. Three widely spaced soil samples yielded assay results greater than 0.5 part per million (ppm) gold with some anomalous arsenic and antimony. More than 80 rock grab samples were also collected in the soil grid area (ASA-Montague, 1994).

Saddle surface sample gold mineralization is hosted in quartz monozonite, adjacent hornfels and silicified Devonian sedimentary rocks (ASA, Inc., 1992).

Production notes:

None.

Reserves:

None.

Additional comments:

Suggestions to add this record and references were provided as a written communication by J.R. Woodman, Senior Natural Resource Manager, Doyon Limited, 2014.

References:

ASA, Inc., 1992 Annual Report Reconnaissance Program Doyon Option Lands, Volume 3, Plates 3.3.4.1A – 3.4.3.1B (Doyon Report 92-168c, Report held by Doyon, Limited, Fairbanks, Alaska).

ASA-Montague, 1994, Annual Report Reconnaissance Program Doyon Option Lands, Volume 1 (Doyon Report 95-14a, Report held by Doyon, Limited, Fairbanks, Alaska).

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: ASA-Montague, 1994

Reporter(s): V.C.Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-24

Site name(s): Huron

Site type: Prospect

ARDF no.: LG212

Latitude: 65.425 **Quadrangle:** LG B-5

Longitude: 149.48

Location description and accuracy:

The Huron prospect is located on a northeast-trending ridge of the Sawtooth Mountains between Huron Creek and Mud Fork, 2.8 miles north-northeast from the peak VAMB 4494 'Tooth'; NW1/4NE1/4 and 0.4 mile north-northeast from the center of section 19, T. 7 N., R. 9 W., of the Fairbanks Meridian. The Huron Prospect location is accurate within 300 meters.

Commodities:

Main: Au

Other: Ag, Cu, Hg, Mo, Pb, Sb, U, W, Zn

Ore minerals: Arsenopyrite, gold, pyrrhotite

Gangue minerals: Quartz, sericite

Geologic description:

The Huron Prospect is the northeastern most prospect on a gold mineralized trend known at the Tooth Trend (J.R. Woodman, Senior Natural Resource Manager, Doyon Limited, written communication, 2014). The Huron prospect, Peak prospect, and Saddle occurrence are located on the Tooth trend, which coincides with projection of a southwest-northeast trending thrust fault contact, in Devonian sedimentary rocks (Wilson and others, 1998).

Huron gold mineralization is associated with (a) narrow quartz-sulfide veins within quartz monozonite sills and in sedimentary rocks adjacent to the sills; (b) semi-massive pyrrhotite-rich sulfide plus silica replacement bodies in calcareous sedimentary rocks adjacent to the sills. Quartz-sulfide veins contain up to 15 percent arsenopyrite and assays up to 1.4 grams of gold per tonne for a 5 foot interval (sample HC9603, 25 to 30 feet) with sericitic alteration selvages hosted in two quartz monzonite/granite dikes and adjacent sedimentary rock (ASA -Montague, 1997).

Sixty-one soil samples were collected on and near two quartz monozonite sills by ASA-Montague in 1994. Nineteen of the soil samples yielded assays of greater than 0.5 part per million (ppm) gold, with the highest containing 1.57 ppm gold (ASA-Montague, 1994a, 1994b). In 1996 and 1997, eleven core holes totaling 2,368 feet were drilled in sedimentary hornfels adjacent to the sills. A total of 10 drill intercepts ranging from 0.1 foot to 5.0 feet thick yielded assays of greater than 1.0 ppm gold (ASA-Montague,1997).

Alteration:

One type of alteration associated with gold mineralization is semi-massive pyrrhotite-rich sulfide plus silica replacement bodies in calcareous sedimentary rocks adjacent to the sills. Another type of alteration also associated with gold mineralization is sericitic alteration in which sericitic selvages are hosted in two quartz monzonite/granite dikes and adjacent sedimentary rock (ASA -Montague, 1997).

Age of mineralization:

Cretaceous or later based on age of the quartz monzonite (Wilson and others, 1998).

Generic deposit model:

Deposit model:

Intrusive-related gold.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Sixty-one soil samples were collected on and near two quartz monozonite sills by ASA-Montague in 1994. Nineteen of the soil samples yielded assays of greater than 0.5 part per million (ppm) gold, with the highest containing 1.57 ppm gold (ASA-Montague, 1994a, 1994b). In 1996 and 1997, eleven core holes totaling 2,368 feet were drilled in sedimentary hornfels adjacent to the sills. A total of 10 drill intercepts ranging from 0.1 foot to 5.0 feet thick yielded assays of greater than 1.0 ppm gold (ASA-Montague, 1997).

Huron gold mineralization is associated with a) narrow quartz-sulfide veins within quartz monozonite sills and in sedimentary rocks adjacent to the sills; b) semi-massive pyrrhotite-rich sulfide plus silica replacement bodies in calcareous sedimentary rocks adjacent to the sills. Quartz-sulfide veins contain up to 15 percent arsenopyrite and assays up to 1.4 grams of gold per tonne for a 5 foot interval (sample HC9603, 25 to 30 feet) with sericitic alteration selvages hosted in two quartz monzonite/granite dikes and adjacent sedimentary rock (ASA -Montague, 1997).

Production notes:

None.

Reserves:

None.

Additional comments:

Suggestions to add this record and references were provided as a written communication by J.R. Woodman, Senior Natural Resource Manager, Doyon Limited, 2014.

References:

ASA-Montague, 1994a, Annual Report Reconnaissance Program Doyon Option Lands, Volume 1 (Doyon Report 95-14a, Report held by Doyon, Limited, Fairbanks, Alaska).

ASA-Montague, 1994b, Annual Report Reconnaissance Program Doyon Option Lands, Volume 3 (Doyon Report 95-14c Report held by Doyon, Limited, Fairbanks, Alaska).

ASA-Montague, 1997, Annual Report for Doyon Option Lands Volume 1 (Doyon Report 98-7a, Report held by Doyon, Limited, Fairbanks, Alaska).

Wilson, F.H., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and Haeussler, P.J., 1998, Geologic map of central (interior) Alaska: U.S. Geological Survey Open-File Report 98-133, 76 p., 3 sheets, scale 1:500,000.

Primary Reference: ASA-Montague, 1997

Reporter(s): V.C.Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-24

Site name(s): Rampart Copper

Site type: Occurrence

ARDF no.: LG213

Latitude: 65.6647 **Quadrangle:** LG C-5

Longitude: 149.0513

Location description and accuracy:

The copper occurrences were exposed during excavation for the Trans-Alaska Pipeline and are situated on the right-of-way located in SE¼NE¼, SE¼SE¼, and NW¼SE¼ Section 29, T. 10 N., R. 7 W., Fairbanks Meridian. The site is along the pipeline service pad on the north-facing hillslope to the Hess Creek valley.

Commodities:

Main: Cu

Other:

Ore minerals: Chalcopyrite, malachite, pyrite

Gangue minerals:

Geologic description:

The Rampart Group is mapped by Weber, and others (1992) as Triassic and Permian extrusive and intrusive mafic rocks with some undifferentiated sedimentary rocks. Brosge and others (1969) noted that diabase dikes and larger bodies of gabbro and augite diorite are common within the mapped boundaries of the Rampart Group'. A dike of hornblende diorite in the Rampart Group south of Hess Creek in the Livengood Quadrangle was found to locally contain as much as 10 percent sulfide.

Alteration:

No significant alteration.

Age of mineralization:

Host rock diorite is Permian; age of mineralization is unknown.

Generic deposit model:

Deposit model:

Porphyry copper (Cox and Singer, 1986; model 17).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

17

Production Status: None

Site Status: Inactive

Workings/exploration:

In the 1970s the Bureau of Mines made mineral evaluation studies of the Trans-Alaska Pipeline Corridor

for the Bureau of Land Management. A dike of hornblende diorite south of Hess Creek in the Livengood Quadrangle was found to locally contain as much as 10 percent sulfide. Copper minerals occur in chert and diorite float at several sites locally; the best assay value was 1.56 percent copper in a select hand sample. Further examination found copper mineralization to be limited and discontinuous, and associated with diorite dikes and sills. Copper minerals were seen in hand specimen. A few blebs of chalcopyrite were noted in the diorite (?) and malachite coated fractures in the chert over a small area near one of the diorite (?) dikes and meta-siltstone. Investigation included several ground magnetic surveys, soil sampling, and general reconnaissance of the area (McDermott and others, 1981). Analytical results for soil and rock samples are reported in Averett and Barker, 1981.

Due to the low concentrations and low tonnages implied by a dike or sill-like occurrence of disseminated copper in diorite, and the lack of significant copper mineralization, alteration, mineral zoning and alteration zoning typical of copper-porphyry deposits, no further work was recommended.

Production notes:

None.

Reserves:

None.

Additional comments:

Access to the pipeline pad requires a temporary use permit from Alyeska Pipeline Service Co. Splits of most samples collected by the U.S. Bureau of Mines and referenced in this report have been archived at the Alaska Geologic Materials Center, Anchorage, Alaska and are available for review.

References:

Averett, W.R., and J.C. Barker, 1981, Report of Analyses from Mineral Resource Investigations in Central and Eastern Alaska: Bendix Field Engineering Corp., Grand Junction, Co. and U.S. Bureau Mines, AFOC, Fairbanks, AK for the U.S. Department of Energy, Contract #GJBX-178(81).

Brosge, W.P., Lamphere, M.A. Reiser, H.N. and Chapman, R.M., 1969, Probable Permian Age of the Rampart Group, Central Alaska: U.S. Geological Survey Bulletin 1294-B, p. Bl-Bl8.

McDermott, M.M., Foley, J.Y., and Southworth, D.D., 1981, Investigation of a copper occurrence in the Rampart Diorites: U.S. Bureau of Mines Open-File Report 143-81, 26 p., 1 sheet, scale 1:24,000.

Robinson, M.S., and Metz, P.A., 1979, Evaluation of the mineral resources of the pipeline corridor, phases i and ii: University of Alaska Mineral Industry Research Laboratory Open-File 79-2, 272 p.

Weber, F.R., Wheeler, K.L., Rinehart, C.D., Chapman, R.M., and Blodgett, R.B., 1992, Geologic map of the Livengood quadrangle, Alaska: U.S. Geological Survey Open-File Report 92-562, 19 p., scale 1:250,000.

Primary Reference: McDermott, and others, 1981

Reporter(s): J.C. Barker

Last report date: 2016-03-15

Site name(s): Mount Schwatka; East Fork Flat Creek

Site type: Occurrence

ARDF no.: LG214

Latitude: 65.9172 **Quadrangle:** LG D-1

Longitude: 147.061

Location description and accuracy:

This site represents closely-spaced multiple mineral occurrences and anomalies at the headwater divide between the upper East Fork of Flat Creek and an unnamed east tributary of Jefferson Creek located about 6 miles northeast of Mt. Schwatka. The site is at elevations of 2,000 to 3,000 feet and involves all of Sections 26 and 35, T. 13 N., R. 3 E., of the Fairbanks Meridian. The location is accurate within 0.5 mile and denotes the center point of these two sections.

Commodities:

Main: Ag, Cu, Pb, Zn

Other: Mo, Pb

Ore minerals: Smithsonite, unknown zinc mineral(s)

Gangue minerals:

Geologic description:

The Mount Schwatka area is a fault-bounded block about 35 to 40 miles east-west and composed of marine sedimentary and volcanic rocks (Chapman and others, 1971). Like the Crazy Mountains to the east, it is one of several fragmented geologic blocks termed klippen-like features (Payne, 1959) comprised of North American plate geology that are tectonically emplaced along the Tintina Fault (Payne, 1959). The Tintina Fault is a major feature of northwest North America and in central Alaska it has resulted in conspicuous fault-lineated valleys and elongate but discontinuous hills and ridges composed of sedimentary rock that abut the Yukon River basin. It is generally believed these rocks are correlative to the Selwyn Basin in the Yukon Territory (Tempelman-Kluit, 1977). This implies that there has been as much as 280 miles of right lateral displacement along the Tintina Fault.

In the Mt. Schwatka area a Cambrian black shale unit is overlain by Ordovician-Silurian volcanic rocks including the Fossil Creek Volcanics (Blodgett and others, 1987). In the local area of this occurrence the shale unit also includes intermediate tuffaceous limestone, andesite, and locally pyroclastics, gray shale, and chert (Barker, 1980). Stratigraphically overlying the volcanic rocks is the Tolovana Limestone (Chapman and others, 1971), which prominently caps some of the higher terrain.

Similar to the Selwyn Basin, the Mt. Schwatka area features a number of lead-zinc occurrences, some with minor copper, and mostly localized in early- to mid-Paleozoic marine sediments and volcanics including intermediate tuffaceous. Most mineral occurrences are hosted in, or near, fault zones and breccia.

Sulfides of copper, lead, zinc and their associated oxides occur in quartz veins that cut outcropping sequences of calcarenite (?), tuffaceous limestone, and commonly iron-stained argillite rocks within a complex structural setting (Barker, 1980). A few subcrops of dense iron-rich tuff, chert and shale were noted. This host sequence is bounded on the north and east by the Tolovana Limestone, which caps the higher ridges. At a few locations specks of galena were noted in the limestone near contacts with underlying argillaceous rocks.

Alteration:

Most original mineralization has been destroyed by oxidation and gossan development. Smithsonite is

generally a carbonate-altered sphalerite (Barker, 1980).

Age of mineralization:

Generic deposit model:

Deposit model:

Zinc replacement body? (Cox and Singer, 1986; model 19a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

19a?

Production Status: None

Site Status: Inactive

Workings/exploration:

Sulfides of copper, lead, zinc and their associated oxides occur in quartz veins that cut outcropping sequences of calcarenite (?), tuffaceous limestone, and commonly iron-stained argillite rocks within a complex structural setting (Barker, 1980). A few subcrops of dense iron-rich tuff, chert and shale were noted. This host sequence is bounded on the north and east by the Tolovana Limestone, which caps the higher ridges. At a few locations specks of galena were noted in the limestone near contacts with underlying argillaceous rocks.

On a west-facing ridge slope a boulder train of smithsonite occurs; samples contained 30 to 46.5 percent zinc, up to 0.175 percent lead, and 0.18 percent copper. Near the head of this slope an argillite sample was anomalous with lead, zinc, and also reported 6 ppm silver and 195 ppm molybdenum. The source was not found exposed. Isolated patches and pods of sulfides with malachite staining occur in the host sequence. Peripheral to the area, about 7 of 15 widely spaced soil samples and 9 of 10 stream sediment samples contained anomalous values of one or several of these metals.

The evaluation of this site was one visit with no follow-up.

Production notes:

None.

Reserves:

None.

Additional comments:

This site is on land now included in the Yukon Flats National Wildlife Refuge, which excludes mineral exploration activities.

References:

Barker, J. C., 1980, Occurrences and Potential for Lead and Zinc Mineralization in the Mount Schwatka Region: U.S. Bureau of Mines, Open-File Report 70-80, 51 p., 9 plates.

Blodgett, R.B., Wheeler, K.L., Rohr, D.M., Harris, A.G., and Weber, F.R., 1987, A Late Ordovician age reappraisal for the upper Fossil Creek Volcanics, and possible significance for glacio-eustacy, in Hamilton, T.D., and Galloway, J.P., eds., Geologic studies in Alaska by the U.S. Geological Survey during 1986: U.S. Geological Survey Circular 998, p. 54-58.

Chapman, R.E., Weber, F. R., and Tabor, B., 1971, Preliminary Geologic Map of the Livengood Quadrangle, Alaska: U.S. Geological Survey, Open File 71- 483, 2 plates.

Payne, T. G., 1959, Mesozoic and Cenozoic Tectonic Elements of Alaska: U.S. Geological Survey, Miscellaneous Geological Investigations, Map I-84.

Tempelman-Kluit, D. J., 1977, Stratigraphic and Structural Relations Between the Selwyn Basin, Pelly-Cassiar Platform, and Yukon Crystalline Terrane in the Pelly Mountains, Yukon: Geological Survey of Canada, Paper 77-1A, pp. 223-227.

Weber, F.R., Wheeler, K.L., Rinehart, C.D., Chapman, R.M., and Blodgett, R.B., 1992, Geologic map of the Livengood quadrangle, Alaska: U.S. Geological Survey Open-File Report 92-562, 19 p., scale 1:250,000.

Primary Reference: Barker, 1980

Reporter(s): J.C. Barker

Last report date: 2016-03-15

Site name(s): Roy Creek

Site type: Prospect

ARDF no.: LG215

Latitude: 65.4847

Quadrangle: LG B-1

Longitude: 147.0773

Location description and accuracy:

The prospect is located 42 miles northwest of Chena Hot Springs, 7.2 miles east-southeast from VABM 4772 'Cache Mountain', and 0.5 miles south of the center of section 26, T. 8 N., R 3 E., Fairbanks Meridian. It lies on the ridge between Roy and O'brian creeks. The location is accurate to within approximately 100 feet (Susan Karl, USGS, oral commun., 2014).

Commodities:

Main: U

Other: F, REE

Ore minerals: Allanite, bastnaesite, monazite, thorianite, thorite, uraninite, xenotime

Gangue minerals: Fluorite, hematite, topaz, tourmaline

Geologic description:

This area contains significant uranium-rare earth mineralization. There are numerous uranium prospects, uraniferous springs and stream-sediments in the area (Barker and Clautice, 1977). Mt. Prindle pluton is a tourmaline- and topaz-bearing porphyritic biotite granite that crops out over a 50-square-km area. Country rock is quartzite and micaceous quartzite with subordinate quartz-mica schist, phyllitic schist and calcareous schist, thermally metamorphosed to upper hornblende facies near the pluton contact. The pluton is cut by three major NE-trending faults, and several quartz porphyry, aplite and pegmatite dikes.

Lithologies of the Roy Creek prospect consist of a Late Precambrian-Cambrian low grade metasedimentary asseblege intruded by a Cretaceous age alkaline complex (Burton, 1981). The intrusive complex consists of aegirine augite syenite and biotite augite porphric syenite.

Fissure veins containing allanite, bastnaesite, monazite, thorianite, thorite, uraninite, and xenotime occur in Cretaceous porphyritic biotite syenite and alkali granite (Burton, 1981). The deposit contains significant La, Cd, Nd, Pr, Yb, and fluorite. Hematitic alteration of wall rock and leaching of magnetite occurs in host rocks. Samples contain up to 0.1 percent U-238 and 15 percent rare-earth elements (Burton, 1981).

Alteration:

There is hematitic alteration of wall rock and leaching of magnetite in host rocks (Burton, 1981).

Age of mineralization:

K-Ar dates of 85.4 - 86.7 Ma on augite syenite from the Roy Creek Pluton (Burton, 1981) when corrected with appropriate decay constants are 87.5+/-6.4 and 88.9+/-3.6 Ma.

Generic deposit model:

Deposit model:

U-REE deposit associated with a monzogranite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Exploration in the Mt Prindle area has focused on radioactive mineral occurrences within the syenite and surrounding altered quartzites. Fissure veins contain anomalous U, Th, and REEs. Some exploration prospect pits and limited drilling was carried out at Roy Creek by MAPCO in the late 1970s but no further development has taken place. Claims were active from 1977 through at least 1981 (Menzie and others, 1983, p. 56).

Production notes:

None.

Reserves:

None.

Additional comments:

The 9/9/1998 version of this record combined the Roy Creek and Little Creek records and listed the coordinates for Little Champion Creek in the Circle quadrangle. The ARDF number for Little Champion Creek remains CI051.

References:

Barker, J.C., and Clautice, K.H., 1977, Anomalous uranium concentrations in artesian springs and stream sediments in the Mount Prindle area, Alaska: U.S. Bureau of Mines Open-File Report 130-77, 19 p.

Burton, P.J., 1981, Radioactive mineral occurrences, Mt. Prindle area, Yukon-Tanana Uplands: Fairbanks, University of Alaska, M.Sc. thesis, 72 p.

Menzie, W.D., Foster, H.L., Tripp, R.B., and Yeend, W.E., 1983, Mineral resource assessment of the Circle quadrangle, Alaska: U.S. Geological Survey Open-File Report 83-170-B, 61 p., 1 sheet, 1:250,000.

Primary Reference: Burton, 1981

Reporter(s): C.J. Freeman, J.R. Guidetti Schaefer, A.S. Clements (Avalon Development Corporation); V.C. ZInno (Alaska Earth Science, Inc.)

Last report date: 2016-03-15

Site name(s): Peak

Site type: Prospect

ARDF no.: LG216

Latitude: 65.386 **Quadrangle:** LG B-6

Longitude: 149.609

Location description and accuracy:

The Peak prospect is located on a peak on the western side of Sawtooth Mountain, 2.6 miles west of VANM 4494 'Tooth'. It is in the SW1/4 SW1/4 of section 33, 0.4 mile southwest from the center of section 33, T. 7 N., R. 10 W., of the Fairbanks Meridian. This location is accurate within 300 meters (J.R. Woodman, Natural Resource Manger, Doyon Limited, written commun., 2014).

Commodities:

Main: Au

Other: As

Ore minerals: Arsenopyrite, gold

Gangue minerals: Quartz, sericite

Geologic description:

American Scotland Australia found that gold mineralization is associated with quartz veins and sericitic alteration selvages hosted in two quartz monzonite / granite dikes and adjacent sedimentary rock (ASA-Montague,1997). Country rock is the Devonian Quail unit of Weber and others (1992) consisting of phyllite, siltstone, quartzose sandstone, graywacke, and conglomerate. Unit may be correlated with Nation River Formation of the Charley River quadrangle.

In 1994, ASA-Montague performed soil sampling to test for gold mineralization (ASA-Montague, 1994). In 1996 and 1997 ASA-Montague conducted core drilling to determined the extent of mineralization (ASA-Montague, 1997).

Surface samples assays show high-grade gold concentrations exhibit a poor correlation with arsenic. Drill assay results indicate gold mineralization is hosted in quartz veins and high arsenic values are commonly found in the adjacent vein selvages and sporadically in auriferous quartz veins (ASA-Montague, 1997; J.R. Woodman, Natural Resource Manager, Doyon Limited, written communication, 2014).

Alteration:

Quartz and sericite (ASA-Montague, 1997).

Age of mineralization:

Gold mineralization probably associated with Cretaceous intrusive rocks (ASA-Montague, 1997). Dikes likely similar in age to mid-Cretaceous (91 Ma) Sawtooth pluton (Weber and others, 1992).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins? (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a?

Production Status: None

Site Status: Inactive

Workings/exploration:

American Scotland Australia found that gold mineralization is associated with quartz veins and sericitic alteration selvages hosted in two quartz monzonite / granite dikes and adjacent sedimentary rock (ASA-Montague,1997). Surface samples assays show high-grade gold exhibits a poor correlation with arsenic. Drill assay results indicate gold mineralization is hosted in quartz veins and high arsenic values are commonly found in the adjacent vein selvages and sporadically in auriferous quartz veins. Thirty-three soil samples were collected in a 150 X 150 meter grid covering the dikes. Seven of the soil samples yielded assays of greater than 1.0 ppm gold (ASA-Montague, 1994; and J.R. Woodman, Natural Resource Manager, Doyon Limited, written communication, 2014).

In 1996 and 1997, eight core holes totaling 1556 feet were drilled in and adjacent to the dikes. A total of 34 drill intercepts ranging from 0.7 feet - 4.7 feet thick yielded assays of greater than 1.0 ppm gold. Surface samples assays show high-grade gold concentrations exhibit a poor correlation with arsenic. Drill assay results indicate gold mineralization is hosted in quartz veins and high arsenic values are commonly found in the adjacent vein selvages and sporadically in auriferous quartz veins (ASA-Montague,1997; J.R. Woodman, Natural Resource Manager, Doyon Limited, written communication, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

American Scotland Australia, 1993, Annual Report Reconnaissance Program Doyon Option Lands, Volume 4 (Doyon Report 93-44d, Report held by Doyon, Limited, Fairbanks, Alaska).

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Weber, F.R., Wheeler, K.L., Rinehart, C.D., Chapman, R.M., and Blodgett, R.B., 1992, Geologic map of the Livengood quadrangle, Alaska: U.S. Geological Survey Open-File Report 92-562, 19 p., scale 1:250,000.

Primary Reference: American Scotland Australia-Montague, 1997

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.); F.H. Wilson (USGS)

Last report date: 2016-03-15

Site name(s): Unnamed (on Sawtooth Mountain)

Site type: Prospect

ARDF no.: LG217

Latitude: 65.382 **Quadrangle:** LG B-6

Longitude: 149.534

Location description and accuracy:
Prospect site is a large area northwest of the Sawtooth Mountain mine (ARDF LG006; Cobb (1972, MF-413), loc. 2) and west of VABM Tooth. It apparently spans SW1/4 sec. 36, T.7 N., R. 10 W and the N1/2 sec. 2, T. 6 N., R. 10 W., of the Fairbanks Meridian on Sawtooth Mountain. Latitude and longitude are approximate and near the center of the prospect area and are accurate wiItin about 1/2 mile.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:
Rock samples taken from 1987 to 1993 by American Copper and Nickel Company (ACNC), WGM, Placer Dome and Australia Scotland and America (ASA) 27 yielded greater than 10 ppm gold with the highest containing 103 ppm gold, located approximately 1 mile north of the stibnite mine shaft (ARDF LG006). The drill intercepts showing gold mineralization were found in quartz veins and are strongly associated with arsenopyrite (ASA-Montague, 1995; American Copper and Nickel Company, 1989; WGM, 1989).

Alteration:
Quartz and arsenopyrite (ASA-Montague, 1995).

Age of mineralization:
The granitic rock has been K-Ar dated at 91.0+/-0.9 Ma (Weber and others, 1992).

Generic deposit model:

Deposit model:
Intrusion hosted gold.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

From 1987 through 1993, American Nickel and Copper Company, WGM, Placer Dome and Australia Scotland and America (ASA) collected over 200 rock samples from the Sawtooth Mountain quartz monzonite intrusion. 27 of the rock samples yielded greater than 10 ppm gold with the highest of 103 ppm gold located approximately 1 mile north of the stibnite mine shaft. In 1993 ASA collected 595 soil samples in a 400 foot X 400 foot grid over the intrusion. Three core holes were drilled in the near the surface exposure of the quartz monzonite intrusion, within 1 mile west of the stibnite mine shaft. Core holes SM93-01, SM93-02 both encountered 5 intercepts less than two feet wide with grades of over 5.0 ppm Au. Core hole SM93-03 encountered 4 intercepts less than two feet wide with grades of over 2.0 ppm Au. The gold mineralization drill intercepts were found in quartz veins and are strongly associated with arsenopyrite (ASA-Montague, 1995; American Nickel and Copper Company, 1989; WGM, 1989).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

American Copper and Nickel, 1989, Annual Report Reconnaissance Program Doyon Option, (Doyon LIbrary Report held by Doyon Limited, Fairbanks, Alaska).

ASA-Montague, 1995, 1994 Annual Report Reconnaissance Program Doyon Option Lands, VOL. 1, Doyon Library Report 1995-14 (Report held by Doyon, Limited, Fairbanks, Alaska).

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WGM, Inc., 1989, Geochemical Sample Locations, Doyon, Limited Block 21 1975-1986 Volume 1 of 1 Doyon Library Report 1989-17. (Report held by Doyon, Limited, Fairbanks, Alaska).

Primary Reference: ASA-Montague, 1995

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.), F.H. Wilson, USGS

Last report date: 2016-03-15

Site name(s): Cache Mountain

Site type: Occurrence

ARDF no.: LG218

Latitude: 65.4853 **Quadrangle:** LG B-1

Longitude: 147.3166

Location description and accuracy:

The Cache Mountain tin occurrence consists of greisen rubble located on a south-trending ridge leading from the summit of Cache Mountain at an elevation of 3,840 feet. Elevations in the prospect area range from 3,500 to 4,700 feet. The occurrence is in the SW1/4 SE1/4 sec. 27, T. 8 N., R. 2 E of the Fairbanks Meridian. Accuracy of the location is within about 1,500 feet.

Cache Mountain is a prominent 4,772-foot high mountain in the White Mountains area about 40 miles due north of Fairbanks and about two miles north of this occurrence.

Commodities:

Main: Sn

Other: W

Ore minerals: Cassiterite

Gangue minerals: Chlorite, clay, epidote, hematite, magnetite, plagioclase, pyrrhotite, quartz, sericite

Geologic description:

Cache Mountain is underlain by a biotite granite pluton of similar composition to the Lime Peak pluton to the east. Both the intrusions are composed of four apparent phases: a fine-grained to porphyritic biotite granite, a coarser grained biotite granite, lesser phases of smoky, finely crystalline quartz biotite-muscovite tourmaline granite locally quartz-rich, and a younger cross-cutting porphyritic rhyolite. Based on A-F-M and K2O-Na2O-CaO ternary plots these phases compare closely to Lime Peak (Warner, 1984).

An occurrence of tin greisen was located along the ridge south of the mountain where a chip sample of scattered mineralized rubble over an area 50 feet across assayed 0.105 percent tin (Warner, 1984). Berryhill, 1964, also reported a similar occurrence from the general area that assayed 0.22 percent tin although the exact location has been lost over the years. Petrographic examination of Berryhill’s samples by the U.S. Bureau of Mines described the samples as tourmaline-bearing greisen rather than lithium enriched (Berryhill, 1964).

Analyses of heavy mineral concentrates were weakly to moderately anomalous for tin were reported by Warner (1984) in drainages on either side of the ridge.

Alteration:

Greisen, locally argillic, limonite, goethite, hematite staining and corroded quartz, wider zones of sericite, argillic and chloritic alteration. Tourmaline is found in the greisen (Warner, 1984).

Age of mineralization:

Quartz monzonite of the Cache Mountain pluton was dated at 59.8±1.8 Ma, Paleocene (Holm, 1973; Rinehart and others, 1997).

Generic deposit model:

Deposit model:

Granite-hosted greisen tin veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

The Cache Mountain area was selected for study by the U.S. Bureau of Mines in 1979 because of on-going Strategic and Critical minerals assessments in Alaska by the Bureau of Mines. Warner (1984) reports only one sample of finely crystalline granite float yielded evidence of potential mineralization; 1,050 parts per million (ppm) tin was found. Pan Concentrate samples from creeks radiating from Cache Mountain yielded between 370 to 2,390 ppm tin and 200 to 400 ppm tungsten (Warner, 1984). In comparison to tin values in pan concentrates collected elsewhere in the White Mountain upland area, none of the Cache Mountain values are highly anomalous (Warner, 1984).

Production notes:

None.

Reserves:

None.

Additional comments:

Claims (BEE block) staked in area by Mapco Minerals in 1976; no further work was performed.

References:

Berryhill, R.V., 1964, Tin occurrences at Cache Mountain, Livengood quadrangle. U.S. Bureau of Mines Field Report (available through the Alaska Division of Geology and Geophysical Surveys). 4 p.

Holm, Bjarne, 1973, Bedrock geology and mineralization of the Mount Prindle area, Yukon-Tanana Upland, Alaska: M.S. thesis, University of Alaska, Fairbanks, 55 p.

Rinehart, C.D., Light, T.D., and Shew, N.B., 1997, Petrography and radiometric ages for selected rocks from the Livengood quadrangle, Alaska: U.S. Geological Survey Open-File Report 97-484-D.

Warner, J.D., 1984, Cache Mountain Field Report. U.S. Bureau of Mines Field Report, (available through the Alaska Division of Geology and Geophysical Surveys) 12 p.

Primary Reference: Warner (1984)

Reporter(s): J.C. Barker

Last report date: 2017-04-06

Site name(s): Terra

Site type: Mine

ARDF no.: LH010

Latitude: 61.7739 **Quadrangle:** LH D-2

Longitude: 153.7027

Location description and accuracy:

The Terra prospect is at an elevation of about 5,030 feet, about 8.5 miles southwest of the junction of Fish Creek and the Hartman River. It is about 0.5 mile south of the center of section 31, T. 19 N., R. 24 W., of the Seward Meridian. The location is accurate to within 500 feet.

Commodities:

Main: Ag, Au, Cu, Mo, Pb

Other: As, Sb, W

Ore minerals: Arsenopyrite, chalcopyrite, electrum galena, jordanite, molybdenite, native gold, pyrite, pyrrhotite, sphalerite, tennantite

Gangue minerals: Carbonate, quartz, sericite

Geologic description:

In 1990, Allen reported anomalous gold in a rock at sample location 819 from a basal moraine near here. A GIS compilation and follow-up of published U.S. Geological survey mapping and sampling in the area (Allen, 1990; Allen and others 1990; Allen and Slaughter, 1990) by Kennecott Exploration led to the discovery of finely disseminated native gold and minor sulfides and sulfosalts in tectonic breccia and carbonate-quartz veins in monzonite and diorite intrusive rocks of the Hartman sequence and Jurassic or Lower Cretaceous hornfelsed sedimentary rocks of the Kahiltna terrane (Porterfield, 2000). Porterfield describes two target areas, each approximately 6,000 feet in length, that contain high-grade mineralization in quartz veins and carbonate-cemented tectonic breccia. The quartz veins contained as much as 687 parts per million (ppm) gold and 1,135 ppm silver; the breccia contained as much as 71 ppm gold and 572 ppm silver.

Rock-chip samples, talus fines, and soil samples were collected from two target areas on the Terra prospect. In samples, gold correlates with arsenic, silver, antimony, copper, and lead. Porterfield (2000) reports that bismuth and tungsten are anomalous in some samples.

In 2004, AngloGold Ashanti (USA) Exploration, Inc. began work on the Terra prospect with surface geochemistry and outcrop sampling. In 2005, they drilled 12 holes south of the terminus of the glacier at the head of Fish Creek (Klipfel and Giroux, 2010). In 2006, International Tower Hill Mines began work on the property in a joint venture with AngloGold; they drilled 12 holes in 2006 and another 15 holes in 2007 (International Tower Hill Mines, Ltd., 2008). In 2010, International Tower Hill signed a joint venture with the Terra Mining Corporation to explore the property (Terra Mining Corp., 2010). In 2010, International Tower Hill formed a new company, Corvus Gold Inc., to take over many of their prospects, including Terra; the joint venture with Terra Mining continued as before and Terra was acquired by WestMountain Gold Corporation in March of 2011.

WestMountain drilled four more holes in 2011 and extended the Ben vein an additional 200 meters; several other veins were also intersected in the drilling in the hanging wall of the Ben vein (WestMountain Gold Corp., 2011). Some notable intercepts were: 1) 0.84 meters that averaged 7.42 grams of gold per tonne and 69.39 grams of silver per tonne, this included 0.31 meter that averaged 15.60 grams of gold per tonne and 138.00 grams of silver per tonne; 2) 0.36 meters that averaged 35.70 grams of gold per tonne and 174

grams of silver per tonne; 3) 5.60 meters that averaged 8.15 grams of gold per tonne and 69.69 grams of silver per tonne; and 4) 0.53 meters that averaged 25.60 grams of gold per tonne and 4.90 grams of silver per tonne.

The mineralization at the Terra prospect consists of high-grade epithermal, quartz-carbonate veins 0.1 to 2 meters thick with visible gold. The veins are near the periphery of a Cretaceous diorite stock that intrudes a thick sequence of carbonaceous shale of the Late Jurassic Kahiltna Shale (Klipfel and Giroux, 2010). The veins typically contain gold, electrum, sulfosalts, arsenopyrite, pyrite, pyrrhotite, sphalerite, and chalcopyrite. Alteration includes silica-rich selvages near the veins and sericite-rich selvages farther away. The selvages may also contain up to 10 percent pyrite and arsenopyrite but the selvages seldom extend more than a meter from the veins. The holes on the Ben Vein indicate that it extends for at least 600 meters along strike and persists to a depth of at least 350 meters. It varies from from 0.2 to 3.0 meters wide and has an average gold value of 19.8 grams per ton. Five other vein systems have been identified on the prospect including a discovery in 2007, the Ice vein. All of the vein systems have a north-northwest to north-south strike with with variable west dips.

Early in 2008, International Tower Hill (Klipfel and Giroux, 2008 and 2010) reported an inferred resource estimate for the Ben Vein of 168,000 ounces of gold and 318,000 ounces of silver in material with an average grade of 12.2 grams of gold per ton and 23.1 grams of silver per ton. The mineralization was then open at both ends and at depth.

In 2016, WestMountain Gold Inc. conducted small-scale surface mining and milling operations at Terra but in late summer, a landslide buried the surface bulk-sampling area. By mid-September, WestMountain Gold Inc. had processed 890 tons of material from the high-grade gold vein at Terra, and had another 1,470 tons of stockpiled material that was mined prior to the landslide (Athey and Werdon, 2017).

Alteration:

Carbonates, iron-oxides, quartz, and sericite in selvages near the veins (Klipfel and Giroux, 2008).

Age of mineralization:

Cretaceous; sericite from a quartz vein in hornfels has an Ar/Ar age date of 66.4 +/- 5.7 Ma (Porterfield, 2000).

Generic deposit model:

Deposit model:

Epithermal gold-silver veins (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

Kennecott Exploration carried out reconnaissance mapping and surface sampling in the late 1990s that first identified the Terra deposit (Porterfield, 2000). In 2004, AngloGold Ashanti (USA) Exploration, Inc. (2008) began work on the Terra prospect with surface geochemistry and outcrop sampling; in 2005 they drilled 12 holes south of the terminus of the glacier at the head of Fish Creek. In 2006, International Tower Hill Mines began work on the property in a joint venture with AngloGold; they drilled 12 holes in 2006 and another 15 holes in 2007. In 2010, International Tower Hill signed a joint venture with the Terra Mining Corporation to explore the property (Terra Mining Corp., 2010). In 2010, International Tower Hill formed a new company, Corvus Gold Inc., to take over many of their prospect, including Terra. The joint venture with Terra Mining continued as before and Terra was acquired by WestMountain Gold Corporation in March of 2011.

WestMountain Gold, Inc. (WMTN) drilled four more holes in 2011. In 2012, WMTN drilled four more

holes; in 2013, WMTN drilled five more holes (Greg Schifrin, written communication, 2014).

Production notes:

In 2016, WestMountain Gold Inc. conducted small-scale surface mining and milling operations at Terra but in late summer, a landslide buried the surface bulk-sampling area. By mid-September, WestMountain Gold Inc. had processed 890 tons of material from the high-grade gold vein at Terra, and had another 1,470 tons of stockpiled material that was mined prior to the landslide (Athey and Werdon, 2017).

Reserves:

Early in 2008, International Tower Hill (Klipfel and Giroux, 2010) announced an initial inferred resource estimate for the Ben Vein of 168,000 ounces of gold and 318,000 ounces of silver in ore with an average grade of 12.2 grams of gold per ton and 23.1 grams of silver per ton.

In 2013, the first t test run on production occurred 75 tons were run averaging 3 oz per ton (Greg Schifrin, written commun., 2014).

Additional comments:

In 2013, Gustavson and Associates completed a 43-101 report with an indicated resource of 50,000 Au and inferred 370,000 ounces of gold for a total gold resource of 420,000 grade gold and 15.5 grams per ton with a 5 year reserve (WestMountain Gold, Inc., 2014).

In 2014, WMTN acquired 100 percent ownership - buying out Corvus Gold joint venture agreement (WestMountain Gold, Inc., 2014).

References:

Allen, M.S., 1990, Gold anomalies and newly identified gold occurrences in the Lime Hills quadrangle, Alaska , and their association with the Hartman sequence plutons, in Goldfarb, R. J., Nash, J. T., and Stoeser, J. W., eds., Geochemical studies in Alaska by the U.S. Geological Survey, 1989: U.S. Geological Survey Bulletin 1950, p. F1-F16.

Allen, M. S., Malcolm, M. J., Motooka, J. M., and Slaughter, K. E., 1990, Geologic description, chemical analyses, and sample locality map for rock samples collected from the eastern part of the Lime Hills quadrangle, Alaska: U.S. Geological Survey Open-File Report 90-69, 49 p., 1 sheet, scale 1:250,000.

Allen, M.S., and Slaughter, K. E., 1990, Mineralogical data and sample locality map of nonmagnetic, heavy-mineral-concentrate samples collected from the eastern part of the Lime Hills quadrangle, Alaska: U.S. Geological Survey Open-File Report 90-67, 64 p., 1 sheet, scale 1:250,000.

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Klipfel, Paul, 2008, Summary report on the Terra gold project, McGrath district, Alaska: Unpublished report for International Tower Hill Mines, Ltd. (posted on www.sedar.com, February 14, 2008), http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00005628&fileName=/csfsprod/data86/filings/01214217/00000002/C%3A%5CSEDAR%5CFILINGS%5CITH%5CTerra-43-101-Res-Rpt-feb0108.pdf (as of December 1, 2014).

Klipfel, Paul, and Giroux, Gary, 2010, Summary report on the Terra gold project, McGrath district, Alaska: Unpublished report for International Tower Hill Mines Ltd., 71 p. (posted on www.sedar.com, July 15, 2010),
http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00005628&fileName=/csfsprod/data

%3A%5CG_drive%5CDMA%5CV31429%5Carrangmt%5Cterra.pdf (as of December 1, 2014).

Porterfield, Ben, 2000, The Terra gold prospect, Alaska Range, Alaska [abs.]: Alaska Miners Association 17th Biennial Conference on Alaska Mining, Abstracts, p.58-63.

Terra Mining Corp., 2010, Corvus Gold Inc. signs definitive joint venture agreement for the development high grade Terra gold project, Alaska: http://www.terraminingcorp.com/news.html (News release, Oct. 6, 2010).

WestMountain Gold Corp., 2011, Drilling at Ben Vein intersects 3.4m @11.6 g/t gold at Terra project, Alaska: http://terraminingcorp.com/site/drilling-at-ben-vein-intersects-3-4m-11-6-gt-gold-at-terra-project-alaska/ (News release, December 6, 2011).

WestMountain Gold Corp., 2014, Terra Project Overview: http://www.westmountaingold.com/index.php?option=com_content&view=article&id=52&Itemid=118 (as

Primary Reference: Klipfel and Giroux, 2010

Reporter(s): Travis L. Hudson (Applied Geology) and Madelyn A. Millholland (Millholland & Associates); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon

Last report date: 2017-08-26

Site name(s): Copper Joe

Site type: Prospect

ARDF no.: LH020

Latitude: 61.545 **Quadrangle:** LH C-1

Longitude: 153.1777

Location description and accuracy:

This prospect is on a west tributary to the upper Styx River in the Alaska Range about 16.5 miles northeast of Snowcap Mountain in the northeast quarter of section 24, T. 17 N., R. 22 W., of the Seward Meridian. The location site is centered where potassic alteration with A-veins and chalcopyrite has been found in outcrop along the creek.

Commodities:

Main: Ag, Au, Cu, Mo, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, gold, pyrite, sphalerite

Gangue minerals: Quartz, sericite

Geologic description:

As originally described by Reed and Elliott (1970), iron-stained and altered intrusive rocks are present along about 200 feet of a creek. The altered rocks consist dominantly of quartz and sericite with minor potassium feldspar and biotite. These rocks generally contain less than one percent sulfide minerals, including pyrite, sphalerite, and galena, which are disseminated and in quartz veins as much as 2 inches wide. Sphalerite and galena also occur as thin veinlets and disseminations in felsite. Shear zones in the altered intrusions are also mineralized with sulfides. Besides zinc and lead values, rock samples contained as much as 15 parts per million (ppm) silver and 300 ppm molybdenum. The altered intrusive rocks are probably Late Cretaceous or Tertiary components of the Alaska-Aleutian Range batholith (Reed and Lanphere, 1973).

Float boulders contained chalcopyrite. Potassic alteration with quartz-magnetite stockworks and disseminated chalcopyrite extends over an area of about 1 kilometer by 3 kilometers, and intense phyllic alteration extends outward about another 2.5 kilometers. Kennecott did a ground magnetic survey that defined a magnetic high about 1.0 by 1.9 kilometers in area that trends northeast from the mineralization. Rock samples contained up to 0.73 percent copper, 0.415 grams of gold per tonne, and 0.125 percent molybdenum (Kiska Metals Corporation, 2010).

In 2016, First Quantum Minerals funded a single, 806-meter-long, exploratory drill hole targeting the center of a 1.4-kilometer-wide magnetotelluric anomaly, which is coincident with other geological, geochemical, and geophysical anomalies, at Kiska Metals Corp.'s Copper Joe porphyry copper property in southwest Alaska. The drill hole into the Evening Star target intercepted more than 400 meters of hydrothermal breccia with strong phyllic alteration, abundant pyrite, sparse early quartz veins, magnetite-anhydrite-pyrite-chalcopyrite veins, and banded molybdenite veins. No significant copper grades were intersected but extensive brecciation and strong alteration suggests a robust hydrothermal porphyry system; additional drilling is required to determine if ore-grade mineralization exists. First Quantum Minerals withdrew from the project at the end of the season. In December 2016, AuRico Metals Inc. announced a definitive agreement to acquire Kiska Metals, subject to customary closing conditions including Kiska shareholder approval, expected in the first quarter of 2017 (Athey and Werdon, 2017).

Alteration:

A core zone of potassic and magnetite alteration associated with porphyry dikes and an extensive 4.5 by 2.5 kilometer zone of moderate to intense phyllic alteration peripheral to the core zone (Roberts, 2014).

Age of mineralization:

Probably Late Cretaceous or Tertiary based on similarities with other mineralized intrusives of the Alaska-Aleutian Range batholith (Reed and Elliott, 1970; Reed and Lanphere, 1973).

Generic deposit model:

Deposit model:

Copper-gold-molybdenum porphyry? (Cox and Singer, 1986, model 20c or 21a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c? or 21a?

Production Status: None

Site Status: Active

Workings/exploration:

In 2006, Kennecott Exploration staked 100 State of Alaska mining claims over this prospect, which they interpreted to have porphyry-style alteration in porphyritic monzodiorite rocks (Kiska Metals Corporation, 2010). Kennecott did a ground magnetic survey that defined a magnetic high about 1.0 by 1.9 kilometers in area that trends northeast from the mineralization. Rock samples contained up to 0.73 percent copper, 0.415 grams of gold per tonne, and 0.125 percent molybdenum.

In 2010, Kiska Metals Corp. (Kiska) signed an option agreement with Kennecott to explore the Copper Joe claims. Exploration work conducted by Kiska consisted of geological mapping, rock, soil and stream sediment geochemistry sampling, and an induced-polarization (IP) survey and ground magnetics around a prospective area defined in previous work by AMAX and Kennecott. In 2011, a short follow-up program was conducted on Copper Joe that consisted of geological mapping, rock geochemistry sampling, and prospecting. At this time, new claims were staked (Shogun Claims) to the northwest of the Copper Joe claims covering drainages with anomalous copper and gold in stream sediment samples collected in 2010 (Roberts, 2014).

Kiska and First Quantum Minerals Ltd. (First Quantum) drilled two holes totalling 885 meters at Copper Joe in 2014. Drilling did not return any significant assay results but did confirm a large porphyry-hydrothermal system. One drill hole intersected two zones of heterolithic, magnetite breccia cross-cutting a porphyritic quartz monzonite and the other drill hole intersected a moderately to strongly chlorite-epidote altered quartz monzonite breccia intruded by a weakly altered biotite-feldspar porphyry (Kiska Metals Corp., 2014). Exploration work in 2015 includes a geophysical survey and infill geologic mapping (Kiska Metals Corp., 2015).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

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Roberts, M., 2014, Copper Joe Executive Summary, Kiska Metals Corporation. (Released January 26,

Primary Reference: Roberts, 2014

Reporter(s): Travis L. Hudson (Applied Geology) and Madelyn A. Millholland Millholland & Associates); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.); N.V. King (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Revelation

Site type: Prospect

ARDF no.: LH036

Latitude: 61.7783 **Quadrangle:** LH D-3

Longitude: 153.0635

Location description and accuracy:

The location of the Revelation prospect is ambiguous. Most recently (2011), it is reported to be about 10.6 miles south-southeast of the junction of the South Fork of the Kuskokowim River and the Styx River near the center of section 34, T. 20 N., R. 21 W. The prospect may be a mile or more from this location and an earlier report places it about 2 miles to the north-northwest.

Commodities:

Main: Ag, Au, Cu

Other:

Ore minerals: Pyrite

Gangue minerals: Quartz

Geologic description:

Relatively little is known about the Revelation prospect. It probably is similar to other deposits in the area (TY031, TY032, TY 019) that are associated with the Cretaceous (65-66 Ma), Mount Estelle and similar plutons in the area. The Mount Estelle pluton is zoned with a granite core and marginal phases of quartz monzonite, quartz monzodiorite, augite monzodiorite, diorite, and lamprophyric mafic and ultramafic rocks (Reed and Elliott, 1970; Millholland, 1995; Crowe and others, 1991; Crowe and Millholland, 1990). The pluton intrudes Jurassic and Cretaceous sedimentary rocks that are hornfelsed adjacent to the pluton, are locally stained red, and have been altered to sericite and clay. Pyrite is disseminated along fractures.

There was considerable work in the Mount Estelle area by government and industry as far back as the 1970s that identified mineralization but most of the work was more reconnaissance than prospect specific (see TY019). From 2005 to 2008, several companies, Hidefield Gold Plc. (2008), International Tower Hill Mines Ltd. (2007) and Millrock Resources Inc. (2008), worked in the area and defined several specific prospects. As described in Hidefield (2008), the Revelation vein can be traced for 200 meters on the surface. Two samples contained 32.4 and 7.07 grams of gold per ton, 8.1 and 12.6 grams of silver per ton, and 0.10 and 0.15 percent copper.

Millrock is currently (March, 2012) exploring the area as part of their Estelle project, which covers a large block of claims north and south of Mount Estelle; the Revelation vein is in that block. Millrock describes the deposit as quartz stockwork veining that extends for 600 meters in an iron-stained zone of porphyritic diorite and hornfelsed sedimentary rocks. Their geochemical sampling suggests the area of mineralization is larger.

Alteration:

Iron staining and sericitic and clay alteration in hornfelsed rocks.

Age of mineralization:

Probably related to a nearby 65-66 Ma pluton.

Generic deposit model:

Deposit model:

Gold-copper porphyry deposit? Intrusion-related gold deposit?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

There was considerable work in the Mount Estelle area by government and industry as far back as the 1970s that identified mineralization but most of the work was more reconnaissance than prospect specific (see TY019). From 2005 to 2008, several companies, Hidefield Gold Plc. (2008), International Tower Hill Mines Ltd. (2007) and Millrock Resources Inc. (2008), worked in the area and defined several specific prospects, including the Revelation prospect. Millrock is currently (March, 2012) exploring the area as part of their Estelle project which covers a large block of claims north and south of Mount Estelle; the Revelation prospect is in that block. Their only work in 2011 at the Revelation prospect was surface sampling.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Crowe, D.E., and Millholland, M.A., 1990, High-grade gold mineralization associated with high salinity hydrothermal fluids, Mt. Estelle pluton, central Alaska Range [abs.]: Geological Society of America, Abstracts with Programs, v. 22, p. A41.

Crowe, D.E., Millholland, M.A., and Brown, P.E., 1991, Precious and base metal mineralization associated with high-salinity hydrothermal fluids in the Mount Estelle pluton, south-central Alaska: Economic Geology, v. 86, p. 1103-1109.

Hidefield Gold Plc., 2008, South Estelle: http://www.hidefieldgold.com/s/SouthEstelle.asp (as of May 25, 2008)

International Tower Hill Mines Ltd., 2007, ITH further defines mineralization at South Estelle: http://www.ithmines.com/s/NewsReleases.asp?ReportID=267305&_Type=News-Releases&_Title=ITH-Further-Defines-Mineralization-at-South-Estelle (News Release, October 18, 2007)

Millrock Resources Inc., 2008, Estelle: http://www.millrockresources.com/index.php/projects/estelle/ (as of May 25, 2008).

Millrock Resources Inc., 2012, Revelation: http://www.millrockresources.com/projects/revelation/ (as of March 4, 2012).

Millholland, M.A., 1995, Geology and discovery at Mount Estelle: Newsletter of the Alaska Geological Society, v. 24, no. 8, p. 1.

Reed, B.L., and Elliott, R.L., 1970, Reconnaissance geologic map, analyses of bedrock and stream sediment samples, and an aeromagnetic map of parts of the southern Alaska Range: U.S. Geological Survey Open-file Report 70-271, 24 p., 4 sheets, scale 1:250,000.

Primary Reference: Millrock, 2012

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Frozen Creek

Site type: Prospect

ARDF no.: MD032

Latitude: 63.532

Quadrangle: M C-4

Longitude: 154.513

Location description and accuracy:

The Frozen Creek prospect is situated on a south rim of an east-facing cirque valley on the east side of the Mystery Mountains at an elevation of 2,500 feet (762 m) in Section 6, T. 23 S., R. 22 E., of the Kateel River Meridian. Prospect is known to within 250 feet (76 m).

Commodities:

Main: Au, Cu

Other: Ag

Ore minerals: Chalcopyrite, magnetite, pyrite, pyrrhotite

Gangue minerals: Tourmaline

Geologic description:

The Frozen Creek prospect consists of a large zone of boron metasomatism in the eastern edge of the Mystery Mountains Pluton. It is the eastern-most porphyry-like prospect in a seven mile (11 km) long northeast-trending zone of similar prospects that cut across the central Mystery Mountains. The Frozen Creek prospect is inferred to be Late Cretaceous based on isotopic age of Mystery Mountains intrusive complex (Moll and others, 1981).

A strong copper-gold soil anomaly was detected at Frozen Creek (DiMarchi and others, 1997), which is part of the core of Cu-Au anomalies that are surrounded by a lead-zinc mineral zonation. Disseminated chalcopyrite and pyrrhotite are found throughout a tourmaline-enriched monzonitic plutonic rocks; little mineralization is noted in host biotite hornfels. Malachite is locally abundant in hairline fractures in small intrusive bodies. The mineralized zone at Frozen Creek is at least 1,500 feet (457 m) in diameter. Two grab samples of mineralization collected by Clautice and others (1993) averaged 585 ppm copper and 2.1 ppm silver.

Alteration:

Sericite and secondary biotite in pluton.

Age of mineralization:

The Frozen Creek prospect is inferred to be Late Cretaceous based on isotopic age of Mystery Mountains intrusive complex (Moll and others, 1981).

Generic deposit model:

Deposit model:

Porphyry Cu-Au (Cox and Singer, 1986; model 20c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c

Production Status: None

Site Status: Active?

Workings/exploration:

The Frozen Creek prospect was found during regional exploration conducted by WGM Inc. in 1977 (Andrews, 1978). American Copper and Nickel Inc. (ACNC) worked on the prospect from 1988 to 1990, and ASA Inc. continued work through 1997 (DiMarchi and others, 1997). During 1989-1991, ACNC explored the area as a porphyry copper-gold target. ASA Inc. continued exploration work with the same target in mind during 1995 and 1996. Two grab samples reported by Clautice and others (1993) averaged 585 ppm copper and 2.1 ppm silver.

Newmont Mining Corporation (2012) collected soil samples on ridges and spurs with a nominal spacing of 100 meters and followed up with grid soil samples in 2010 and 2011. Soil samples having assays of greater than 100 ppb gold and 1,000 ppm copper form an elongate anomalous zone of approximately 1,100 meters long. High-grade gold and copper assays in soil samples are centered on a zone of 3 to 5 granite porphyry dikes that exhibit potassic alteration (Newmont Mining Corp, 2012).

In 2012, drilling by Newmont identified long intercepts of low grade copper and gold (164.5 meters of 0.17 ppm gold and 0.09 percent copper in hole COTT-0004 and 134.1 meters of 0.37 ppm gold and 0.1 percent copper in hole COTT-0005b), hosted in a fine grained to aphanitic andesite (Newmont Mining Corp., 2013).

Production notes:

None.

Reserves:

None.

Additional comments:

See Tarn (MD027), Pork Chop (MD031), Mystery Mt. East (MD028), and Copenhagen Hill (MD030) prospects. The Frozen Creek Prospect is on land selected or owned by Doyon Ltd. For additional information contact Doyon Ltd. at 210 1st Ave., Fairbanks, Alaska, 99701.

References:

Andrews, Tom, 1978, Summary of Progress, Doyon Project, Mystery Mountains (Block 10): Anchorage, Alaska, WGM Inc., 24 p. (Held by Doyon, Limited, Fairbanks, Alaska, as proprietary report 78-42).

Clautice, K.H., Bowman, N.D., Clough, J.G., Gilbert, W.G., Kline, J.T., Smith, T.E., and Blodgett, R.B., 1993, Land selection Unit 8 (Kantishna River, Ruby, and Medfra quadrangles); References, lead isotope, geochemical and major oxide data: Alaska Division of Geological and Geophysical Surveys, 42 p., 1 sheet, scale 1:250,000.

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

DiMarchi, J.J., and Frantz, P.S., 1997, Annual Report for 1997-Doyon Option Lands, Block 10: ASA Inc.-Montague Gold Joint Venture Report, Volume II: Unpublished report, 189 p. (Report held by Doyon, Limited, Fairbanks, Alaska).

Moll, E.J., Silberman, M.L., and Patton, W.W. Jr., 1981, Chemistry, mineralogy, and K-Ar ages of igneous and metamorphic rocks of the Medfra quadrangle, Alaska: U.S. Geological Survey Open-File Report 80-811-C, 15 p., 2 sheets, scale 1:250,000.

Newmont Mining Corp., 2012, Doyon Kuskokwim Block 10, 2011 Work Summary, Doyon limited report 2012-03 (Report held by Doyon Limited, Fairbanks, Alaska).

Newmont Mining Corp., 2013, Doyon Kuskokwim Block 10, 2012 Work Summary, Doyon limited report 2013-05 (Report held by Doyon Limited, Fairbanks, Alaska).

Primary Reference: DiMarchi and others, 1997

Reporter(s): Bundtzen, T.K. (Pacific Rim Geological Consulting); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Shepard

Site type: Occurrence

ARDF no.: MD034

Latitude: 63.592 **Quadrangle:** M C-3

Longitude: 154.225

Location description and accuracy:

The Shepard occurrence is situated on a north-facing spur of a sharp 3,160 foot high peak that overlooks Shepard Creek. The occurrence is at an elevation of 3,080 feet (939 m) in section 9, T. 22 S., R. 24 E., of the Kateel River Meridian. The site is accurate to within 500 feet (152 m).

Commodities:

Main: Au, Cu, Zn

Other: Co

Ore minerals: Arsenopyrite, chalcopyrite

Gangue minerals: Quartz

Geologic description:

The Shepard occurrence consists of quartz veins in and near a northwest trending quartz monzonite dike swarm (DiMarchi and others, 1992). The quartz veins contain disseminated arsenopyrite, chalcopyrite, and carry gold values; they are found in zones of silicic and phyllic alteration in the quartz monzonite dikes.

Surface samples collected by DiMarchi and others (1992) contain up to 500 ppb gold. Nine samples averaged 100 ppb gold. Copper, cobalt, and arsenic values were not reported.

Soil samples collected by Newmont Mining Corporation in 2011 demonstrated high-grade gold assays of up to 18 ppm gold. These samples are associated with 5 to 10 centimeter wide quartz veins hosted in intensely hornfelsed Kuskokwim metamorphic rocks (Newmont Mining Corp, 2011).

Alteration:

Silicic and phyllic in intrusion.

Age of mineralization:

The Shepard prospect is inferred to be Late Cretaceous based on isotopic age of Mystery Mountains intrusive complex (Moll and others, 1981).

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model no. 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active?

Workings/exploration:

Surface samples taken by DiMarchi and others (1992) contain up to 500 ppb gold. Nine samples averaged 100 ppb gold. Copper, cobalt, and arsenic values are not reported.

Newmont Mining Corporation collected 222 soil samplings and 21 rock chip samples in conjunction with detailed geologic mapping in 2011. Soil samples were collected along ridges and spurs on a nominal spacing of 100 meters. High-grade gold assays in soil samples of up to 18 ppm gold, are associated with 5 to 10 centimeter wide quartz veins hosted in intensely hornfelsed Kuskokwim metasediments (Newmont Mining Corp, 2011).

Production notes:

None.

Reserves:

None.

Additional comments:

The Shepard occurrence is on lands selected or owned by Doyon Ltd. For further information, contact Doyon Ltd. at 210 1st Ave., Fairbanks, Alaska, 99701.

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

DiMarchi, J.J., Weglarz, T.B., Freeman, L.K., Nicholson, L.C., and Barker, J.C., 1992, Annual Report for 1992--Doyon Option Lands, Block 10: ASA Inc. Report, 121 p. (Report held by Doyon, Limited, Fairbanks, Alaska.)

Newmont Mining Corp., 2011, Doyon Kuskokwim Block 10, 2011 Work Summary, Doyon limited report 2012-03 (Report held by Doyon Limited, Fairbanks, Alaska.)

Primary Reference: DiMarchi and others, 1992

Reporter(s): Bundtzen, T.K. (Pacific Rim Geological Consulting); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-09-02

Site name(s): Nixon Fork - Crystal; Garnet Extension

Site type:

ARDF no.: MD061

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

As originally compiled, this record treated this deposit as independent of the Nixon Fork Mine (MD062). In reality it is only one of the several ore bodies of that mine. The data that was originally in this description was integrated into the Nixon Fork Mine record. This ARDF number is retained only for accounting purposes.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-03-04

Site name(s): **Nixon Fork; Mespelt; Crystal; Garnet Extension; Mespelt Inclined Shaft; Recreation; Keen; Twin Shafts; Mespelt Main Shaft; Garnet Trench; Parsons and Strand; Southern Cross**

Site type: Mine

ARDF no.: MD062

Latitude: 63.2381 **Quadrangle:** M A-4

Longitude: 154.7759

Location description and accuracy:

The main portal of the Nixon Fork Mine is near the head of Crystal Gulch about 0.2 mile north of the center of section 13, T. 26 S., R. 21 E., of the Kateel River Meridian. The location is accurate to within 500 feet.

Commodities:

Main: Ag, Au, Cu

Other: Bi, Th, U, W

Ore minerals: Azurite, bismuth, bornite, chalcocite, chalcopyrite, chrysocolla, electrum, gold, malachite, scheelite, unidentified U/Th minerals

Gangue minerals: Calcite, diopside, epidote, garnet, limonite, quartz, sericite, siderite, tremolite

Geologic description:

The Nixon Fork deposit was first staked in 1917 and was mined intermittently from 1918 to 1964, notably by the Yukon-Treadwell company and by E.M. Whalen, from several shafts, open pits, and trenches (Mertie, 1936, Herreid, 1966, Wallis and Rennie, 2005, Postle and others, 2006). The total production during this period is estimated to be 42,200 ounces of gold, 11,281 ounces of silver, and 41,400 pounds of copper from ore that averaged about 1.5 ounce of gold per ton. Much of this production came from ore bodies in the vicinity of this site near the head of Crystal Gulch but at least some came from the nearby Whalen Shaft (MD071) and from the glory hole near it.

The property was explored by Battle Mountain Gold from 1984 to 1988 and by the Nixon Fork Joint Venture/Central Alaska Gold from 1989 to 1993. From 1985 to 1998, 719 surface and underground, reverse circulation and core holes were drilled that totaled 63,093 meters. The deposit was mined by Nevada Goldfields Inc. from 1995 to 1999, when they filed for bankruptcy and the property reverted to its owners. They produced 137,749 ounces of gold and 2,145,826 pounds of copper from 122,391 tons of ore with a 'reconciled' grade of 42 grams of gold per tonne.

St. Andrew Goldfields Ltd. leased the property in 2003, did extensive surface and underground drilling, drove several spiral declines on the ore bodies they defined, and built a 200-ton-per-day mill. They began mining in late 2006 and produced their first gold in January 2007 (St. Andrew Goldfields Ltd., 2009). In the first nine months of 2007, they produced 18,105 tons of ore with a grade of 17.1 grams of gold per ton. Production was suspended in October 2007 to better define the ore bodies as the production was lower than anticipated from their reserve estimates.

In February, 2009, Fire River Gold (2010) acquired the property and in early 2010 they were engaged in a major program of re-logging and reanalyzing the surface and drill samples from the previous operators, mapping, and new drilling to define the deposit.

The Nixon Fork Mine consists of several classic gold-copper, epidote-diopside-garnet skarn deposits,

generally within 10 to 150 meters of the periphery of a Cretaceous (68 to 70 Ma) quartz monzonite to granodiorite stock about 3 by 5 kilometers in outcrop area (Moll and others, 1981, Bundtzen and Miller, 1997, Wallis and Rennie, 2005). The stock intrudes the Ordovician Telsitna Formation, a 2,000-meter-thick sequence of limestone and dolomite, and Cretaceous calcareous sandstone and shale. Both the quartz monzonite and the host rocks are cut by late, quartz-feldspar and quartz porphyry dikes.

At least 6 ore bodies are known along about a mile of the west contact of the stock near Crystal Gulch and several more are suspected from surface sampling (Wallis and Rennie, 2005). Five of these were mined from 1995 to 1998. The ore bodies are irregular and complex, often with branching arms, but are roughly pipelike, dip steeply, and follow or parallel the border of the stock at depth. In plan, the ore bodies typically are about 4 meters by 20 to 30 meters in area and extend down dip as much as several hundred meters, sometimes more. They are typically associated with epidote-diopside-garnet skarn near carbonate rocks or hornfels near sandstone and shale. Both exoskarn and endoskarn are present. Most of the ore minerals and skarn are in exoskarn 10 to 30 feet into the marble front. Minor mineralized endoskarn occurs within satellite bodies of monzonite; however, most of this mineralization is not ore grade. The main ore minerals are pyrrhotite, chalcopyrite, pyrite, and native gold; minor bornite and chalcocite are known. The quartz monzonite is sericitized and argillized near the mineralization and some of the ore bodies are oxidized to a depth of 160 meters. However, two of the major ore bodies, the Crystal and Garnet Extension, show little sign of oxidization to the surface.

In 2006, Postle and others (2006) estimated the resources and reserves of the Nikon Fork Mine for St Andrew Gold Fields Ltd. These are: 1) a measured resource of 23,400 tonnes with a grade of 36.8 grams of gold per tonne; 2) an indicated resource of 126,000 tonnes with a grade of 21.6 grams of gold per tonne; 3) an inferred resource of 93,000 tonnes with a grade of 15.5 grams of gold per tonne; 4) a proven reserve of 47,000 tons with a grade of 34.05 grams of gold per tonne; and 5) a probable reserve of 137,500 tonnes with a grade of 18.6 grams of gold per tonne. However, when mining took place from late 2006 to late 2007, the production fell short of the estimates. In early 2010, Fire River Gold was engaged in a major program to better define the reserves and resources.

In Fall of 2010, Fire River released an updated mineral resource estimate (Fire River Gold Corp., 2010b). In July 2011, Fire River started up the Nixon Fork Mill (Fire River Gold, 2011). There was ongoing drilling, mining, and milling in 2012 and early 2013 (Fire River Gold Corp., 2013).

Alteration:

Extensive development of endoskarn, exoskarn, and hornfels that is genetically related to the mineralization. Quartz monzonite is sericitized and argillized near the mineralization and some of the ore bodies are oxidized up to a depth of 160 meters (Moll and others, 1981, Bundtzen and Miller, 1997). Other evidence of alteration includes weak argillic alteration around narrow sulfide quartz veins and broad zones of propylitic alteration are present in the quartz monzonite. Late felsic dikes may exhibit silicification overprinted on the argillic alteration (Wallis and Rennie, 2005).

Age of mineralization:

Late Cretaceous based on 68 to 70 Ma, isotopic age of quartz monzonite adjacent to the skarn ore bodies (Moll and others, 1981, Bundtzen and Miller, 1997, Wallis and Rennie, 2005).

Generic deposit model:

Deposit model:

Copper-gold skarn (Cox and Singer, 1986; model 18b)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b

Production Status: Yes; medium

Site Status: Probably inactive

Workings/exploration:

The Nixon Fork deposit was first staked in 1917 and was mined intermittently from 1918 to 1964, notably by the Yukon-Treadwell company and by E.M. Whalen, from several shafts, open pits, and trenches (Mertie, 1936, Herreid, 1966, Wallis and Rennie, 2005, Postle and others, 2006).

The property was explored by Battle Mountain Gold from 1984 to 1988 and by the Nixon Fork Joint Venture/Central Alaska Gold from 1989 to 1993. From 1985 to 1998, 719 surface and underground, reverse circulation and core holes were drilled that totaled 63,093 meters. The deposit was mined by Nevada Goldfields Inc. from 1995 to 1999, when they filed for bankruptcy and the property reverted to its owners.

St. Andrew Goldfields Ltd. leased the property in 2003, did extensive surface and underground drilling, drove several spiral declines on the ore bodies they defined, and built a 200-ton-per-day mill. They began mining in late 2006 and produced their first gold in January 2007 (St. Andrew Goldfields Ltd., 2009). Mining was suspended in October 2007 to better define the ore bodies as the production was lower than anticipated from their reserve estimates.

In February, 2009, Fire River Gold (2010) acquired the property and in early 2010, they were engaged in a major program of re-logging and reanalyzing the surface and drill samples from the previous operators, mapping, and new drilling to define the deposit.

In Fall of 2010, Fire River released an updated mineral resource estimate (Fire River Gold Corp., 2010b). In July 2011, Fire River started up the Nixon Fork Mill (Fire River Gold, 2011). There was ongoing drilling, mining, and milling in 2012 and early 2013 (Fire River Gold Corp., 2013).

Production notes:

The Nixon Fork deposit was first staked in 1917 and was mined intermittently from 1918 to 1964, notably by the Yukon-Treadwell company and E.M. Whalen, from several shafts, open pits, and trenches (Mertie, 1936, Herreid, 1966, Wallis and Rennie, 2005). The total production during this period is estimated to be 42,200 ounces of gold, 11,281 ounces of silver, and 41,400 pounds of copper, from ore that averaged about 1.5 ounce of gold per ton. Much of this production came from ore bodies in the vicinity of Crystal Gulch. But at least some came from the Whalen Shaft (MD071), about a mile south, and from the glory hole near it.

The deposit was mined by Nevada Goldfields Inc. from 1995 to 1999 when they filed for bankruptcy. They produced 137,749 ounces of gold and 2,145,826 pounds of copper from 122,391 tons of ore with a 'reconciled' grade of 42 grams of gold per ton. In the first nine months of 2007, St Andrew Goldfields produced 18,105 tons of ore with a grade of 17.1 grams of gold per ton. Production was suspended in October 2007.

Reserves:

In 2006, Postle and others (2006) estimated the resources and reserves of the Nikon Fork Mine for St Andrew Gold Fields Ltd. These are: 1) a measured resource of 23,400 tonnes with a grade of 36.8 grams of gold per tonne; 2) an indicated resource of 126,000 tonnes with a grade of 21.6 grams of gold per tonne; 3) an inferred resource of 93,000 tonnes with a grade of 15.5 grams of gold per tonne; 4) a proven reserve of 47,000 tons with a grade of 34.05 grams of gold per tonne; and 5) a probable reserve of 137,500 tonnes with a grade of 18.6 grams of gold per tonne. However, when mining took place from late 2006 to late 2007, the production fell short of the estimates. In early 2010, Fire River Gold was engaged in a major program to better define the reserves and resources.

In December 2011, Fire River released an updated resource estimate based on 2010 and 2011 drilling results. These are: 1) an indicated resource of 129,060 tonnes with a grade of 24.9 grams of gold per tonne in the mines plus 2) an indicated resource of 92,000 tonnes with a grade of 7.9 grams of gold per tonne in the tailings for 3) a total indicated resource of 3,941,067 grams of contained gold; 4) an inferred resource of 53,980 tonnes with a grade of 28.0 grams of gold per tonne in the mines plus 5) an inferred resource of 48,000 tonnes with a grade of 7.4 grams of gold per tonne in the tailings for 6) an inferred resource of 1,863,681 grams of contained gold (Fire River Gold Corp., 2011).

Additional comments:

In June 2013, Fire River announced they were suspending operations and placing the mine into care and maintenance mode (Fire River Gold Corp., 2013). In 2014, Fire River announced they defaulted on their credit agreement terms with Waterton Global Value, L.P., and that Waterton has taken full and unrestricted

ownership of the Nixon Fork Gold Mine (Fire River Gold Corp., 2014).

References:

Bundtzen, T.K., and Miller, M.L., 1997, Precious metals associated with Late Cretaceous-early Tertiary igneous rocks of southwestern Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 242-286.

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Fire River Gold Corp., 2010a, Nixon Fork overview: http://www.firerivergold.com/s/NixonFork.asp (as of March 2, 2010).

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Fire River Gold Corp., 2013, Fire River Gold Corp. provides operations update: http://www.firerivergold.com/i/pdf/FAU280313.pdf (as of July 14, 2014).

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Mertie, J.B., Jr., 1936, Mineral deposits of the Ruby-Kuskokwim region, Alaska: U.S. Geological Survey Bulletin 864-C, p. 115-245.

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Newberry, R.J., Allegro, G.L., Cutler, S.E., Hagen-Levelle, D.D., Adams, D.D., Nicholson, L.C., Weglarz, T.B., Bakke, A.A., Clautice, K.H., Coulter, G.A., Ford, M.J., Myers, G.L., and Szumigala, D.J., 1997, Skarn deposits of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 355-395.

Patton, W.W. Jr., Moll, E.J., Dutro, J.T., Jr., Silberman, M.L., and Chapman, R.M., 1980, Preliminary

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Postle, John, Scott, Kevin, and Wallis, C.S., 2006, Technical report on the Nixon Fork project Alaska, U.S.A.: Technical report prepared for St. Andrew Goldfields Ltd., 98 p. (posted on www.sedar.com, October 4, 2006).

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Williams J.A., 1961, Report for the year 1960 of the Division of Mines and Minerals: Alaska Department of Natural Resources Special Report, 88 pages.

Primary Reference: Wallis and Rennie, 2005; Fire River Gold, 2010a

Reporter(s): Bundtzen, T.K. (Pacific Rim Geological Consulting); D.J. Grybeck (Contractor, U.S. Geological Survey); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-02

Site name(s): Whalen Shaft

Site type: Mine

ARDF no.: MD071

Latitude: 63.2164 **Quadrangle:** M A-4

Longitude: 154.7696

Location description and accuracy:

The Whalen Shaft is about 0.5 mile northeast of the center of section 24, T. 26 S., R. 21 E., on the ridge at the head of Rudy Creek. It is near the 'Glory Hole' shown on the 1:63,360-scale U.S. Geological Survey topographic map. The location is accurate.

Commodities:

Main: Ag, Au, Cu

Other: Bi, Th, U, W

Ore minerals:

Gangue minerals: Calcite, diopside, epidote, garnet, limonite, quartz, sericite, siderite, tremolite, zeolite

Geologic description:

Mineralization was first staked in the area in 1917 and was mined intermittently from 1918 to 1964, notable by the Yukon-Treadwell company and by E.M. Whalen from several shafts, open pits, trenches, and a glory hole (Mertie, 1936; Herreid, 1966, Wallis and Rennie, 2005). The total production during this period is estimated to be 42,200 ounces of gold, 11,281 ounces of silver, and 41,400 pounds of copper from ore that averaged about 1.5 ounce of gold per ton. During this period, most of the mining took place here and about a mile to the north in the vicinity of Crystal Gulch (MD062); together they were usually referred to as the Nixon Fork Mine and their production aggregated. Much of the production during this period probably came from the Whalen Shaft area.

There has been almost continuous exploration and considerable mining in the vicinity by several companies since 1984 but most of it has been concentrated in what is now usually called the Nixon Fork Mine (MD062) near Crystal Gulch, about a mile to the north. The several companies who have worked in the area undoubtedly have done some work in the Whalen Shaft area and it is noted in passing in several of the reports of their work. However little detail is available for the Whalen Shaft area specifically. The geology and mineralization is also similar to that at the better-known Nixon Fork Mine (MD062). The mineralization at the Nixon Fork Mine consists of several classic gold-copper, epiodote-diopside-garnet skarn deposits, generally within 10 to 150 meters of the periphery of a Cretaceous (68 to 70 Ma) quartz monzonite to granodiorite stock about 3 by 5 kilometers in size (Moll and others, 1981; Bundtzen and Miller, 1997, Wallis and Rennie, 2005). The Whalen Shaft is on the southern periphery of this stock. The stock intrudes the Ordovician Telsitna Formation, a 2,000-meter-thick sequence of limestone and dolomite, and Cretaceous calcareous sandstone and shale. Both the quartz monzonite and the host rocks are cut by late quartz-feldspar and quartz porphyry dikes. The orebodies are irregular and complex, often with branching arms, but are roughly pipelike, dip steeply, and follow or parallel the border of the intrusion at depth. In plan the orebodies typically are about 4 meters by 20 to 30 meters in area and extend down dip for several hundred meters. They are typically associated with epidote-diopside-garnet skarn near carbonate rocks or hornfels near sandstone and shale. Both exoskarn and endoskarn are present. Most of the ore minerals and skarn occur in exoskarn 10 to 30 feet into the marble front. Minor mineralized endoskarns occur within satellite bodies of quartz monzonite; however, most of this mineralization is not ore grade. The main ore minerals are pyrrhotite, chalcopyrite, pyrite, and native gold; minor bornite and chalcocite are known The

quartz monzonite is sericitized and argillized near the mineralization and some of the ore bodies are oxidized up to a depth of 160 meters.

Alteration:

Age of mineralization:

Late Cretaceous based on 68 to 70 Ma isotopic age of monzonite adjacent to the skarn ore bodies.

Generic deposit model:

Deposit model:

Cu-Au skarn (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b

Production Status: Yes

Site Status: Active

Workings/exploration:

The Whalen Shaft was driven to an unknown depth, but not below the water table, which was at about 400 feet. A glory hole is nearby and probably other workings. Beginning in 1984, several companies have extensively explored and drilled in the area but almost all of that work has been concentrated about a mile to the north at what is now called the Nixon Fork Mine (MD062). Some of the recent exploration undoubtedly extended to the vicinity of the Whalen Shaft as it is part of the same property. But other than mentioning it in passing, no detail is available.

Production notes:

Mineralization was first staked in the area in 1917 and was mined intermittently from 1918 to 1964, notable by the Yukon-Treadwell company and E.M. Whalen, from several shafts, open pits, trenches, and a glory hole (Mertie, 1936; Herreid, 1966, Wallis and Rennie, 2005). The total production during this period is estimated to be 42,200 ounces of gold, 11,281 ounces of silver, and 41,400 pounds of copper from ore that averaged about 1.5 ounce of gold per ton. During this period, most of the mining took place here and about a mile to the north in the vicinity of Crystal Gulch; together they were usually referred to as the Nixon Fork Mine and their production aggregated. Probably much of the production during this period came from the Whalen Shaft area.

Reserves:

None.

Additional comments:

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St Andrew Goldfields Ltd., 2009, Nixon Fork Mine: was available on the Internet as of March 11, 2009 but as of early 2010 it has been deleted.

Wallis, C.S., and Rennie, E.W., 2005, Technical report on the Nixon Fork project, Alaska: Technical Report prepared for St. Andrew Goldfields Ltd., 78 p. (posted on www.sedar.com, October 4, 2006).

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Williams J.A., 1961, Report for the year 1960 of the Division of Mines and Minerals: Alaska Department of Natural Resources Special Report, 88 pages.

Primary Reference: Herreid, 1966; Wallis and others, 2003

Reporter(s): Bundtzen, T.K. (Pacific Rim Geological Consulting); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): North Shepard

Site type: Occurrence

ARDF no.: MD082

Latitude: 63.6431 **Quadrangle:** M C-3

Longitude: 154.3001

Location description and accuracy:

The North Shepard occurrence is situated on the northeast-facing side of a ridge between Johns and Shepherd Creeks. The occurrence is located 0.3 mile northeast from the center of Section 30, T. 21 S., R. 24 E., of the Kateel River Meridian. The site is accurate to within 500 feet (152 m).

Commodities:

Main: Au, Cu

Other: As, Co

Ore minerals: Arsenopyrite, chalcopyrite, gold

Gangue minerals: Quartz, sericite

Geologic description:

The North Shepard occurrence consists of quartz veins contained in felsic dikes. Anomalous gold mineralization is associated with quartz-sericite alteration of the dikes (DiMarchi and others, 1992, Newmont Mining Corp., 2012). The quartz veins contain disseminated arsenopyrite, chalcopyrite, and carry gold values; they are found in zones of silicic and phyllic alteration in the quartz monzonite dikes.

Surface samples collected by DiMarchi and others (1992) contain up to 500 ppb gold. Nine samples averaged 100 ppb gold. Copper, cobalt, and arsenic values were not reported.

Newmont Mining Corporation (2012) collected soil samples and rock chip samples in conjunction with detailed geologic mapping on Doyon Land in 2011. Soil samples were collected along ridges and spurs on a nominal spacing of 100 meters resulting in the identification of a northeast trending gold and arsenic anomaly associated with the northeast trending dike swarm. Newmont follow-up soil sampling in 2012 consisted of grid soil sampling a 2 kilometer by 5 kilometer area. Anomalous gold was found to be associated with veins bearing quartz- sericite in altered rhyolite dikes (Newmont Mining Corp., 2012, 2013).

Alteration:

Quartz and sericite (Newmont Mining Corp., 2012).

Age of mineralization:

The North Shepard prospect is inferred to be Late Cretaceous or early Tertiary based on isotopic age of Mystery Mountains intrusive complex (Moll and others, 1981).

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active?

Workings/exploration:

Newmont Mining Corporation (2012) collected 466 soil samples and 23 rock chip samples in conjunction with detailed geologic mapping on Doyon Land in 2011. Soil samples were collected along ridges and spurs on a nominal spacing of 100 meters resulting in the identification of a northeast trending gold and arsenic anomaly. Newmont follow-up soil sampling in 2012 consisted of grid soil sampling a 2 kilometer by 5 kilometer area. Anomalous gold was found to be associated with veins bearing quartz- sericite in altered rhyolite dikes. Selected rock chip samples of quartz veins hosted in rhyolite dikes yielded assays of up to 12 ppm gold, whereas, non-quartz veined rock chip samples collected within the northeast trend typically yielded assays of 1 to 3 ppm gold. In 2012, Newmont drilled 3 NQ size core holes totaling 486 meters designed to intersect the sericite altered rhyolite dikes. Drill intercepts of anomalous gold include 4.9 meters of 3.74 g/t gold in hole number SHEP-0002 and 2.8 meters of 8.07 g/t gold in hole number SHEP-0003 (Newmont Mining Corp., 2012 and Newmont Mining Corp., 2013).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

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Newmont Mining Corp., 2012, Doyon Kuskokwim Block 10, 2011 Work Summary, Doyon limited report 2012-03 (Report held by Doyon Limited, Fairbanks, Alaska.).

Newmont Mining Corp., 2013, Doyon Kuskokwim Block 10, 2012 Work Summary, Doyon limited report 2013-05 (Report held by Doyon Limited, Fairbanks, Alaska.).

Primary Reference: Newmont Mining Corp., 2012

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.), F.H. Wilson, (USGS)

Last report date: 2016-03-15

Site name(s): Vinasale

Site type: Prospect

ARDF no.: MG009

Latitude: 62.7051 **Quadrangle:** M C-6

Longitude: 155.7071

Location description and accuracy:

The Vinasale prospect is near the top of Vinsale Mountain directly east of the Kuskokwim River about 18 miles south of McGrath. The location is centered on the area of a calculated resource of the Central zone near the western edge of section 8, T. 30 N., R. 34 W, of the Seward Meridian.

Commodities:

Main: Ag, Au

Other: As, Bi, Mo, Pb, Sb, Zn

Ore minerals: Arsenopyrite, galena, jamesonite, pyrargyrite, pyrite, silver, sphalerite, stibnite

Gangue minerals: Dolomite, quartz, sericite

Geologic description:

Vinasale Mountain is underlain by a nearly circular composite, intrusive complex, about 2,500 meters in diameter (Bundtzen, 1986; DiMarchi, 1993; Adams and Giroux, 2011). The intrusive complex includes peraluminous, porphyritic quartz monzonite, rhyolite porphyry, shonkinite, and monzonite breccia. The intrusive phases cut and thermally alter flysch of the Late Cretaceous, Kuskokwim Group (Bundtzen and Miller, 1997). The stock has been dated by K-Ar methods at 69 Ma (Solie and others, 1991). The intrusive is marked by a magnetic high centered over Vinasale Mountain and a ring-shaped magnetic low that coincides with hornfels at the periphery of the intrusive complex.

During industry exploration work from 1989 to 1991 (DiMarchi, 1993), large coincident soil anomalies in gold, arsenic, antimony, lead, and molybdenum were found in three distinct zones named the Central, Northeast, and South zones on the top of Vinasale Mountain. The Central zone is approximately 457 by 610 meters in size and contains up to 2,470 parts per billion (ppb) gold. The Northeast and South zones contained up to 185 ppb and 335 ppb gold, respectively. The soil anomalies resulted in drilling that discovered significant gold-polymetallic mineralization.

The most common alteration types associated with gold mineralization consist of sericite-dolomite alteration and silicification. Strong dolomite alteration is generally indicative of higher gold values. Sericite-dolomite alteration occurs primarily as replacements of feldspars either in broad zones or in centimeter-scale alteration envelopes adjacent to sulfide-quartz veins. Silicification most often occurs as stockwork zones and veins up to 4 cm wide, although irregular quartz segregations and zones of pervasive flood silica can also be found locally. Broad zones of light-green sericite alteration are found adjacent to some zones of intense silicification. Weak propylitic alteration (mostly as incipient chlorite alteration of biotite) is widespread, generally occurring distal to gold mineralization relative to sericite-dolomite alteration and silicification. Minor amounts of chlorite or tourmaline alteration are found locally, and are typically associated with late shears and thin, late stage quartz veins (Abrams and Giroux, 2013).

The mineralization consists of disseminated sulfides and sulfide-quartz veins and veinlets. Sulfide mineralization in the Central zone consists of disseminated pyrite and arsenopyrite in areas of silica flooding in quartz monzonite, sericitic alteration in monzonite breccias, and quartz-dolomite veins and segregations in all intrusive rocks. Subordinate veinlets and veins contain coarsely crystalline pyrite, galena, arsenopyrite, sphalerite, stibnite, pyrargyrite, and jamesonite, and microscopic native silver and minor gold

(DiMarchi, 1993). The Northeast and South zones contain gold mineralization similar to but weaker than that in the Central zone.

Alteration:

Sericite-dolomite alteration and silicification are the main forms of alteration observed with mineralization. Weak propylitic alteration occurs more distal to mineralization (Abrams and Giroux, 2013).

Age of mineralization:

Hydrothermal sericite from the Central zone has been dated at 68.0 +/- 1.7 Ma (DiMarchi, 1993).

Generic deposit model:

Deposit model:

Intrusion-related gold (IRG) (McCoy and others, 1997).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

In 1990, Placer Dome U.S. Inc. and Central Alaska Gold Mining Company initiated a diamond drill program, concentrating on the Central zone. They drilled 65 holes that totaled 11,260 meters through 1993 (DiMarchi, 1993). The two longest auriferous intercepts in the Central zone were 63.1 meters with 2.42 grams per tonne (g/t) gold and 71.9 meters with 2.27 g/t gold. Those intercepts averaged 338 parts per million (ppm) antimony, 108 ppm zinc, 5 ppm lead, 3 ppm bismuth, and 0.7 ppm silver. In mineralized core, the gold/silver ratio is about 2:1. Arsenic is most concentrated in the southern Central zone where it averages 0.80 percent. The Northeast zone averaged about 500 ppm barium.

ASA-Montague leased the property from Doyon, Limited in 1994, and collected 771 soil samples, 20 rock samples and drilled 26 core holes (5262.4 meters). Most of this work was focused on the Central zone to upgrade the quality of the resource but some drill holes tested the outlying geophysical and soil anomalies. In 1995 and 1996 ASA-Montague did metallurgical testing, an environmental and permitting review, pre-feasibility study, and a resource estimate (Abrams and Giroux, 2013).

In 2007, Freegold Ventures Limited (Freegold) (2007) signed an agreement with Doyon, Limited to explore the property. Their 2007 and 2008 work included staking an additional 12,000 acres northeast of the previous claims that covered about 128,000 acres, a rock and and stream sediment sampling program, an aerial geophysical survey over the property, and an induced polarization (IP) survey (Adams and Giroux, 2011).

Freegold drilled 6 holes totaling 6,396 feet in 2010 with the aim at expanding the historical resources as well as testing weaker geophysical anomalies to the northeast. Exploration by Freegold during 2011 was entirely focused on the Central zone. The program was aimed at expanding and upgrading the current NI 43-101 resource. This work included a diamond core drilling program and an IP/resistivity geophysical survey. The geophysical survey indicates that in addition to the Central zone where most of the drilling has been conducted that a significant geophysical anomaly is defined in the Northeast zone where limited drilling has indicated mineralization of similar character to the Central zone (Abrams and Giroux, 2013).

In 2012 Freegold drilled 13 holes, 5 at the Northeast zone, 6 at the Central zone, and 2 between these two zones for a total of 3,425 meters. Highlights from the drilling include 85.3 meters at 1.49 g/t gold, 29.3 meters at 1.63 g/t gold, 12.2 meters at 1.34 g/t gold, 29.3 meters at 1.19 g/t gold, 9.1 meters at 1.10 g/t gold, and 33.7 meters at 1.09 g/t gold (Abrams and Giroux, 2013).

Production notes:

None.

Reserves:

Adams and Giroux (2011) calculated the inferred resource of the Central zone at 15 levels by varying the cut-off grade from 0.10 to 2.00 grams per tonne (g/t) gold. At a cut-off grade of 0.5 g/t gold, the Central zone has an inferred resource of 37.260 million tonnes with a grade of 1.11 g/t gold (or 1,331,000 ounces of gold); at a cut-off grade of 1.0 g/t gold, it has an inferred resource of 17.070 million tonnes with a grade of 1.57 g/t gold (or 859,000 ounces of gold).

The resource at Vinasale was updated again by Abrams and Giroux (2013). At a 0.5 g/t gold cut-off there is an indicated resource of 3.41 million tonnes averaging 1.48 g/t gold (162,000 ounces of gold) and an inferred resource of 50.2 million tonnes averaging 1.06 g/t gold (1,703,000 ounces of gold).

Additional comments:

The Vinasale prospect is located within Doyon, Limited conveyed land. For more information contact Doyon, Limited, Fairbanks, Alaska.

References:

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Bundtzen, T.K., 1986, Prospect examination of a gold-tungsten placer deposit in Alder Creek, Vinasale Mountain area, western Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File Report 86-15, 10 p.

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McCoy, Dan, Newberry, R.J., Layer, Paul, DiMarchi, J.J., Bakke, Arne, Masterman, J.S., and Minehane, D.L., 1997, Plutonic-related gold deposits of interior Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 191-241.

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Primary Reference: Abrams and Giroux, 2013

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); D.J. Grybeck (Contractor, USGS); N.V. King (Alaska Earth Sciences)

Last report date: 2016-02-25

Site name(s): Alder Gulch; Vinasale

Site type: Mine

ARDF no.: MG010

Latitude: 62.696 **Quadrangle:** M C-6

Longitude: 155.71

Location description and accuracy:

The Alder Gulch placer mine is located in Alder Gulch, a south flowing tributary that drains the south slope of Vinasale Mountain. The mine workings are at an elevation of 850 feet (259 meters) in the NE 1/4 section 18, T. 30 N., R. 34 W., of the Seward Meridian. T.K. Bundtzen investigated the mine in 1982. The accuracy is within one-quarter mile.

Commodities:

Main: Ag, Au

Other: Bi, PGE, Sb, W

Ore minerals: Bismuth, gold, ilmenorutile, monazite, scheelite

Gangue minerals:

Geologic description:

The Alder Gulch heavy mineral placer deposit consists of auriferous, semi-residual and alluvial, unconsolidated deposits of Quaternary age in a steep gulch on the south flank of Vinasale Mountain. The placer deposit lies down slope and downstream from a mineralized 69.0 Ma granitic pluton that forms most of Vinasale Mountain (Bundtzen, 1986). Alder Gulch has only intermittent water flow and is dry through much of late summer and fall.

The gold and heavy mineral bearing material ranges from 0.5 to 2 meters thick, over stream widths of 12 to 20 meters. Placer gold has been detected for about 2 kilometers below the main workings. The placer deposit begins just below the contact between quartz monzonite and sheared hornfels, which may be a mineralized source for the placer minerals. The stream gradient is very steep and averages about 100 meters/kilometer at the head of Alder Gulch.

Principal heavy minerals identified during mining activities include placer gold that exhibits a fineness of 930, abundant native bismuth and scheelite; minor hastingsite, ilmenite, magnetite, and zircon; trace amounts of monazite, and ilmenorutile; and up to 2.6 ppm PGE (Bundtzen, 1986). The mineralogical source of the PGE is unknown. Sulfide-scheelite-quartz float found in the placer cut contains up to 14.3 grams/tonne gold (Bundtzen, 1986).

In 2010, Freegold completed it's initial drilling on the Vinasale Project; a total of 1,947 meters were drilled in the Central Zone. The results of which were incorporated into Freegold's initial NI-43-101 compliant resource, which was completed in March 2011. The 2011 exploration program included a 13 hole diamond drill program the results of which were incorporated into an updated NI 43-101 compliant resource in March 2012. The addition of 13 drill holes drilled in 2011 and the expansion of the body expanded the tonnage of the resource. During the 2012 exploration season, Freegold completed 13 core drill holes for a total of 11,238 feet (3,425.7 meters). Reconnaissance level rock and soil geochemistry were also completed in the Central Zone, Northeast Zone and in outlying areas (Freegold, 2014).

In March 2013 a new updated NI 43-101 Compliant resource was completed, which incorporated the results of the 2012 drilling. The resource estimate was completed by Giroux Consultants Ltd. of Vancouver, BC. Canada. Indicated resources are 3.41 million tonnes averaging 1.48 grams of gold per tonne for 162,000 ounces, and inferred resources are 53.25 million tonnes averaging 1.05 grams of gold per tonne for

1,799,000 ounces of gold utilizing a cutoff value of 0.5 gram of gold per tonne as a possible open pit cutoff within the total blocks (Abrams and Giroux, 2013).

Alteration:

Extensive oxidation of regolith results in grussification of plutonic suite (Bundtzen, 1986).

Age of mineralization:

Quaternary, based on geomorphic character (in active stream basin) (Bundtzen, 1986).

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Gold heavy mineral placer (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Surface exploration includes samples collected and processed by mine operator Peter Snow and samples reported by Bundtzen (1986). Sulfide-scheelite-quartz float found in the mine cut contain up to 14.3 grams/tonne gold.

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Bundtzen (1986) collected a series of bulk concentrate samples from Peter Snow's 1982 operation, and concluded that up to 68 kilograms of scheelite could be recovered from one tonne of concentrate.

Production notes:

Between 1930 and 1932, Carl Shutler mined in shallow hand mining cuts and produced 106.5 ounces (3.3 kg) gold and 20.2 ounces (0.6 kg) of byproduct silver Bundtzen, 1986). In 1981 and 1982, Peter Snow produced 16.5 ounces (503 grams) gold and 3.5 ounces (108 grams) of silver from a series of small test pits using a small tractor.

Reserves:

Indicated resources are 3.41 million tonnes averaging 1.48 grams of gold per tonne for 162,000 ounces, and inferred resources are 53.25 million tonnes averaging 1.05 grams of gold per tonne for 1,799,000 ounces of gold utilizing a cutoff value of 0.5 grams of gold per tonne as a possible open pit cutoff within the total blocks (Abrams and Giroux, 2013).

Additional comments:

Freegold Ventures Ltd. entered into an Exploration Agreement with an Option to Lease the Vinasale Project from Doyon Limited, an Alaskan Native Regional Corporation, in 2007.

References:

Abrams, M.J., and Giroux, G. H., 2013, Technical Report for the Vinasale Mountain Prospect, McGrath Mining District, Alaska: http://www.freegoldventures.com/i/pdf/43101/vinasale/VINASALEREPORT040213.pdf (as of July 24, 2014).

Bundtzen, T.K., 1986, Prospect examination of a gold-tungsten placer deposit in Alder Creek, Vinasale Mountain area, western Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File Report 86-15, 10 pages.

Cobb, E.H., 1972, Metallic mineral resources map of the McGrath quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-379, 1 sheet, 1:250,000 scale.

Cobb, E.H., 1973, Placer deposits of Alaska: U.S. Geological Survey Bulletin 1374, 213 p.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Iliamna, Lake Clark, Lime Hills, and McGrath quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-485, 101 p.

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Freegold Ventures Ltd., 2014, Vinsala Project Overview: http://www.freegoldventures.com/s/Vinasale.asp?ReportID=197043&_Type=Vinasale-Project-Alaska (as of July 24, 2014).

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb,

Primary Reference: Bundtzen, 1986

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); V. C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-02-25

Site name(s): Roberts (near Middle Fork of Kuskokwim River)

Site type: Prospect

ARDF no.: MG030

Latitude: 62.196 **Quadrangle:** M A-3

Longitude: 154.4487

Location description and accuracy:

The Roberts prospect is on the crest of a steep, north-sloping ridge near the head of an unnamed tributary of the Middle Fork of the Kuskokwim River. It is at an elevation of about 4,170 feet about 0.2 mile southeast of the center of section 5, T. 24 N., R. 28 W., of the Seward Meridian. The location is accurate.

Commodities:

Main: Cu, Ni, Pd, Pt

Other: Ag, Au, Bi, Co, Cr

Ore minerals: Bravoite, chalcopyrite, galena, pentlandite, pyrite, pyrrhotite, Te-Bi sulfosalts, unidentified PGE minerals

Gangue minerals: Hematite, magnetite

Geologic description:

The Roberts prospect is in a differentiated, mafic-ultramafic sill that cuts silty limestone and shale of the Late Cambrian to Early Ordovician, Lyman Hills Formation, the oldest facies of the Dillinger subterrane (Bundtzen, Harris, and Gilbert, 1997). The sill is undated, but believed to be correlative with Late Triassic feeders in the Tatina River Volcanics, a subdivision of the Middle Devonian to Lower Jurassic Mystic subterrane (Bundtzen, Harris, and Gilbert, 1997; T.K. Bundtzen and G.M. Laird, written communication, 1998).

The mafic-ultramafic sill trends N 55 E and dips about 35SE parallel to bedding; it varies in composition from picrite to diorite but mostly is gabbro. Surface sampling and mapping indicate that the sill is differentiated with picrite-gabbro near the base and diorite near the top (T.K. Bundtzen and G.M. Laird, written communication, 1998). Another mafic sill mapped by Gilbert and others (1988) about 3 kilometers southwest is on strike with the Roberts occurrence.

The mineralization at the Roberts prospect is mainly disseminated and network-style sulfides with a notable content of platinum group elements (PGE) in the lower and middle part of the sill. The ore minerals include megascopic chalcopyrite, pyrite, magnetite, and pyrrhotite, and microscopic bravoite, galena, Bi-Te sulfosalts, and pentlandite. According to W.S. Roberts (written communication, 1984), the PGE mineral may be a palladium-bismuth telluride. T.K. Bundtzen and G.M. Laird (written communication, 1998) could not identify the PGE minerals at the prospect. Based on limited chip-channel sampling, the thickness of the mineralized zone varies from 2 to 4 meters and extends for a strike length of at least 25 meters.

Five samples taken perpendicular to the strike of the sill contained up to 0.49 parts per million (ppm) palladium, 0.35 ppm platinum, 0.8 ppm silver, 0.09 ppm gold, 1,315 ppm copper, 1,510 ppm nickel, and 1,530 ppm chromium (T.K. Bundtzen and G.M. Laird, written communication, 1998). Bench tests conducted by the Bureau of Mines showed up to 4.71 percent nickel, 0.16 percent cobalt, 4.68 percent copper, 6.2 ppm platinum, 7.7 ppm palladium, and 4.7 ppm gold (W.S. Roberts, written communication, 1984; Foley and others, 1997; Bundtzen, Harris, and Gilbert, 1997).

Brozdowski and Taylor (2009) reported on recent work by Nycon Resources Inc. They drilled the prospect and flew two airborne geophysical surveys over it covering about 195 square kilometers. Brozdowski and Taylor describe the Roberts prospect as an anastomosing dike- to sill-like body of olivine

gabbro and peridotite that extends for about 430 meters along strike and is about 50 feet thick. Its magnetic expression and drill holes indicate it dips steeply west. Several rock chip samples contained 2.27 to 2.32 percent nickel, 1.31 to 2.30 percent copper and 13.22 to 16.88 ppm platinum group elements. A drill intercept 8.4 meters long contained 0.94 ppm platinum and 1.07 ppm palladium. The geophysical data suggests the Roberts prospect is part of a belt of similar deposits that includes the nearby Chip-Loy prospect (MG032).

Alteration:

Serpentinization of ultramafic phases of sill.

Age of mineralization:

Probably correlative with Late Triassic feeders in Tatina River Volcanics (Bundtzen, Harris, and Gilbert, 1997).

Generic deposit model:

Deposit model:

Disseminated Ni-Cu-PGE in gabbro (Cox and Singer, 1986; model 5b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

5b

Production Status: None

Site Status: Active

Workings/exploration:

The Robert's prospect was discovered in 1981 by W.S. Roberts of the U.S. Bureau of Mines while working with the Alaska Division of Geological and Geophysical Surveys in the McGrath quadrangle. The prospect was sampled by the Alaska Division of Geological and Geophysical Surveys and the U.S. Bureau of Mines several times in the 80s and 90s. In 2009, Nycon Resources Inc. was active on the property; they drilled the prospect and flew two airborne geophysical surveys over it that covered about 195 square kilometers.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brozdowski, R.A., and Taylor, S.R., 2009, Magmatic Ni-Cu-PGE in mafic-ultramafic intrusive conduits to a Triassic flood basalt province, Nycon Resource's Farewell District project, southwestern Alaska: Abstracts, Alaska Minerals Association 2009 Annual Convention, p. 17-18 (also available on the Internet at www.alaskaminers.org/abstracts2009.pdf).

Bundtzen, T.K., Harris, E.E., and Gilbert, W.G., 1997, Geologic Map of the eastern McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 97-14, 34 p., 1 sheet, scale 1:125,000.

Foley, J.Y., Light, T.D., Nelson, S.W., and Harris, R.A., 1997, Mineral occurrences associated with mafic-

ultramafic and related alkaline complexes in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 396-449.

Gilbert, W.G., Solie, D.N., and Kline, J.T., 1988, Geologic map of the McGrath A-3 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 92, 2 sheets, scale 1:63,360.

Roberts, W.S., and O'Connor, W.K., 1985, Petrographic and geological summary, Robert's PGM occurrence, McGrath A-3 quadrangle, Alaska: U.S. Bureau of Mines unpublished prospect examination report, 9 pages.

Primary Reference: Brozdowski and Taylor, 2009

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Chip-Loy

Site type: Prospect

ARDF no.: MG032

Latitude: 62.1664 **Quadrangle:** M A-3

Longitude: 154.3834

Location description and accuracy:

The Chip-Loy deposit is on a steep valley wall of what is locally called Straight Creek, one of the headwater tributaries of the Middle Fork of the Kuskokwim River. It is between about 2,900 feet to 4,000 feet in elevation, about 0.3 mile southeast of the center of section 15, T. 24 N., R. 28 W., of the Seward Meridian. The location is accurate.

Commodities:

Main: Co, Cu, Ni

Other: Ag, Au, Fe

Ore minerals: Bravoite, chalcopyrite, cubanite, galena, nickelian pyrrhotite, pentlandite, sphalerite, tetradymite, violarite, undetermined Co-Ni-Fe arsenide

Gangue minerals: Ilmenite

Geologic description:

According to Herreid (1968), Foley (1987), and Foley and others (1997), the Chip-Loy deposit consists of an irregular, steeply dipping layer of massive to disseminated, nickelian pyrrhotite and other sulfides in an elongate, composite, diabase intrusion. Herreid (1968) describes the diabase, which ranges from gabbro to diorite, as a pipe in plan view, but Smith and Albanese (1985) describe it as a dike. The diabase trends in a northeast direction and varies from 40 meters to 260 meters wide; cliff walls prevent accurate investigations of the intrusion's true dimensions. The composite diabase intrusion cuts mid-Silurian Terra Cotta Mountains Sandstone, a formation of the Dillinger subterrane of Lower Paleozoic age. (Bundtzen, Harris, and Gilbert, 1997). Gilbert and others (1988) assign an early Tertiary age to the mineralized diabase intrusion.

The Chip-Loy deposit contains disseminated to massive sulfides, mainly pyrrhotite and chalcopyrite, with minor cubanite and sphalerite, and trace galena, bravoite, violarite, tetradymite ($Bi2Te2S$), and undetermined Co-Ni-Fe arsenides (Bart Cannon, written communication, 1998). The sulfides are intergrown with ilmenite and other rock-forming minerals such as plagioclase and olivine. The northeast trending, sulfide-bearing zone is in the diabase about 10 to 30 meters from the contact with sandstone and shale. The zone is about 335 meters long and 10 to 15 meters wide but is quite irregular along strike. Herreid (1968) estimated that the Chip-Loy deposit contains an inferred reserve of about 150,000 tonnes of disseminated and massive sulfide mineralization. Smith and Albanese (1985) suggested a larger reserve than Herreid; they estimate 0.15 to 1.25 million tonnes of sulfide mineralization.

Chip-channel samples from the Chip-Loy deposit contained up to 3.30 percent nickel, 0.25 percent cobalt, 2.10 percent copper, 12.1 grams of silver per tonne, and 43.2 percent iron (Smith and Albanese, 1985; Bundtzen and others, 1982). A single sample of massive sulfide mineralization contained 3.0 grams of gold per tonne (Foley, 1987; Gilbert and others, 1988). Tetradymite is in the interstices of the rock-forming silicates. A 12-meter-long chip-channel sample across the deposit contained 0.28 percent copper, 2.6 grams of silver per tonne, 444 parts per million (ppm) cobalt, 0.70 percent nickel, and 17.82 percent iron (Smith and Albanese, 1985; Gilbert and others, 1988). Pyrrhotite from selected samples averaged 0.4 percent cobalt and 1.5 percent nickel (Bart Cannon, written communication, 1998). About 50 percent of the nickel

and cobalt is in pyrrhotite; the remainder is in pentlandite and other nickel and cobalt minerals.
Brozdowski and Taylor (2009) reported on recent work by Nycon Resources Inc. as part of their exploration on a large block of claims. They drilled the prospect and flew two airborne geophysical surveys over it that covered about 195 square kilometers. Brozdowski and Taylor describe the deposit as a highly-contaminated Early Tertiary gabbro to diorite dike. Grab samples contained up to 2.7 percent nickel, 0.4 percent copper, and 20 parts per billion platinum and palladium. The aerial geophysical data suggest that the Chip-Loy prospect is part of a belt of similar deposits that includes the nearby Roberts prospect (MG030).

Alteration:

Slight oxidation of massive sulfides.

Age of mineralization:

Little evidence for age. Thought to be early Tertiary by Gilbert and others (1988) and Brozdowski and Taylor (2009); however, the nearby Roberts deposit (MG030) possibly is Late Triassic.

Generic deposit model:

Deposit model:

Gabbroic Ni-Cu (Cox and Singer, 1986; model 7a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

7a

Production Status: None

Site Status: Active

Workings/exploration:

The Chip-Loy deposit was discovered and staked by prospectors Ed Chipp and Robert Loy in the early 1960s. Since then numerous geologists from industry and government have visited and sampled it. In 2009, the prospect was explored and drilled by Nycon Resources, Inc. as part of their study of similar deposits on a large block of claims that covered this prospect.

Production notes:

None.

Reserves:

Herreid (1968), who provides the only detailed geologic map of the Chip-Loy deposit, estimated approximately 150,000 tonnes of disseminated-to- massive sulfide mineralization. Smith and Albanese (1985) estimated that that the deposit contains 0.15 and 1.25 million tonnes of disseminated to massive mineralization.

Additional comments:

References:

Brozdowski, R.A., and Taylor, S.R., 2009, Magmatic Ni-Cu-PGE in mafic-ultramafic intrusive conduits to a Triassic flood basalt province, Nycon Resource's Farewell District project, southwestern Alaska: Abstracts, Alaska Minerals Association 2009 Annual Convention, p. 17-18 (posted on the Internet at www.alaskaminers.org/abstracts2009.pdf)

Bundtzen, T.K., Harris, E.E., and Gilbert, W.G., 1997, Geologic Map of the eastern McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 97-14, 34 p., 1

sheet, scale 1:125,000.

Bundtzen, T.K., Kline, J.T., and Clough, J.G., 1982, Preliminary geology of the McGrath B-2 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File report 149, 22 p., 1 sheet, scale 1:40,000.

Cobb, E.H., 1972, Metallic mineral resources map of the McGrath quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-379, 1 sheet, 1:250,000 scale.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Iliamna, Lake Clark, Lime Hills, and McGrath quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-485, 101 p.

Foley, J.Y., 1987, Reconnaissance strategic and critical mineral investigations in the McGrath A-3 and B-2 quadrangles, southwest Alaska: U.S. Bureau of Mines Field Report, 26 p.

Foley, J.Y., Light, T.D., Nelson, S.W., and Harris, R.A., 1997, Mineral occurrences associated with mafic-ultramafic and related alkaline complexes in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 396-449.

Gilbert, W.G., Solie, D.N., and Kline, J.T., 1988, Geologic map of the McGrath A-3 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 92, 2 sheets, scale 1:63,360.

Herreid, G.H., 1968, Geological and geochemical investigations southwest of Farewell, Alaska: Alaska Division of Mines and Geology Geologic Report 26, 24 p., 1 sheet, scale 1:75,000.

Nokleberg, W.J., Bundtzen, T.K., Berg, H.C., Brew, D.A., Grybeck, D.J., Robinson, M.S., Smith, T.E., and Yeend, W., 1987, Significant metalliferous lode deposits and placer districts of Alaska: U.S. Geological Survey Bulletin 1786, 104 p., 2 plates, scale 1:5,000,000.

Smith, T.E., and Albanese, M.D., 1985, Preliminary prospect examinations in the McGrath A-2, A-3, and B-2 quadrangles, Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 85-54, 19 p.

Primary Reference: Herreid, 1968; Brozdowski and Taylor, 2009

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Little Bird; BMP

Site type: Prospect

ARDF no.: MG047

Latitude: 62.3692 **Quadrangle:** M B-2

Longitude: 153.7942

Location description and accuracy:
The Little Bird prospect is on an east-facing slope on the west side of Sheep Creek Valley at an elevation of about 3,600 feet It is in the SE1/4 section 6, T. 26 N., R. 24 W., of the Seward Meridian.

Commodities:

Main: Ag, Cu, Zn

Other: Pb, W

Ore minerals: Chalcopyrite, galena, pyrrhotite, scheelite, sphalerite

Gangue minerals: Epidote, diopside

Geologic description:
The Little Bird occurrence is a sulfide-bearing, pyroxene skarn in limestone of the Lower Devonian, Barren Ridge Limestone, a unit of the Dillinger sub-terrane (Bundtzen, Harris, and Gilbert, 1997). The skarn occurs near a weakly mineralized, granite porphyry stock (Brewer and others, 1992). Discontinuous semi-massive and disseminated pyrrhotite with chalcopyrite, sphalerite, and galena occur in a 200 meter by 700 meter skarn zone. The grades and widths of the mineralization in the skarn are variable, but samples contain up to 4.5 percent copper, 1.7 percent lead, 11.4 percent zinc, 426.1 grams of silver per ton , and 0.33 percent tungsten (Brewer and others, 1992). The deposit was explored by Anaconda Minerals Company from 1981-1983.
In 2008, this prospect was one of several in a block of claims covering more than 70 square miles, known collectively as the BMP project (International Tower Hill Mines, Ltd., 2008).

Alteration:
Mineralization in a skarn zone.

Age of mineralization:
Cretaceous?

Generic deposit model:

Deposit model:
Polymetallic lead-zinc skarn (Cox and Singer, 1986; model 18c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
18c

Production Status: None

Site Status: Active

Workings/exploration:

The Little Bird occurrence was explored by Anaconda Minerals Company from 1981-1983 (Rob Kell, written communication, 1984). As of 2008, the prospect was in a large block of claims called the BMP project by International Tower Hill MIne, Ltd.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brewer, N.H., Puchner, C.C., and Gemuts, I., 1992, Farewell district, southwest Alaska Range: North Pacific Mining Company prospectus report, 21 p.

Bundtzen, T.K., Harris, E.E., and Gilbert, W.G., 1997, Geologic Map of the eastern McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 97-14, 34 p., 1 sheet, scale 1:125,000.

Bundtzen, T.K., Kline, J.T., and Clough, J.G., 1982, Preliminary geology of the McGrath B-2 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File report 149, 22 p., 1 sheet, scale 1:40,000.

International Tower Hills Mines, Ltd., 2008, BMP: http://www.ithmines.com/s/BMP.asp (as of April 30, 2008).

Primary Reference: Brewer and others 1992

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Crash; Sheep Creek 2; BMP

Site type: Prospect

ARDF no.: MG049

Latitude: 62.353 **Quadrangle:** M B-2

Longitude: 153.8015

Location description and accuracy:

The Crash prospect is located in an unnamed east-flowing tributary of Sheep Creek. It is 4.0 kilometers northwest of Smith Lake at an elevation of 2,800 feet in the SW1/4 sec. 7, T. 26 N., R. 24 W., of the Seward Meridian.

Commodities:

Main: Ag, Cu, Zn

Other: Au, Pb

Ore minerals: Chalcopyrite, galena, malachite, pyrrhotite , sphalerite

Gangue minerals: Quartz

Geologic description:

The Crash prospect consists of two siliceous, cataclastic breccias similar to those that host the mineralization at the Dahl prospect (MG053). The Crash zone is in a splay structure associated with a regional fault that hosts the Dahl prospect (MG053). The mineralization in one shale-hosted breccia zone contains massive chalcopyrite and sphalerite with traces of galena. It is near the contact of the Lower Ordovician to Lower Silurian, Post River Formation and the Middle to Upper Silurian Terra Cotta Mountains Sandstone, both units of the Dillinger sub-terrane (Bundtzen, Harris, and Gilbert, 1997). The other cataclastic breccia contains abundant arsenopyrite. Both sulfide-bearing breccia zones are from 3 to 30 centimeters thick, appear stratiform or parallel to sedimentary bedding, and are isoclinally folded. This suggests the sulfides were formed prior to Lower Cretaceous compressive deformation (Bundtzen, Harris, and Gilbert, 1997). The mineralization at the Crash prospect might be related to younger plutons. Samples from the larger sulfide-bearing breccia contain up to 16.5 percent copper and 926.8 grams of silver per tonne. (Brewer and others, 1992). The smaller cataclastic zone has a pod 02 to 2.0 meters thick of massive arsenopyrite that contains 6.8 grams of gold per tonne. Three samples collected by Smith and Albanese (1985) contain up to 316 parts per million (ppm) copper, 86 ppm lead, 940 ppm zinc, and 10.5 grams of silver per tonne. The gold in the Crash is atypical of most sulfide occurrences and prospects in the Farewell Mineral Belt.

In 2008, this prospect was one of several in a block of claims that covered more than 70 square miles, known collectively as the BMP project (International Tower Hill Mines, Ltd., 2008).

Alteration:

Age of mineralization:

Undated; inferred to be Lower Ordovician to Lower Silurian, based on graptolites found in mineralized area (Bundtzen, Harris, and Gilbert, 1997).

Generic deposit model:

Deposit model:

Either sedimentary exhalative lead-zinc or polymetallic vein (Cox and Singer, 1986; model 31a or 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

31a or 22c

Production Status: None

Site Status: Active

Workings/exploration:

Tom Smith and Mary Albanese first sampled the Sheep Creek-2 occurrence in 1982 during mineral investigations by the Alaska Division of Geological and Geophysical Surveys (Smith and Albanese, 1985). As of 2008, the prospect was within a large block of claims called the BMP project by International Tower Hill MIne, Ltd. (2008).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brewer, N.H., Puchner, C.C., and Gemuts, I., 1992, Farewell district, southwest Alaska Range: North Pacific Mining Company prospectus report, 21 p.

Bundtzen, T.K., Harris, E.E., and Gilbert, W.G., 1997, Geologic Map of the eastern McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 97-14, 34 p., 1 sheet, scale 1:125,000.

Bundtzen, T.K., Kline, J.T., and Clough, J.G., 1982, Preliminary geology of the McGrath B-2 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File report 149, 22 p., 1 sheet, scale 1:40,000.

International Tower Hills Mines, Ltd., 2008, BMP: http://www.ithmines.com/s/BMP.asp (as of April 30, 2008)

Smith, T.E., and Albanese, M.D., 1985, Preliminary prospect examinations in the McGrath A-2, A-3, and B-2 quadrangles, Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 85-54, 19 p.

Primary Reference: International Tower Hill Mines, Ltd., 2008

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Sheep Creek-1; BMP

Site type: Occurrence

ARDF no.: MG051

Latitude: 62.3419 **Quadrangle:** M B-2

Longitude: 153.8018

Location description and accuracy:

The Sheep Creek-1 occurrence is in the main tributary valley of Sheep Creek, about 2.0 kilometers upstream from the junction of the main tributary and the Smith Lake fork. It is at an elevation of about 2,800 feet in the SW1/4 sec. 18, T. 26 N., R. 24 W., of the Seward Meridian.

Commodities:

Main: Ag, Zn

Other: Pb, Sb, V

Ore minerals: Pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The Sheep Creek-1 occurrence is a discontinuous zone of metal-bearing, sulfur-rich shale and siltstone of the Lower Ordovician to Lower Silurian Post River Formation, a unit of the Dillinger sub-terrane (Bundtzen, Harris, and Gilbert, 1997). The shale-hosted mineralization contains graptolites that correspond to the Monograptus spiralis zone of Lower Silurian age. The mineralized zones occur in distinctive areas where a bright yellow sulfur staining seeps out of pyrite-rich lamina in the black shale. Within the sulfur-rich zones, disseminated pyrite and sphalerite occur in bands 2 to 4 centimeter thick.

Bundtzen, Harris, and Gilbert (1997) regard the Sheep Creek-1 occurrence as a sedimentary-exhalative lead-zinc deposit; however, it may be an epigenetic occurrence related to nearby plutons. Random chip samples reported by Bundtzen, Kline, and Clough (1982) and Bundtzen, Harris, and Gilbert (1997) from four stratiform horizons contained an average of 600 parts per million (ppm) lead, 1,700 ppm zinc, 1,000 ppm vanadium, and 2.7 grams of silver per tonne. Smith and Albanese (1985) reported a single sample from the Sheep Creek-1 occurrence that contained 720 ppm lead, 37.1 grams of silver per tonne, and 472 ppm antimony.

In 2008, this prospect was one of several in a block of claims that covered more than 70 square miles, known collectively as the BMP project (International Tower Hill Mines, Ltd., 2008).

Alteration:

Strong sulfurous alteration.

Age of mineralization:

Inferred to be Lower Silurian based on graptolite collected at the prospect.

Generic deposit model:

Deposit model:

Sedimentary exhalative Pb-Zn? deposit (Cox and Singer, 1986; model 31a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
31a?

Production Status: None

Site Status: Active

Workings/exploration:
First recognized in 1981 (Bundtzen, Kline, and Clough, 1982). The prospect was subsequently examined by industry and government. As of 2008, the prospect was within a large block of claims called the BMP project by International Tower Hill MIne, Ltd. (2008).

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Bundtzen, T.K., Harris, E.E., and Gilbert, W.G., 1997, Geologic Map of the eastern McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 97-14, 34 p., 1 sheet, scale 1:125,000.

Bundtzen, T.K., Kline, J.T., and Clough, J.G., 1982, Preliminary geology of the McGrath B-2 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File report 149, 22 p., 1 sheet, scale 1:40,000.

International Tower Hills Mines, Ltd., 2008, BMP: http://www.ithmines.com/s/BMP.asp (as of April 30, 2008).

Smith, T.E., and Albanese, M.D., 1985, Preliminary prospect examinations in the McGrath A-2, A-3, and B-2 quadrangles, Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 85-54, 19 p.

Primary Reference: Bundtzen, Harris, and Gilbert, 1997; International Tower Hill Mines, Ltd., 2008

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Sheep Creek-West; BMP

Site type: Prospect

ARDF no.: MG052

Latitude: 62.3298 **Quadrangle:** M B-2

Longitude: 153.8115

Location description and accuracy:

The Sheep Creek-West prospect is on the west side of Sheep Creek Valley just downstream from the intersection of the Rat Fork and the South Fork of Sheep Creek; it is at an elevation of 3,400 feet in the SW1/4 section 13, T. 26 N., R. 24 W., of the Seward Meridian. The location is accurate.

Commodities:

Main: Ag, Cu, Pb, Zn

Other: Au, Cd

Ore minerals: Cerussite, chalcopyrite, galena, malachite, pyrrhotite, sphalerite

Gangue minerals: Epidote, garnet, iron oxides, johannsenite

Geologic description:

The Sheep Creek-West prospect contains oxidized, sulfide mineralization. It is along a steeply dipping, northeast-striking fault(?) zone, 2 to 3 meters wide that juxtaposes silty limestone against tan arkosic sandstone. Both units belong to the Lower to Upper Silurian, Terra Cotta Mountains Sandstone, a formation within the Dillinger sub-terrane (Bundtzen, Harris, and Gilbert, 1997). The fault zone strikes northeast for at least 135 meters and is marked by a distinctive notch along the steep side hill. Sphalerite, galena, chalcopyrite and pyrrhotite in epidote, johannsenite, and garnet skarn replace limestone as vug fillings and stringers along the shear zone (Bundtzen, Kline, and Clough, 1982). Abundant malachite staining is a conspicuous feature locally along the fault zone.

Two chip samples collected across about 3 meters of the zone contain up to 0.85 percent copper, 1.01 percent lead, 0.58 percent zinc, 30 parts per million cadmium, 86 grams of silver per tonne and 0.60 grams of gold per tonne. (Bundtzen, Kline, and Clough, 1982).

The vein is probably related to nearby polymetallic veins at the Dahl (MG053), and the Sheep Creek-South (MG057) prospects that are part of the Farewell Mineral Belt. The structurally controlled, vein-type mineralization may be related to skarn mineralization observed throughout the Farewell Mineral Belt.

In 2008, this prospect was one of several in a block of claims that covered more than 70 square miles, known collectively as the BMP project (International Tower Hill Mines, Ltd., 2008).

Alteration:

Sulfides are highly oxidized with the development of conspicuous cerussite, iron oxides, and malachite.

Age of mineralization:

Generic deposit model:

Deposit model:

Polymetallic vein (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
22c

Production Status: None

Site Status: Active

Workings/exploration:
Surface sampling by Bundtzen and others in 1981 and 1982 was done on behalf of the Alaska Division of Geological and Geophysical Survey. As of 2008, the prospect was within a large block of claims called the BMP project by International Tower Hill MIne, Ltd. (2008).

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Bundtzen, T.K., Harris, E.E., and Gilbert, W.G., 1997, Geologic Map of the eastern McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 97-14, 34 p., 1 sheet, scale 1:125,000.

Bundtzen, T.K., Kline, J.T., and Clough, J.G., 1982, Preliminary geology of the McGrath B-2 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File report 149, 22 p., 1 sheet, scale 1:40,000.

Cobb, E.H., 1972, Metallic mineral resources map of the McGrath quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-379, 1 sheet, 1:250,000 scale.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Iliamna, Lake Clark, Lime Hills, and McGrath quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-485, 101 p.

International Tower Hills Mines, Ltd., 2008, BMP: http://www.ithmines.com/s/BMP.asp (as of April 30, 2008).

Reed, B.L. and Elliott, R.L., 1968, Geochemical anomalies and metalliferous deposits between Windy Fork and Post River, southern Alaska: U.S. Geological Survey Circular 596, 22 pages.

Primary Reference: Bundtzen, Kline, and Clough, 1982; International Tower Hill Mines, Ltd., 2008

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Dahl, BMP

Site type: Prospect

ARDF no.: MG053

Latitude: 62.3272

Quadrangle: M B-2

Longitude: 153.8118

Location description and accuracy:

The Dahl prospect is in a steep north-trending gulch, 4.0 kilometers west of the outlet of Smith Lake and one kilometer south of the junction of the headward tributaries of Sheep Creek. It is at elevation of about 3,600 feet near the middle of the boundary between sections 19 and 24, T. 26 N., R. 24 W., of the Seward Meridian.

Commodities:

Main: Ag, Cu, Zn

Other: Pb

Ore minerals: Chalcopyrite, pyrite, pyrrhotite, sphalerite

Gangue minerals: Quartz

Geologic description:

The Dahl prospect consists of several impressive zones of massive chalcopyrite-pyrite-sphalerite mineralization that replaces Lower Paleozoic carbonaceous shale in contact zones between a north-trending quartz-feldspar porphyry sill(?) and shale. The massive sulfide mineralization is exposed for over 90 meters along a narrow north-trending ravine between two unnamed tributaries of upper Sheep Creek. The quartz-feldspar porphyry sill is parallel to the contact between the Lower Ordovician to Lower Silurian Post River Formation and mid-Silurian Terra Cotta Mountains Sandstone; both are units of the Dillinger sub-terrane (Bundtzen, Harris, and Gilbert, 1997).

The mineralized horizon consists primarily of massive pyrrhotite with variable amounts of chalcopyrite, and sphalerite, and traces of tetrahedrite; it is 2.0 to 4.5 meters wide in a 4.0 meter to 7.0 meter zone of siliceous breccia. This breccia is localized in the faulted contact between the Ordovician-Lower Silurian Post River Formation and the mid to Upper Silurian Terra Cotta Sandstone. Chalcopyrite forms fine-grained masses up to 15 centimeters thick. Subordinate sphalerite, pyrrhotite, and pyrite accompany the chalcopyrite and form separate masses up to 5 centimeters thick. Minor quartz gangue occurs in the sulfide zones, which range from 1 to 5 meters thick.

The genesis of the Dahl prospect is controversial. The Anaconda Minerals Company, which explored the deposit in 1982 with a diamond drill, regarded the Dahl prospect as a shale hosted, sedimentary exhalative, massive-sulfide deposit in lower Silurian tuffaceous(?) shale (Reed, 1982; Brewer and others, 1992). They based this interpretation on: (1) the stratigraphic section of the Dillinger sub-terrane is similar to that in the Selwyn Basin in Yukon Territory, Canada, which hosts significant 'sedex' mineralization of the same age; (2) the wallrocks at the Dahl prospect contain framboidal pyrite with high lead, zinc and copper contents, (3) pyrite has been altered to pyrrhotite and 'buckshot' textures similar to that observed at Faro orebody, in Yukon; and (4) the whitish(?) layer interlayered with the sulfides was believed to be a syndepositional, submarine tuff. Sulfide-rich shale sections in drill core that were examined by T.P. Bundtzen (personal observation) in 1983 contained the graptolite Monograptus spiralis which confirms that the host rock is Lower Silurian in age.

However, Smith and Albanese (1985) observed crosscutting relationships of sulfides and host sediments, and sulfide replacements in the younger(?) quartz-feldspar porphyry sill(?). The quartz-feldspar porphyry

was also observed to cut bedding in host sediments. Isotopic S34 values from pyrrhotite average -0.2, which suggests derivation from plutonic sources (T.K. Bundtzen, written communication, 1989). Hence, Smith and Albanese (1985) and Bundtzen, Harris, and Gilbert (1997) classified the Dahl prospect as an epigenetic, sulfide replacement deposit.

Two holes were drilled on the Dahl prospect. Drill hole DP-W01 intersected 5.5 meters of massive sulfide mineralization that averaged 0.9 percent copper, 1.0 percent lead, 6.0 percent zinc, and 177.3 grams of silver per tonne. Diamond drill hole DP-D01 intersected 3.5 meters of semi-massive sulfides that averaged 4.0 percent copper, 0.3 percent lead, 1.0 percent zinc, and 370.1 grams of silver per tonne (Brewer and others, 1992). Bundtzen, Kline, and Clough (1982), Smith and Albanese (1985) and Bundtzen, Harris, and Gilbert (1997) reported that chip samples contained up to 5.40 percent copper, 3.48 percent zinc, and 165.0 grams of silver per tonne. A down hole geophysical survey showed that the DP-D01 drill-hole intercept is electrically continuous with the surface outcrops, suggesting that surface mineralization continues down dip for at least 150 meters. Additional surface conductivity surveys also suggest that the massive sulfide horizon extends to the north an additional 150 meters. No estimates of size and grade have been made (Reed, 1982; Brewer and others, 1992).

In 2008, the Dahl prospect was one of the prominent deposits in a block of claims that covered more than 70 square miles and known collectively as the BMP project (International Tower Hill Mines, Ltd., 2008). Their mapping in 2007 suggests that the mineralization occurs along a fault developed in a north-trending anticlinal hinge that extends 5 km to the south through several prospects (MG057 and MG061) to the 6120 prospect (MG062) and about 3 kilometers to the north through several other prospects (MG049-051).

Alteration:

Age of mineralization:

Unknown; believed to be either Tertiary, based on presumed age of the associated quartz-feldspar porphyry sill or Silurian, based on fossil identification (Bundtzen, Harris, and Gilbert, 1997).

Generic deposit model:

Deposit model:

Either polymetallic replacement or sedimentary exhalative lead-zinc (Cox and Singer, 1986; model 19a or 31a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

19a or 31a

Production Status: None

Site Status: Active

Workings/exploration:

The Dahl prospect was discovered by Anaconda Minerals Company in 1980 or 1981 and two holes were drilled in 1982. In 2008, the Dahl prospect was one of the prominent deposits in a block of claims that covered more than 70 square miles and known collectively as the BMP project (International Tower Hill Mines, Ltd., 2008).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brewer, N.H., Puchner, C.C., and Gemuts, I., 1992, Farewell district, southwest Alaska Range: North Pacific Mining Company prospectus report, 21 p.

Bundtzen, T.K., Harris, E.E., and Gilbert, W.G., 1997, Geologic Map of the eastern McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 97-14, 34 p., 1 sheet, scale 1:125,000.

Bundtzen, T.K., Kline, J.T., and Clough, J.G., 1982, Preliminary geology of the McGrath B-2 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File report 149, 22 p., 1 sheet, scale 1:40,000.

International Tower Hills Mines, Ltd., 2008, BMP: http://www.ithmines.com/s/BMP.asp (as of April 30, 2008).

Reed, Mark, 1982, The Tin Creek sector of the Farewell district, Alaska: Anaconda Minerals Company internal report, 44 p.

Smith, T.E., and Albanese, M.D., 1985, Preliminary prospect examinations in the McGrath A-2, A-3, and B-2 quadrangles, Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 85-54, 19 p.

Primary Reference: Brewer and others, 1992; International Tower Hill Mines, Ltd., 2008

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Smith Lake; BMP

Site type: Prospect

ARDF no.: MG055

Latitude: 62.3279

Quadrangle: M B-2

Longitude: 153.7404

Location description and accuracy:

The Smith Lake prospect is about 150 meters west of the outlet of Smith Lake and 120 meters upstream from the junction of a small unnamed tributary and the Smith Lake fork of Sheep Creek. It is at an elevation of 3,000 feet in the SW1/4 sec. 21, T. 26 N., R. 24 W., of the Seward Meridian. The location is accurate.

Commodities:

Main: Ag, Cu, Pb, Zn

Other: Bi, Co

Ore minerals: Chalcopyrite, galena, pyrite, pyrrhotite, sphalerite

Gangue minerals: Clinopyroxene, siderite

Geologic description:

The mineralization at the Smith Lake prospect consists of a high angle, sulfide-rich fault zone in mid-Silurian clastic rocks of the Terra Cotta Sandstone, a unit of the Dillinger sub-terrane (Bundtzen, Harris, and Gilbert, 1997). The fault zone trends N45E, dips steeply to vertically, and is from 0.5 to one meter wide. An adit driven into the mineralized zone exposed about 8 meters of the sulfide vein along its strike.

The main ore mineral is pyrrhotite which makes up 75 percent of the sulfides; minor amounts of pyrite, chalcopyrite, galena, and sphalerite are associated with the pyrrhotite. The gangue material includes significant secondary siderite and highly deformed clinopyroxene. Selected chip samples contained up to 1.05 percent copper, 1.74 percent lead, 5.22 percent zinc, 42.0 grams of silver per tonne, 100 parts per million (ppm) cobalt, and 100 ppm bismuth (Bundtzen, Kline, and Clough, 1982; Smith and Albanese, 1985). A 0.3-meter-long channel sample collected by Brewer and others (1992) contained 14.8 percent lead, 10.6 percent zinc, 0.6 percent copper, and 90.2 grams of silver per tonne. The Smith Lake mineralization is typical of other silver-polymetallic prospects in Farewell Mineral Belt.

In 2008, this prospect was one of several in a block of claims that covered more than 70 square miles, known collectively as the BMP project (International Tower Hill Mines, Ltd., 2008).

Alteration:

Siderite alteration.

Age of mineralization:

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

Some time prior to 1980, an 8-meter-long adit was driven into this sulfide-rich fault zone. It has been sampled several times by government and industry geologists from the early 80s into the 1990s. As of 2008, the prospect was within a large block of claims called the BMP project by International Tower Hill MIne, Ltd. (2008).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brewer, N.H., Puchner, C.C., and Gemuts, I., 1992, Farewell district, southwest Alaska Range: North Pacific Mining Company prospectus report, 21 p.

Bundtzen, T.K., Harris, E.E., and Gilbert, W.G., 1997, Geologic Map of the eastern McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 97-14, 34 p., 1 sheet, scale 1:125,000.

Bundtzen, T.K., Kline, J.T., and Clough, J.G., 1982, Preliminary geology of the McGrath B-2 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File report 149, 22 p., 1 sheet, scale 1:40,000.

International Tower Hills Mines, Ltd., 2008, BMP: http://www.ithmines.com/s/BMP.asp (as of April 30, 2008).

Smith, T.E., and Albanese, M.D., 1985, Preliminary prospect examinations in the McGrath A-2, A-3, and B-2 quadrangles, Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 85-54, 19 p.

Primary Reference: Bundtzen, Kline, and Clough, 1982; International Tower Hill Mines, Ltd., 2008

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Clough; BMP

Site type: Occurrence

ARDF no.: MG056

Latitude: 62.3258 **Quadrangle:** M B-2

Longitude: 153.7712

Location description and accuracy:

The Clough occurrence is in a saddle that separates two northwest-trending ridge lines, about 2.0 kilometers west of the north end of Smith Lake. It is at an elevation of about 4,500 feet in the SW1/4 sec. 20, T. 26 N., R. 24 W., of the Seward Meridian. (The occurrence as shown in Bundtzen, Harris, and Gilbert (1997; map no. 10) is mislocated.)

Commodities:

Main: Ag, Cu, Pb, Zn

Other: Co

Ore minerals: Chalcopyrite, pyrite, sphalerite

Gangue minerals: Epidote, quartz

Geologic description:

The Clough occurrence is a small but rich deposit in skarn adjacent to an altered, east-west-trending felsic (?) dike. The skarn is in argillaceous limestone of the mid-Silurian Terra Cotta Mountains Sandstone, a unit of the Dillinger sub-terrane (Bundtzen, Harris, and Gilbert, 1997).

The principle sulfides are massive pyrite and sphalerite in veins up to 8 centimeters thick; they and a trace of chalcopyrite occur in an epidote-quartz skarn. One grab sample of mineralization contained 13.0 percent zinc, 0.11 percent lead, 0.50 percent copper, 26 grams of silver per tonne, and 300 parts per million cobalt. (Bundtzen, Kline, and Clough, 1982; Bundtzen, Harris, and Gilbert, 1997).

In 2008, this prospect was one of several in a block of claims that covered more than 70 square miles, known collectively as the BMP project (International Tower Hill Mines, Ltd., 2008).

Alteration:

None.

Age of mineralization:

Generic deposit model:

Deposit model:

Low temperature lead-zinc skarn (Cox and Singer, 1986; model 18c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18c

Production Status: None

Site Status: Active

Workings/exploration:

The Clough occurrence was found by Jim Clough of Alaska Division of Geological and Geophysical Surveys during a geologic mapping program in 1981 (Bundtzen, Kline, and Clough, 1982). As of 2008, the prospect was within a large block of claims called the BMP project by International Tower Hill MIne, Ltd. (2008).

Production notes:

None.

Reserves:

None.

Additional comments:

Similar to Rat Fork-Headwall (MG059) and Rat Fork-Base (MG058) prospects.

References:

Bundtzen, T.K., Harris, E.E., and Gilbert, W.G., 1997, Geologic Map of the eastern McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 97-14, 34 p., 1 sheet, scale 1:125,000.

Bundtzen, T.K., Kline, J.T., and Clough, J.G., 1982, Preliminary geology of the McGrath B-2 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File report 149, 22 p., 1 sheet, scale 1:40,000.

International Tower Hills Mines, Ltd., 2008, BMP: http://www.ithmines.com/s/BMP.asp (as of April 30, 2008).

Primary Reference: Bundtzen, Harris, and Gilbert, 1997; International Tower Hill Mines, Ltd., 2008

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Sheep Creek-South; BMP

Site type: Occurrence

ARDF no.: MG057

Latitude: 62.3174 **Quadrangle:** M B-2

Longitude: 153.7944

Location description and accuracy:

The Sheep Creek-South occurrence is on the east side of the upper Sheep Creek valley. It is at an elevation of 3,300 feet in the NE1/4 sec. 30, T. 26 N., R. 24 W., of the Seward Meridian.

Commodities:

Main: Zn

Other: Fe, Pb

Ore minerals: Sphalerite, pyrite, pyrrhotite

Gangue minerals: Quartz

Geologic description:

The Sheep Creek occurrence consists of sphalerite in small lenses along shear zones in dikes near the north side of a small stock. The stock intrudes limestone and siltstone of the mid-Silurian Terra Cotta Mountains Sandstone, a formation within the Dillinger sub-terrane (Bundtzen, Harris, and Gilbert, 1997). According to Reed and Elliott (1968), selected grab samples contain up to 5.00 percent zinc.

In 2008, this prospect was one of several in a block of claims that covered more than 70 square miles, known collectively as the BMP project (International Tower Hill Mines, Ltd., 2008).

Alteration:

None recognized.

Age of mineralization:

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

Only limited surface sampling data. As of 2008, the prospect was within a large block of claims called the

BMP project by International Tower Hill MIne, Ltd. (2008).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bundtzen, T.K., Harris, E.E., and Gilbert, W.G., 1997, Geologic Map of the eastern McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 97-14, 34 p., 1 sheet, scale 1:125,000.

Bundtzen, T.K., Kline, J.T., and Clough, J.G., 1982, Preliminary geology of the McGrath B-2 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File report 149, 22 p., 1 sheet, scale 1:40,000.

Cobb, E.H., 1972, Metallic mineral resources map of the McGrath quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-379, 1 sheet, 1:250,000 scale.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Iliamna, Lake Clark, Lime Hills, and McGrath quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-485, 101 p.

International Tower Hills Mines, Ltd., 2008, BMP: http://www.ithmines.com/s/BMP.asp (as of April 30, 2008).

Reed, B.L. and Elliott, R.L., 1968, Geochemical anomalies and metalliferous deposits between Windy Fork and Post River, southern Alaska: U.S. Geological Survey Circular 596, 22 pages.

Primary Reference: International Tower Hill Mines, Ltd., 2008

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Rat Fork-Base; BMP

Site type: Prospect

ARDF no.: MG058

Latitude: 62.3189 **Quadrangle:** M B-2

Longitude: 153.8727

Location description and accuracy:

The Rat Fork-Base prospect is near the base of the cirque that defines the head of the Rat Fork of Sheep Creek. It is at an elevation of 4,175 feet in the NW1/4 sec. 26, T. 26 N., R. 25 W., of the Seward Meridian. An active rock glacier forms the southern boundary of the prospect area. The location is accurate.

Commodities:

Main: Ag, Cu, Pb, Zn

Other: Cd, Co, Fe

Ore minerals: Chalcopyrite, pyrite, pyrrhotite, sphalerite

Gangue minerals: Clinopyroxene (johannsenite), epidote, garnet

Geologic description:

The Rat Fork-Base prospect consists of disseminated sulfides in calc-silicate hornfels and marble adjacent to an extensive, east-trending, granodiorite sill and dike swarm. (The same plutonic complex is exposed at the Rat Fork-Headwall (MG059) prospect.) At the Rat Fork-Base prospect, the calc-silicate zone, which consists of garnet, epidote, and clinopyroxene in arkosic, metaclastic rocks, has been intruded by several mafic sills that parallel bedding. The plutonic rocks intrude Lower Paleozoic rocks that are part of the Dillinger sub-terrane (Bundtzen, Harris, and Gilbert, 1997).

The zone of disseminated mineralization trends about east, varies from 1 to 10 meters thick , and can be traced along the strike for about 40 meters. The ore minerals include abundant pyrite and pyrrhotite, with minor chalcopyrite and sphalerite. (The mineralization is similar to that at the Rat Fork-Headwall (MG059), Tin Creek North (MG041), Tin Creek Midway (MG043), Smith Lake (MG055), and Bowser Creek Main (MG068) skarn deposits in the Farewell Mineral belt.)

Sometime in the late 1960s or early 1970s, a single hole was drilled by Falconbridge Minerals through their subsidiary St. Eugene Mining Company but there is little record of their activities. Sulfide-bearing, talus samples collected below the drill station contained 0.31 percent copper, 1.85 percent zinc, 6.5 grams of silver per tonne, 158 parts per million (ppm) cobalt, 161 ppm cadmium, and 41.4 percent iron (Smith and Albanese, 1985).

In 2008, this prospect was one of several in a block of claims that covered more than 70 square miles, known collectively as the BMP project (International Tower Hill Mines, Ltd., 2008).

Alteration:

Surface oxidation of massive pyrite and pyrrhotite forms a pronounced ferricrete gossan.

Age of mineralization:

Unknown; possibly 25 to 35 Ma, based on the age of similar dike swarm in the Tin Creek area (Solie and others, 1991).

Generic deposit model:

Deposit model:

Lead-zinc (copper) skarn (Cox and Singer, 1986; model 18c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18c

Production Status: None

Site Status: Active

Workings/exploration:

Sometime in the late 1960s or early 1970s, a single hole was drilled by Falconbridge Minerals through their subsidiary St. Eugene Mining Company but there is little record of their activities. The prospect was later sampled by the Alaska Division of Geology and Geophysical Surveys. As of 2008, the prospect was within a large block of claims called the BMP project by International Tower Hill MIne, Ltd. (2008).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bundtzen, T.K., Harris, E.E., and Gilbert, W.G., 1997, Geologic Map of the eastern McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 97-14, 34 p., 1 sheet, scale 1:125,000.

Bundtzen, T.K., Kline, J.T., and Clough, J.G., 1982, Preliminary geology of the McGrath B-2 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File report 149, 22 p., 1 sheet, scale 1:40,000.

International Tower Hills Mines, Ltd., 2008, BMP: http://www.ithmines.com/s/BMP.asp (as of April 30, 2008).

Reed, B.L. and Elliott, R.L., 1968, Geochemical anomalies and metalliferous deposits between Windy Fork and Post River, southern Alaska: U.S. Geological Survey Circular 596, 22 pages.

Reed, B.L., and Elliott, R.L., 1968, Lead, zinc, and silver deposits at Bowser Creek area, McGrath A-2 quadrangle, Alaska: U.S. Geological Survey Circular 559, 17 p

Smith, T.E., and Albanese, M.D., 1985, Preliminary prospect examinations in the McGrath A-2, A-3, and B-2 quadrangles, Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 85-54, 19 p.

Solie, D.N., Bundtzen, T.K., and Gilbert, W.G., 1991, K/Ar ages of igneous rocks in the McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 91-23, 7 p., 1 sheet, 1:250,000 scale.

Primary Reference: Smith and Albanese, 1985; International Tower Hill Mines, Ltd., 2008

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Rat Fork-Headwall; BMP

Site type: Prospect

ARDF no.: MG059

Latitude: 62.3194 **Quadrangle:** M B-2

Longitude: 153.8909

Location description and accuracy:

The Rat Fork-Headwall prospect is just below the crest of a steep ridge that forms the headwall of a glacial cirque at the head of the Rat Fork of Sheep Creek; it is at an elevation of about about 5,500 feet in the NW1/4 sec. 27, T. 26 N., R. 25 W., of the Seward Meridian. The location is accurate.

Commodities:

Main: Ag, Cu, Pb, Zn

Other: As, Cd

Ore minerals: Chalcopyrite, galena, pyrite, pyrrhotite, sphalerite

Gangue minerals: Clinopyroxene, epidote, garnet

Geologic description:

The Rat Fork-Headwall prospect consists of disseminated sulfides and a sulfide vein in calc-silicate skarn in a east-trending, granodiorite dike swarm more than 1.5 kilometers wide (Bundtzen Kline, and Clough, 1982). The dike swarm cuts lower Paleozoic clastic rocks and carbonates of the Dillinger sub-terrane (Bundtzen, Harris, and Gilbert, 1997). The dikes are not dated at this prospect but are similar to dikes that have dated as 25 to 35 Ma at the nearby Tin Creek-Midway prospect (MG043) to the northeast (Solie and others, 1991; Bundtzen, Harris, and Gilbert, 1997).

The calc-silicate skarns, which are composed of garnet, epidote, and clinopyroxene (johannsenite) occur mainly in arenaceous, recrystallized limestone. The sulfide-bearing vein parallels a pervasive joint set which cuts various calc-silicate rocks and limestone (Smith and Albanese, 1985). The sulfide vein trends N85W, dips 85S, varies from 0.5 to 3 meters thick, and can be traced for about 22 meters along strike. The main ore minerals in the vein are pyrite, sphalerite (marmatite), galena, and chalcopyrite. The sulfides locally make up to 45 percent of the vein. Chip samples taken across the vein at three places contained up to 0.56 percent copper, 11.10 percent lead, 14.10 percent zinc, 301 grams of silver per tonne, 3.80 percent arsenic, 0.12 percent cadmium, and 42.40 percent iron (Smith and Albanese, 1985).

The Rat Fork-Headwall prospect is part of a widespread polymetallic mineral belt, the Farewell Mineral belt, that includes the Tin Creek North (MG041), Tin Creek South (MG044), Bowser Creek-Main (MG068), Bowser Creek Northeast (MG067), and Smith Lake (MG055) prospects.

In the late 1960s and early 1970s, Falconbridge Minerals through their exploration operator St. Eugene Mining Company, diamond drilled from two stations near the sulfide vein but there is little information on the results of this work. In 2008, this prospect was one of several in a block of claims that covered more than 70 square miles, known collectively as the BMP project (International Tower Hill Mines, Ltd., 2008).

Alteration:

Extensive oxidation of pyrite-rich areas to ferricrete gossan.

Age of mineralization:

Inferred to be 25 to 35 Ma, based on K-Ar dating of similar granodiorite dike swarms nearby.

Generic deposit model:

Deposit model:

Lead-zinc (copper) skarns (Cox and Singer, 1986; model 18c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18c

Production Status: None

Site Status: Active

Workings/exploration:

In the late 1960s and early 1970s, Falconbridge Minerals through their exploration subsidiary St. Eugene Mining Company, diamond drilled from two stations near the sulfide vein but there is little information on the results of this work. Subsequently, the prospect was examined and sampled by several government agencies. As of 2008, the prospect is within a large block of claims called the BMP project by International Tower Hill MIne, Ltd. (2008).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bundtzen, T.K., Harris, E.E., and Gilbert, W.G., 1997, Geologic Map of the eastern McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 97-14, 34 p., 1 sheet, scale 1:125,000.

Bundtzen, T.K., Kline, J.T., and Clough, J.G., 1982, Preliminary geology of the McGrath B-2 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File report 149, 22 p., 1 sheet, scale 1:40,000.

Cobb, E.H., 1972, Metallic mineral resources map of the McGrath quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-379, 1 sheet, 1:250,000 scale.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Iliamna, Lake Clark, Lime Hills, and McGrath quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-485, 101 p.

International Tower Hills Mines, Ltd., 2008, BMP: http://www.ithmines.com/s/BMP.asp (as of April 30, 2008).

Reed, B.L. and Elliott, R.L., 1968, Geochemical anomalies and metalliferous deposits between Windy Fork and Post River, southern Alaska: U.S. Geological Survey Circular 596, 22 pages.

Smith, T.E., and Albanese, M.D., 1985, Preliminary prospect examinations in the McGrath A-2, A-3, and B-2 quadrangles, Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 85-54, 19 p.

Solie, D.N., Bundtzen, T.K., and Gilbert, W.G., 1991, K/Ar ages of igneous rocks in the McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 91-23, 7 p., 1 sheet, 1:250,000 scale.

Primary Reference: Smith and Albanese, 1985; International Tower Hill Mines, Ltd., 2008

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Ozzna Creek; BMP

Site type: Prospect

ARDF no.: MG060

Latitude: 62.2948 **Quadrangle:** M B-2

Longitude: 153.9485

Location description and accuracy:

The Ozzna Creek prospect is on the north facing slopes of Ozzna Creek, a west-flowing tributary of the Windy Fork of the Kuskokwim River; it is at an elevation of about 4,750 feet in the SE1/4 sec. 32, T. 26 N., R. 25 W., of the Seward Meridian. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other: Mo

Ore minerals: Chalcopyrite, galena, molybdenite, pyrite, sphalerite

Gangue minerals: Carbonate, epidote, quartz, sericite

Geologic description:

The Ozzna Creek prospect consists of base metal sulfide veins and replacement deposits in an extensive quartz-sericite-pyrite halo rimming a 450-meter-wide, quartz-monzonite breccia pipe,. The pipe forms the core of a distinctive, precipitous, 7,205-foot -high peak. A biotite separate from the quartz monzonite pipe gave a K-Ar age of 58 Ma. (Solie and others, 1991). A pronounced magnetic high rims the edge of the breccia pipe (Rob Kell, written communication, 1983). (The magnetic anomaly that rims the quartz monzonite breccia pipe is similar to geophysical features found in porphyry copper systems throughout the North American Cordillera.)

The vein and replacement deposits consist of small pods and lenses of pyrrhotite, sphalerite, argentiferous galena, and pyrite in a gangue of carbonate, epidote, and quartz along shear zones in felsic dikes and igneous breccia. Most of the sulfide pods are from 0.2 to 1.5 meters wide and 0.5 to 6.0 meters long. Selected samples contained 1,623 to 2,189 grams of silver per tonne (Reed and Elliott, 1968).

The quartz-sericite-pyrite halo that surrounds the quartz-monzonite breccia pipe is from 15 to 60 meters wide and can be traced along strike for about 450 meters. Disseminated chalcopyrite and traces of molybdenite occur in pyrite-rich igneous breccia. Selected samples from the quartz-sericite-pyrite halo contain up to 0.08 percent copper, 150 parts per million molybdenum, 1.50 percent lead, 1.00 percent zinc, 14.6 grams of silver per tonne, and 2.48 grams of gold per tonne. (Bundtzen, Kline, and Clough, 1982; Bundtzen, Harris, and Gilbert, 1997).

In 2008, this prospect was one of several in a block of claims that covered more than 70 square miles, known collectively as the BMP project (International Tower Hill Mines, Ltd., (2008).

Alteration:

Pyritic and sericitic alteration in breccia pipe.

Age of mineralization:

Early Tertiary (58 Ma), based on K-Ar biotite age of intrusion.

Generic deposit model:

Deposit model:

Porphyry copper molybdenum deposit? (Cox and Singer, 1986; model 21a?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

21a?

Production Status: None

Site Status: Active

Workings/exploration:

Surface sampling by several government agencies. As of 2008, the prospect was within a large block of claims called the BMP project by International Tower Hill MIne, Ltd. (2008).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bundtzen, T.K., Harris, E.E., and Gilbert, W.G., 1997, Geologic Map of the eastern McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 97-14, 34 p., 1 sheet, scale 1:125,000.

Bundtzen, T.K., Kline, J.T., and Clough, J.G., 1982, Preliminary geology of the McGrath B-2 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File report 149, 22 p., 1 sheet, scale 1:40,000.

Cobb, E.H., 1972, Metallic mineral resources map of the McGrath quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-379, 1 sheet, 1:250,000 scale.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Iliamna, Lake Clark, Lime Hills, and McGrath quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-485, 101 p.

International Tower Hills Mines, Ltd., 2008, BMP: http://www.ithmines.com/s/BMP.asp (as of April 30, 2008).

Reed, B.L. and Elliott, R.L., 1968, Geochemical anomalies and metalliferous deposits between Windy Fork and Post River, southern Alaska: U.S. Geological Survey Circular 596, 22 pages.

Smith, T.E., and Albanese, M.D., 1985, Preliminary prospect examinations in the McGrath A-2, A-3, and B-2 quadrangles, Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 85-54, 19 p.

Solie, D.N., Bundtzen, T.K., and Gilbert, W.G., 1991, K/Ar ages of igneous rocks in the McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 91-23, 7 p., 1 sheet, 1:250,000 scale.

Primary Reference: Reed and Elliott, 1968; International Tower Hill Mines, Ltd., 2008

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Badnews; BMP

Site type: Prospect

ARDF no.: MG061

Latitude: 62.2965 **Quadrangle:** M B-2

Longitude: 153.7684

Location description and accuracy:

The Badnews Prospect is on a steep, precipitous, north-facing slope of Peak 6,920; it is at an elevation of about 5,700 feet in the SW1/4 sec. 32, T. 26 N., R. 24 W., of the Seward Meridian. The location is from Foley (1987).

Commodities:

Main: Ag, Au, Cu, Zn

Other: Cd, Co, Pb

Ore minerals: Chalcopyrite, galena, pyrite, pyrrhotite, sphalerite

Gangue minerals: Calcite, epidote, garnet, quartz

Geologic description:

The deposit at the Badnews prospect is a Cu-Pb-Zn-Ag-Au (Co-Pb) skarn in tightly folded limestone, siltstone, and argillite of the mid-Silurian Terra Cotta Mountains Sandstone, a unit of the Dillinger subterrane (Bundtzen, Harris, and Gilbert, 1997). The limestone layers have been preferentially replaced by skarn minerals and locally sulfides; clastic rocks have been transformed into purple-green hornfels. The center of the prospect is a granodiorite porphyry stock with apophyses and numerous dikes that intrude a large aureole of hornfelsed sedimentary rocks (Bundtzen, Harris, and Gilbert, 1997). Several east-trending, high-angle, granodiorite dikes cut the limestone; the dikes are apparently pathways for the fluids that deposited the mineralization and formed the skarn. A post-skarn breccia occurs at the contact of one granodiorite dike.

The main ore minerals are chalcopyrite, pyrrhotite, sphalerite, and a trace of galena. Pyrrhotite is the dominant sulfide in practically all the mineralized skarn zones. The skarn consists of abundant recrystallized calcite and red garnet, with minor epidote and quartz. Massive sulfide pods and mantos up to 10 meters thick can be traced laterally for several hundred meters (Brewer and others, 1992). Individual sulfide zones reach a maximum thickness of 0.7 meters in skarn zones that are up to 2 meters wide. Sphalerite is most abundant in epidote-garnet-rich skarn, whereas chalcopyrite and pyrrhotite are most abundant in calcite-garnet skarn (Foley, 1987).

Twenty-three grab samples from skarns where chalcopyrite and sphalerite dominate contained an average of 3.7 percent zinc and 0.4 percent copper (Brewer and others, 1992). Selected samples from zinc-rich areas also contain up to 1,740 parts per million (ppm) cadmium. The gold content of the Badnews skarn is higher than in any other deposit of the Farewell Mineral Belt; select samples contain up to 11.2 grams of gold per tonne and 143.1 grams of silver per tonne (Brewer and others, 1992). The average gold content of numerous grab samples of the mineralized skarn was 490 parts per billion. Two grab samples of sulfide-bearing skarn collected by Foley (1987) contained up to 9.20 percent zinc, 93 ppm lead, 0.44 percent copper, 290 ppm cobalt, and 16.6 grams of silver per tonne.

In 2008, this prospect was one of several in a block of claims that covered more than 70 square miles, known collectively as the BMP project (International Tower Hill Mines, Ltd., (2008).

Alteration:

Strong secondary biotite (potassic) alteration in skarn.

Age of mineralization:

Generic deposit model:

Deposit model:

Low temperature lead-zinc skarn (Cox and Singer, 1986; model 18c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18c

Production Status: None

Site Status: Active

Workings/exploration:

The Badnews polymetallic prospect was named by Roger Burleigh during mineral investigations conducted in 1979 by Placid Oil Company. Only surface sampling has taken place at the site, mainly by Anaconda Minerals and the U.S. Bureau of Mines. As of 2008, the prospect was within a large block of claims called the BMP project by International Tower Hill MIne, Ltd. (2008).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brewer, N.H., Puchner, C.C., and Gemuts, I., 1992, Farewell district, southwest Alaska Range: North Pacific Mining Company prospectus report, 21 p.

Bundtzen, T.K., Harris, E.E., and Gilbert, W.G., 1997, Geologic Map of the eastern McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 97-14, 34 p., 1 sheet, scale 1:125,000.

Bundtzen, T.K., Kline, J.T., and Clough, J.G., 1982, Preliminary geology of the McGrath B-2 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File report 149, 22 p., 1 sheet, scale 1:40,000.

Foley, J.Y., 1987, Reconnaissance strategic and critical mineral investigations in the McGrath A-3 and B-2 quadrangles, southwest Alaska: U.S. Bureau of Mines Field Report, 26 p.

International Tower Hills Mines, Ltd., 2008, BMP: http://www.ithmines.com/s/BMP.asp (as of April 30, 2008).

Primary Reference: Foley, 1987; International Tower Hill Mines, Ltd., 2008

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): 6120; Pyrrhotite; BMP

Site type: Prospect

ARDF no.: MG062

Latitude: 62.2872 **Quadrangle:** M B-2

Longitude: 153.7804

Location description and accuracy:

The 6120 prospect is on the steep, precipitous southern flank of Peak 6,920 at the head of Sheep Creek. It is at an elevation of 5,750 feet in the NW1/4 sec. 5, T. 25 N., R. 24 W., of the Seward Meridian.

Commodities:

Main: Au,Cu

Other: Co, Fe, Ni, Zn

Ore minerals: Pyrite, pyrrhotite

Gangue minerals: Calcite

Geologic description:

The Pyrrhotite occurrence consists of several pods of pyrrhotite with minor pyrite, enclosed in banded hornfels and marble adjacent to a small stock of highly altered granodiorite porphyry. The host rocks are thermally altered marble and clastic sediments of the mid-Silurian Terra Cotta Mountains Sandstone, a unit of the Dillinger sub-terrane (Bundtzen and others, 1997).

Pyrrhotite occurs as disseminated grains in veinlets up to 8 centimeters thick, as semi-massive to massive sulfide pods up to 30 centimeters thick, and as clots and crystals up to three centimeters across. Grab samples of pyrrhotite-rich mineralization collected by Anaconda Minerals Company contained up to 0.44 percent nickel and 460 parts per million (ppm) cobalt (Brewer and others, 1992). Selected samples reported by Foley (1987) contain up to 180 ppm nickel, 180 ppm copper, and 180 ppm zinc. Massive pyrrhotite-bearing samples contained 58.00 percent iron.

In 2008, the 6120 prospect was one of the prominent deposits in a block of claims that covered more than 70 square miles, known collectively as the BMP project (International Tower Hill Mines, Ltd., (ITH) (2008). Their mapping in 2007 suggests that the mineralization occurs along a fault developed associated with a north-trending anticlinal hinge that extends 8 to the north through several deposits (MG061, MG057, MG052-049), and notable the Dahl prospect (MG053). Twenty samples of skarn collected in outcrop by ITH in 2008 contained an average of 2.3 percent copper, 3.4 grams of gold per ton, 33 grams of silver per ton, 0.16 percent nickel and 0.07 percent cobalt.

Alteration:

None.

Age of mineralization:

Generic deposit model:

Deposit model:

Polymetallic replacement? (Cox and Singer, 1986; model 19a?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

19a?

Production Status: None

Site Status: Active

Workings/exploration:

The 6120 occurrence (initially called the Pyrrhotite prospect) was discovered during geologic mapping in 1981 by the Alaska Division of Geological and Geophysical Surveys (Bundtzen, Kline, and Clough, 1982). The prospect was examined by several companies and government agencies through the 1980s and 1990s. In 2008, the 6120 prospect was one of the prominent deposits in a block of claims that covered more than 70 square miles, known collectively as the BMP project (International Tower Hill Mines, Ltd., (2008). They mapped and sampled the deposit in 2007.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brewer, N.H., Puchner, C.C., and Gemuts, I., 1992, Farewell district, southwest Alaska Range: North Pacific Mining Company prospectus report, 21 p.

Bundtzen, T.K., Harris, E.E., and Gilbert, W.G., 1997, Geologic Map of the eastern McGrath quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 97-14, 34 p., 1 sheet, scale 1:125,000.

Bundtzen, T.K., Kline, J.T., and Clough, J.G., 1982, Preliminary geology of the McGrath B-2 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File report 149, 22 p., 1 sheet, scale 1:40,000.

Foley, J.Y., 1987, Reconnaissance strategic and critical mineral investigations in the McGrath A-3 and B-2 quadrangles, southwest Alaska: U.S. Bureau of Mines Field Report, 26 p.

International Tower Hills Mines, Ltd., 2008, BMP: http://www.ithmines.com/s/BMP.asp (as of April 30, 2008).

Primary Reference: Foley, 1987; International Tower Hill Mines, Ltd., 2008

Reporter(s): T.K. Bundtzen (Pacific Rim Geological Consulting); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Miyaoka West

Site type:

ARDF no.: MH005

Latitude:

Quadrangle:

Longitude:

Location description and accuracy:

This prospect is an extension of the Miyaoka prospect, ARDF site MH006, just to the east and the information that was here previously here has been integrated into that record.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Miyaoka; Miyaoka West

Site type: Prospect

ARDF no.: MH006

Latitude: 63.7127 **Quadrangle:** M C-6

Longitude: 146.7414

Location description and accuracy:

The Miyaoka prospect is at an elevation of about 5,000 feet on the ridge east of the terminus of the east lobe of Hayes Glacier. The mineralized area is about 1,000 feet long and 200 feet wide. The center of the mineralization is about 0.3 mile southwest of elevation 5110 and about 0.6 mile west-southwest of the center of section 11, T. 14 S., R. 5 E.

Commodities:

Main: Cu, Zn

Other: As, Au

Ore minerals: Arsenopyrite, chalcopyrite, galena, pyrite, pyrrhotite, sphalerite

Gangue minerals:

Geologic description:

The rocks in the area are derived from Devonian felsic to intermediate volcanic rocks, mainly andesite, dacite, and quartz keratophyre flows and tuffs, and from Devonian or older shale, marl, and marble (Nokleberg and others, 1992 [MF]; 1992 [Open-File]). The rocks have been penetratively deformed, dismembered, and metamorphosed to chlorite-mica-quartz schist with marble and greenstone, first to lower-amphibolite-grade rocks in the Early Cretaceous and then retrograded to lower-greenschist-grade rocks in the mid-Cretaceous. Detailed mapping of the prospect by American Copper and Nickel Company in 1993 indicated that a felsic intrusion is infolded with mineralized schist and part of the mineralization may be a pyrrhotite-rich skarn (W.T. Ellis, unpublished data, 1993).

The Miyaoka prospect was discovered and sampled by the U.S. Geological Survey in the mid-1980s. American Copper and Nickel Company mapped and sampled the prospect in 1993 and it was examined and sampled by the Bureau of Land Management in the early 2000s.

The Miyaoka prospects consists of lenses, disseminations, and stringers of massive sulfides in the iron-stained metamorphic host rocks (Nokleberg and Aleinikoff 1985; Aleinikoff and Nokleberg, 1985; Nokleberg and others, 1991; Bittenbender and others, 1991). The massive sulfides are generally structureless but in places have a crude banding that parallels the layering in the metamorphic rocks. The sulfide minerals are predominantly pyrrhotite and pyrite with minor chalcopyrite; sphalerite, galena, and arsenopyrite are reported.

The mineralization occurs in two horizons that can be traced north-northwest for about 0.8 mile but the main zone of mineralization is about 1,000 feet long and 200 feet wide. Bittenbender and others (2007) collected 17 measured samples across the main zone of mineralization. The samples averaged 0.096 parts per million (ppm) gold, 0.2 ppm silver, 784 ppm copper, 8.3 ppm lead, 54 ppm zinc, and 3.4 ppm arsenic. The highest-grade sample were: 27 feet that averaged 1.2 ppm gold; 6.2 feet that averaged 0.50 ppm silver; 4.9 feet that averaged 2,750 ppm copper; and 11 feet that averaged 14 ppm arsenic. A high-grade sample collected nearby had the highest metal content of the samples they collected: 7.1 ppm silver, 985 ppm lead, and 2,290 ppm zinc.

Alteration:

Age of mineralization:

Probably Devonian, the pre-metamorphic age of the host rocks.

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a); related base-metal skarn.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Inactive

Workings/exploration:

The Miyaoka prospect was discovered and sampled by the U.S. Geological Survey in the mid-1980s. American Copper and Nickel Company mapped and sampled the prospect in 1993. Examined and sampled by the Bureau of Land Management in the early 2000s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Aleinikoff, J.N., and Nokleberg, W.J., 1985, Age of Devonian igneous-arc terranes in the northern Mount Hayes quadrangle, eastern Alaska Range, Alaska, in Bartsch-Winkler, Susan, ed., The United States Geological Survey in Alaska--Accomplishments during 1984: U.S. Geological Survey Circular 967, p. 44-49.

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Lange, I. M., Nokleberg, W.J., Newkirk, S. R., Aleinikoff, J.N., Church, S.E., and Krouse, R.H., 1993, Devonian volcanogenic massive sulfide deposits and occurrences, southern Yukon-Tanana terrane, eastern Alaska Range, Alaska: Economic Geology, v. 88, p. 344-376.

Nokleberg, W.J., and Aleinikoff, J.N., 1985, Summary of stratigraphy, structure, and metamorphism of Devonian igneous-arc terranes, northeastern Mount Hayes quadrangle, eastern Alaska Range, IN Bartsch-Winkler, Susan, ed., The United States Geological Survey in Alaska--Accomplishments during 1984: U.S. Geological Survey Circular 967, p. 66-71.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (northwest of the terminus of the Hayes Glacier)

Site type: Prospect

ARDF no.: MH007

Latitude: 63.69

Quadrangle: M C-6

Longitude: 146.6593

Location description and accuracy:

This prospect is east of the lower portion of the west lobe of the Hayes Glacier. It is 5.2 miles north-northwest of Mount Hayes and about 0.3 mile north of the center of section 19, T. 14 S., R. 6 E.

Commodities:

Main: Ag, As, Au, Cu, Pb, Sn, Zn

Other:

Ore minerals: Chalcopyrite, galena, pyrite, pyrrhotite, sphalerite

Gangue minerals:

Geologic description:

The rocks in the area are derived from Devonian felsic to intermediate volcanic rocks, mainly andesite, dacite, and quartz keratophyre flows and tuffs, and from Devonian or older shale, marl, and marble (Nokleberg and others, 1992 [MF-1996-D]; Nokleberg and others, 1992 [OFR 92-594]; Bittenbender and others, 2007). The rocks were metamorphosed and intensely deformed into chlorite schist, limestone, and greenstone that were first metamorphosed to lower amphibolite facies in the Early Cretaceous and then retrograded to lower greenschist grade in the mid-Cretaceous.

Resource Associates of Alaska was active in the area in 1970s but they deeded their claims to Cook Inlet Region Incorporated in 1980 (Bittenbender and others, 2007). The prospect was examined and sampled by the U.S. Geological Survey in about 1990 (Nokleberg and others, 1991), by the American Copper and Nickel Company in 1993, and by the Bureau of Land Management in the early 2000s. There are no workings on the prospect.

This prospect is part of a belt of massive sulfide deposits that is about 8 miles long and as much as one-third of a mile wide (Nokleberg and others, 1991; Lange and others, 1993).. Deposits in the belt consist of massive sulfide lenses, pods, and disseminations of pyrrhotite and pyrite, and less abundant galena, sphalerite, and chalcopyrite. Individual lenses and pods are as much as 3 feet thick.

Samples collected here during reconnaissance sampling by the U.S. Geological Survey in the 1980s contained as much as 0.72 percent lead, 0.69 percent zinc, 0.5 percent arsenic, and 0.11 percent copper (Nokleberg and others, 1991). Bittenbender and others (2007) identified zones of thin, massive sulfide pods, lenses, and stringers in tightly folded quartz-mica and quartz-chlorite schist from about 4,900 to 5,300 feet elevation. The zones generally are less than 1 foot thick, may structurally thicken to 2 feet, and are 3 to 4 feet in length. The sulfides are mainly pyrrhotite with small amounts of chalcopyrite, pyrite, and galena. Their samples contained up to 685 parts per billion gold, 13.7 parts per million (ppm) silver, 4,660 ppm copper, 1,350 ppm lead, and 1,035 ppm zinc.

Alteration:

Not specifically noted.

Age of mineralization:

Probably Devonian, the pre-metamorphic age of the host rocks.

Generic deposit model:

Deposit model:
Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
28a

Production Status: None

Site Status: Undetermined

Workings/exploration:
Resource Associates of Alaska was active in the area in 1970s but they deeded their claims to Cook Inlet Region Incorporated (Bittenbender and others, 2007). The prospect was examined and sampled by the U.S. Geological Survey in about 1990 (Nokleberg and others, 1991), by the American Copper and Nickel Company in 1993, and by the Bureau of Land Management in the early 2000s. There are no workings on the prospect.

Production notes:
None.

Reserves:
None.

Additional comments:

References:
Aleinikoff, J.N., and Nokleberg, W.J., 1985, Age of Devonian igneous-arc terranes in the northern Mount Hayes quadrangle, eastern Alaska Range, Alaska, in Bartsch-Winkler, Susan, ed., The United States Geological Survey in Alaska--Accomplishments during 1984: U.S. Geological Survey Circular 967, p. 44-49.

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Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Hayes Glacier East

Site type: Prospect

ARDF no.: MH008

Latitude: 63.6858 **Quadrangle:** M C-6

Longitude: 146.5556

Location description and accuracy:

This prospect is at an elevation of about 4,900 feet, south of the end of the Hayes Glacier. It is about 2.6 miles west of VABM 4862 'Glacier' and about 0.2 mile east-southeast of the center of section 22, T. 14 S., R. 6 E.

Commodities:

Main: Cu, Zn

Other: Ag, Pb

Ore minerals:

Gangue minerals:

Geologic description:

The rocks in the area are derived from Devonian felsic to intermediate volcanic rocks, mainly andesite, dacite, and quartz keratophyre flows and tuffs, and from Devonian or older shale, marl, and marble (Nokleberg and others, 1992 [MF]; 2002 [\Open-File]; Bittenbender and others, 2007). The rocks were intensely deformed into chlorite schist, limestone, and greenstone that were first metamorphosed to lower amphibolite facies in the Early Cretaceous and then retrograded to lower greenschist facies in the mid-Cretaceous.

Resource Associated of Alaska was active in the area in 1970s but they deeded their claims to the Cook Inlet Region Incorporated in 1980 (Bittenbender and others, 2007). The prospect was examined and sampled by the U.S. Geological Survey in about 1990 (Nokleberg and others, 1991), by the American Copper and Nickel Company in 1993, and by the Bureau of Land Management in the early 2000s. There are no workings on the prospect.

Samples taken during a U.S. Geological Survey reconnaissance in the 1980s consisted of disseminated to semi-massive pyrite, chalcopyrite, galena, sphalerite, and pyrrhotite in chlorite-epidote-carbonate schist (Nokleberg and others, 1991). A grab sample of chalcopyrite-bearing schist contained 0.92 percent copper, 0.22 percent zinc, 0.06 percent lead, and 10 parts per million (ppm) silver.

Bittenbender and others (2007) identified thin, massive-sulfide lenses and stringers in several horizons from 4,700 to 4,950 feet in elevation. The mineralization can be traced for about 0.8 mile along strike in zones that trend east and dip about 60 degrees south. The massive sulfides lenses and stringers are generally less than 1.5 feet thick and consist mainly of pyrrhotite with minor chalcopyrite, pyrite, and galena. Samples contained up to 29.4 ppm silver, 2.4 ppm gold, 3,470 ppm lead, 1.94 percent copper, and 1,140 ppm zinc.

Alteration:

Not specifically noted. The mineralization and host rocks have been subject to regional amphibolite- and greenschist-facies metamorphism in the Cretaceous.

Age of mineralization:

Probably Devonian, the pre-metamorphic age of the host rocks.

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Inactive

Workings/exploration:

Resource Associated of Alaska was active in the area in 1970s but they deeded their claims to the Cook Inlet Region Incorporated in 1980 (Bittenbender and others, 2007). The prospect was examined and sampled by the U.S. Geological Survey in about 1990 (Nokleberg and others, 1991), by the American Copper and Nickel Company in 1993, and by the Bureau of Land Management in the early 2000s. There are no workings on the prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Aleinikoff, J.N., and Nokleberg, W.J., 1985, Age of Devonian igneous-arc terranes in the northern Mount Hayes quadrangle, eastern Alaska Range, Alaska, in Bartsch-Winkler, Susan, ed., The United States Geological Survey in Alaska--Accomplishments during 1984: U.S. Geological Survey Circular 967, p. 44-49.

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of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Roberts No. 1

Site type: Occurrence

ARDF no.: MH009

Latitude: 63.5971

Quadrangle: M C-5

Longitude: 146.2664

Location description and accuracy:

The Roberts No. 1 occurrence is about 3.8 miles north-northeast of McGinnis Peak at an elevation of about 7,500 feet. It is about 0.2 mile south-southeast of the center of section 19, T. 15 S., R. 8 E.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals:

Gangue minerals:

Geologic description:

The rocks in the area are derived from Devonian felsic to intermediate volcanic rocks, mainly andesite, dacite, and quartz keratophyre flows and tuffs, and from Devonian or older shale, marl, and marble (Nokleberg and others, 1992 [MF]; 2002 [\Open-File]; Bittenbender and others, 2007). The rocks were intensely deformed into chlorite schist, limestone, and greenstone that were first metamorphosed to lower amphibolite facies in the Early Cretaceous and then retrograded to lower greenschist facies in the mid-Cretaceous.

The Roberts #1 occurrence was first identified by Nokleberg and others in the early 1980s (Nokleberg and Lange, 1985; Nokleberg and others, 1991; Lange and others, 1993). It was examined and sampled by the Bureau of Land Management in the early 2000s (Bittenbender and others, 2007). There are no workings on the occurrence and no published record of industry activity.

The Roberts #1 occurrence is one of several volcanogenic massive-sulfide deposits that lay along the north side of the Alaska Range (Lange and others, 1993, Newberry and others, 1997). As described by Bittenbender and others (2007), the mineralization at the prospect consists of semi-massive to massive sulfides that form several layers up to 6 feet thick that are conformable to the foliation of the calcareous quartz-chlorite schist and limestone host rock. The sulfides are mainly pyrrhotite and pyrite with some chalcopyrite, galena, and sphalerite The thickest layer extends for about 60 feet. Mineralization in float to the southeast suggests continuity to the Roberts #2 occurrence (MH010). A sample across 3.2 feet of mineralization in place contained 102 parts per billion (ppb) gold, 1.3 part per million (ppm) silver, 94 ppm lead, and 1.58 percent zinc. Float samples contained up to 97 ppb gold, 30.1 ppm silver, 1.63 percent copper, 2.56 percent lead, and 7.49 percent zinc.

Alteration:

Age of mineralization:

Probably Devonian, the pre-metamorphic age of the host rocks.

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

The Roberts #1 occurrence was first identified by the U.S. Geological Survey in the early 1980s (Nokleberg and Lange, 1985; Nokleberg and others, 1991; Lange and others, 1993). It was examined and sampled by the Bureau of Land Management in the early 2000s (Bittenbender and others, 2007). There are no workings on the occurrence and no published record of industry activity.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Aleinikoff, J.N., and Nokleberg, W.J., 1985, Age of Devonian igneous-arc terranes in the northern Mount Hayes quadrangle, eastern Alaska Range, Alaska, in Bartsch-Winkler, Susan, ed., The United States Geological Survey in Alaska--Accomplishments during 1984: U.S. Geological Survey Circular 967, p. 44-49.

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Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Roberts No. 2

Site type: Prospect

ARDF no.: MH010

Latitude: 63.5922 **Quadrangle:** M C-5

Longitude: 146.2491

Location description and accuracy:

The Roberts No. 2 prospect is at an elevation of about 6,800 feet about about 3.7 miles north-northeast of McGinnis Peak. It is about 0.7 mile northwest of the center of section 29 T. 15 S., R. 8 E.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, marcasite, pyrite, pyrrhotite, sphalerite

Gangue minerals:

Geologic description:

The rocks in the area are derived from Devonian felsic to intermediate volcanic rocks, mainly andesite, dacite, and quartz keratophyre flows and tuffs, and from Devonian or older shale, marl, and marble (Nokleberg and others, 1992 [MF]; 1992 [Open-File]; Bittenbender and others, 2007). The rocks were intensely deformed into chlorite schist, limestone, and greenstone that were first metamorphosed to lower amphibolite facies in the Early Cretaceous and then retrograded to lower greenschist facies in the mid-Cretaceous.

The Roberts #2 prospect is one of several volcanogenic massive-sulfide deposits that lay along the north side of the Alaska Range (Lange and others, 1993, Newberry and others, 1997). The prospect was first identified by Nokleberg and others in the early 1980s (Nokleberg and Lange, 1985; Nokleberg and others, 1991; Lange and others, 1993). It was examined and sampled by the Bureau of Land Management in the early 2000s (Bittenbender and others, 2007). The prospect was examined and sampled by the American Copper and Nickel company in the 1980s but there are no workings on the prospect.

The mineralization at the Robert #2 prospect consists of massive to semi-massive lenses of sulfides in a layer up to 30 feet thick that can be traced for about 200 feet (Nokleberg and others, 1991; Lange and others, 1993; Bittenbender and others, 2007). The sulfides are mainly pyrrhotite, some oxidizing to marcasite, with lesser pyrite, chalcopyrite, sphalerite, and galena. The hanging wall of the layer is graphitic calcite-quartz schist. A 45-foot-thick layer of gray marble lies about 75 feet structurally below the sulfide layer; some metaconglomerate and metagraywacke is also present.

Samples collected by the U.S. Geological Survey contained up to 0.69 percent copper, 0.3 percent lead, 2.3 percent zinc, and 45.4 parts per million (ppm) silver (Nokleberg and others, 1991; Lange and others, 1993). Bittenbender and others (2007) collected 12 samples. The highest grade sample in place was a 18 feet that contained 44 parts per billion gold, 1.0 ppm silver, and 2,470 ppm copper. One float sample contained 1.17 percent zinc.

Alteration:

Not specifically noted.

Age of mineralization:

Probably Devonian, the pre-metamorphic age of the host rocks.

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Inactive

Workings/exploration:

The Roberts #2 occurrence was first identified by Nokleberg and others in the early 1980s (Nokleberg and Lange, 1985; Nokleberg and others, 1991; Lange and others, 1993). It was examined and sampled by the Bureau of Land Management in the early 2000s (Bittenbender and others, 2007). The prospect was examined and sampled by the American Copper and Nickel company in the 1980s but there are no workings on the prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Aleinikoff, J.N., and Nokleberg, W.J., 1985, Age of Devonian igneous-arc terranes in the northern Mount Hayes quadrangle, eastern Alaska Range, Alaska, in Bartsch-Winkler, Susan, ed., The United States Geological Survey in Alaska--Accomplishments during 1984: U.S. Geological Survey Circular 967, p. 44-49.

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Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Zackly; Stellar

Site type: Prospect

ARDF no.: MH067

Latitude: 63.2181 **Quadrangle:** M A-6

Longitude: 146.6984

Location description and accuracy:

The Zackly prospect is about one-half mile north-northwest of peak 5375, a northwest-aligned ridge about 1.8 miles east of the West Fork Maclaren River. The deposit is exposed from about 4,000 to 4,650 feet in elevation near the north end of the ridge. The location for this record is at the approximate center of the deposit, about 2,400 feet south of the center of section 36, T. 19 S., R. 5 E., Fairbanks Meridian. The property is accessible by a bulldozer trail from the Kathleen-Margaret mine trail (see MH087), not shown on the A-6 quadrangle. The location corresponds to locality [figure] A26 of Kurtak and others (1992) and locality 26 in table 2 of Nokleberg and others (1991).

Commodities:

Main: Au, Cu

Other: Ag, Mo, W

Ore minerals: Azurite, bornite,chalcopyrite, gold, malachite, molybdenite?, native copper, scheelite?

Gangue minerals: Chalcedony, clay, clinopyroxene, garnet, limonite, pyroxene, wollastonite

Geologic description:

The Zackly skarn prospect is hosted in Triassic tuff and sedimentary rocks (Nokleberg and others, 1991). These rocks have been intruded by quartz monzodiorite and monzonite of Cretaceous age. Numerous east-trending high-angle faults cut out or repeat skarn, limestone, volcanic rocks, and intrusive rocks. In general, the contact between sedimentary and intrusive rocks that host the main ore body strikes nearly east-west and is very steep (Kurtak and others, 1992, figure A26). It can be traced for about a mile. The main so-called skarn ore body consists of pods and irregular stratabound lenses of skarn at the contact of Upper Triassic marble with albitized quartz monzodiorite. The body is crudely zoned; the mineral sequence outward from the quartz monzodiorite consists of: (1) brown garnet with chalcopyrite, (2) green garnet with bornite and chalcopyrite, (3) clinopyroxene and wollastonite, and (4) marble with magnetite and bornite. Fine-grained silica (chalcedony) and clay occur irregularly throughout and appear to be late, retrograde minerals.

Stellar project work in 2016 (Millrock Resources Inc., in a joint venture with Vista Minerals Pty Ltd.) consisted of collecting 7 lines of induced-potential measurements over the Zackly copper-gold skarn. They identified chargeability anomalies within copper-in-soil anomalies, which appear to extend the strike length of the skarn to both the east and west (Athey and Werdon, 2017).

Gold occurs only with skarn; the higher gold values are in a supergene (?) assemblage of malachite, limonite, chalcedony, and native copper. Unoxidized ore contains chalcopyrite and bornite. A high-grade sample collected by the U.S. Geological Survey assayed 6.6 percent copper, 4.4 parts per million (ppm) gold, 35 ppm silver, and 30 ppm molybdenum (Nokleberg and others, 1991). Sample 1681 collected by the Bureau of Mines assayed 0.18 ounce of gold per ton, 2.45 ounce of silver per ton, 7.1 percent copper, and 0.11 percent tungsten (Kurtak and others, 1992); a representative 7-foot sample (1675) cut across the skarn assayed 0.05 ounce of gold per ton, 0.31 ounce of silver per ton, 1.35 percent copper, and 430 ppm tungsten. Tungsten is probably contained in scheelite; molybdenum is either in molybdenite or in solid solution in scheelite. Lead, zinc, and arsenic are generally not strongly enriched in the ore.

A resource exists mainly in a gold-skarn body about 2,600 feet long and about 9 feet thick that has been

followed down-dip about 1,000 feet. The deposit is fairly high grade; it contains about 1.24 million tons averaging 2.69 percent copper, 0.18 ounce of gold per ton, and 0.96 ounce of silver per ton (UNC Teton Exploration and Drilling, Inc., 1982).

Metallurgical testing by the U.S. Bureau of Mines suggests that most of the gold in the ore is particulate but fine grained. Oxidized copper minerals contained in the ore seem to be serious cyanogens. Ordinary leaching with 20 pounds of NaCN per short ton of concentrate recovered only about 45 percent of the gold. Satisfactory recovery of gold was made on a test sample pre-leached with sulfuric acid to dissolve oxidized copper minerals (R.W. MacDonald, written communication, 1989); MacDonald pointed out the potential hazard involved with the acid pre-leach and later production of HCN if acid was not neutralized. An alkaline ammonia pre-leach of oxidized copper minerals apparently was not tried.

Alteration:

Alteration zoning is recognized within the endoskarn and exoskarn (Kurtak and others, 1992). Endoskarn development is related to the degree of original rock calcium metasomatism and spatial distribution of the original limestone and volcanic rocks (UNC Teton Exploration and Drilling, Inc. 1982). Four stages of exoskarn development are recognized: (1) skarnoid, (2) main, (3) hydrosilicate, and (4) late hydrothermal. The skarns consist mainly of garnet and clinopyroxene and have undergone retrograde metamorphism and silica-clay alteration (Kurtak and others, 1992).

Age of mineralization:

Cretaceous.

Generic deposit model:

Deposit model:

Cu-gold skarn, similar to the Cu skarn of Cox and Singer (1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b?

Production Status: None

Site Status: Active

Workings/exploration:

Resource Associates of Alaska discovered the Zackly skarn deposit and staked claims in 1979-1980; they drilled 9,723 feet of core in 1981. A partnership with UNC Teton Exploration and Drilling, Inc. was formed, and 19,210 feet of diamond drilling was conducted in 1982 along with trenching and geophysical surveying. Copper, silver, and mercury soil geochemistry was successfully utilized to locate skarn mineralization in overburden areas (Ford, 1988; Resource Associates of Alaska, 1981). In 1986 the property reverted to Resource Associates of Alaska, which was subsequently bought out by Nerco. In 1987 a joint venture of Nerco and Boulder Gold conducted 12,000 feet of reverse circulation and 3,000 feet of diamond drilling. By 1990, the Zackly property was controlled by Pacific Northwest Resources and was optioned to Phelps Dodge Corporation, which completed a limited drilling program. The property was optioned to Hemlo Gold in 1993-34, which completed rock and soil sampling, IP geophysical surveys, and 1,500 feet of reverse circulation drilling. Since 1994 only limited exploration and assessment work has been done on the property.

The U.S. Bureau of Mines collected a 300-pound bulk sample for beneficiation studies at the U.S. Bureau of Mines Salt Lake Research Center (Kurtak and others, 1992). Only 18 percent of the gold in a sample that assayed 0.072 ounces of gold per ton were recovered in a bulk flotation test. Forty-five percent of the gold was recovered in a cyanide amenability test of a 1,000-gram sample ground to -325 mesh and leached for 72 hours (R.W. McDonald, written communication, 1989). Using a 3,965-gram sample ground to various sizes from +20 to -325 mesh improved recovery only to 48 percent. A factor that inhibits gold recovery is the high content of oxidized copper minerals in the ore, which interferes with the NaCN solution. Gold

recovery increased to 98 percent after a sulfuric acid preleach of oxidized copper minerals (R.W. McDonald, written communication, 1989).

As part of their 2016 Stellar project work, Millrock Resources Inc., in a joint venture with Vista Minerals Pty Ltd., collected 7 lines of induced-potential measurements over the Zackly copper-gold skarn. They identified chargeability anomalies within copper-in-soil anomalies, which appear to extend the strike length of the skarn to both the east and west (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

UNC Teton Exploration and Drilling, Inc. (1982) defined a resource of 1.24 million tons of 2.69 percent copper, 0.176 ounce of gold per ton, and 0.96 ounce of silver per ton. This mineralization occurs in a steeply dipping east-west striking body with 2,600 feet of strike length and an average thickness of 8.5 feet extending 1,000 down-dip. U.S. Bureau of Mines beneficiation studies indicated enhanced gold recovery will be necessary for the deposit to become economic (Balen, 1990 [USBM OF 40-90]).

Ross Glanville and Associates (1996) estimated that the resource defined by exploration through 1989 consisted of 1,407,000 tons that graded 2.19 percent copper, 0.83 ounce of silver per ton, and 0.132 ounce of gold per ton. The reserves in the so-called main ore body are not yet sufficiently delineated to be able to carry out a feasibility study; however, a preliminary evaluation was completed by consultants in 1996. On the basis of the number of limiting input parameters and utilizing a mineable reserve of 1,080,000 tonnes of ore, the net present value of the Zackly project was calculated to be $0.7 million. A 50 percent increase in reserves was considered likely to be achieved by additional exploration, which would increase the net present value to $7.4 million (Ross Glanville and Associates, 1996).

Additional comments:

The copper-rich Nikolai Greenstone assimilated by the quartz monzodiorite is speculated to be the source of the metals in the skarn deposit (UNC Teton Exploration and Drilling, Inc., 1982). Pacific Alaska Resources (PO Box 145, Battleground, WA 98604; ph 360 687-2763) controls the property and has additional information about the Zackly prospect.

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Balen, M.D., 1990, The feasibility of mining in the Valdez Creek mining district, Alaska: U.S. Bureau of Mines Open-File Report 40-90, 58 p.

Ford, M.J., 1988, Geology and Mineralization of the Zackly copper- and gold-bearing skarn, central Alaska Range, Alaska: Fairbanks, Alaska, University of Alaska, unpublished thesis, 157 p., 1 plate.

Kurtak, J.M., Southworth, D.D., Balen, M.D., and Clautice, K.H., 1992, Mineral investigations in the Valdez Creek mining district, south-central Alaska: U.S. Bureau of Mines Open-File Report 1-92, 659 p., 2 plates, scale 1:250,000.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Resource Associates of Alaska, 1981, Report on the Central Alaska Range Joint Exploration Program--Zackly, Tucena Creek, and Powell prospects: Unpublished company reports available from Pacific Northwest Resources Company, Vancouver, Wash., 176 p.

UNC Teton Exploration and Drilling, Inc., 1982, Geology and mineralization of the Zackly gold-copper

skarn prospect, Alaska Range, Alaska Final Report 1982: Unpublished company report, available from Pacific Northwest Resources Company, Vancouver, Wash., 139 p.

Primary Reference: UNC Teton Exploration and Drilling, Inc., 1982; Kurtak and others, 1992

Reporter(s): W.T. Ellis (Alaska Earth Science), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Maclaren Glacier

Site type: Occurrence

ARDF no.: MH089

Latitude: 63.3014 **Quadrangle:** M B-5

Longitude: 146.4932

Location description and accuracy:

This prospect extends for about 0.3 mile along a gully from an elevation of about 4,000 to 5,500 feet. The center of the prospect is about 2.6 mile north-northeast of the mouth of the East Fork Maclaren River. It is about 0.6 mile west-northwest of the center of section 6, T.19 S., R. 7 E.

Commodities:

Main: Cu, Fe

Other: Ag, Au, Cr, Ni, Zn

Ore minerals: Azurite, chalcopyrite, gold, magnetite, malachite, sphalerite

Gangue minerals: Calcite, diopside, garnet

Geologic description:

The Maclaren Glacier deposit is along a steeply dipping, west-northwest-striking fault that separates Triassic limestone and gabbro to the south from Triassic argillite to the north (Rose, 1966; Nokleberg and others, 1991; 1992 [MF]; 1992 [Open-File]. Locally, the argillite is intruded by granodiorite of probable Cretaceous age. For about 0.3 mile, limestone is replaced by garnet, diopside, up to 20 percent magnetite, and locally sphalerite and chalcopyrite which is partly oxidized to azurite and malachite. The skarn zone is up to several hundred feet in width. The source of the mineralization may be the Cretaceous granodiorite (Nokleberg and others, 1991).

The mineralized zones are only a few feet or less in length and width. A sample of magnetite skarn contained 16.9 percent iron, 2.8 percent copper, 0.12 percent chromium, 0.14 percent nickel, 45 parts per billion (ppb) gold, and 1 ppb silver (Kurtak and others, 1992). Locally the skarn contains more zinc and precious metals; one sample contained 5.5 percent zinc, 2.5 percent copper, 30 parts per million (ppm) silver, and 3.7 ppm gold (Nokleberg and others, 1991).

Alteration:

Base and precious metals in skarn zones in limestone.

Age of mineralization:

Possibly Cretaceous based on the nearness of a granitic pluton of that age.

Generic deposit model:

Deposit model:

Cu skarn? (Cox and Singer, 1986; model 18b?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b?

Production Status: None

Site Status: Inactive

Workings/exploration:

Only limited sampling by state and federal agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Kurtak, J.M., Southworth, D.D., Balen, M.D., and Clautice, K.H., 1992, Mineral investigations in the Valdez Creek mining district, south-central Alaska: U.S. Bureau of Mines Open-File Report 1-92, 659 p., 2 plates, scale 1:250,000.

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Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1966, Geological and geochemical investigations in the Eureka Creek and Rainy Creek areas, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 20, 41 p., 3 maps [figures], scale 1:40,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Bird's Foot

Site type: Prospect

ARDF no.: MH093

Latitude: 63.3259 **Quadrangle:** M B-5

Longitude: 146.38

Location description and accuracy:

The Bird's Foot prospect is at an elevation of about 5,300 feet, about a 0.3 mile west of lower Eureka Glacier, and 0.6 mile northeast of elevation 6120. It is near the center of section 27, T. 18 S., R. 7 E.

Commodities:

Main: Cr, Cu, Ni

Other: Pd, Pt

Ore minerals: Chalcopyrite, chromite, magnetite, pentlandite, pyrrhotite

Gangue minerals: Olivine, serpentinite

Geologic description:

The Bird's Foot prospect is in Upper Triassic ultramafic and mafic rocks that are faulted into a Tertiary to Cretaceous composite, granitic to dioritic pluton (Nokleberg and others, 1991). Rose (1966) mapped dunite bodies within diorite, quartz diorite, and gabbro in this area. The Broxson Gulch thrust appears to form the hanging wall of the ultramafic and mafic rocks and it has been inferred that dunite bodies lubricated the bottom of the thrust (Kurtak and others, 1992). The hanging wall of the thrust is schist.

The occurrence was found during geologic reconnaissance by the USGS in the early 1990s (Nokleberg and others, 1991) and examined by industry in about 2001 (W.T. Ellis, unpublished field notes, 2001). In 2001, the prospect was on claims of the MAN project of Pure Nickel Inc. Sampled by the Bureau of Land Management in 2003.

This occurrence consists of chromite and magnetite disseminated in a serpentinized olivine inclusion in metagranodiorite (Nokleberg and others, 1991). A grab sample contained more than 0.5 percent chromium.

As described by W.T. Ellis (unpublished data, 2001) rubble of olivine melagabbro and feldspathic peridotite hosts sulfide mineralization. The rubble appears to be derived from a sill-like body of Upper Triassic gabbro and serpentinized peridotite and dunite in the cliffs on the south side of the cirque to the west. The sulfide mineralization consists of coarsely-crystalline clots and disseminations of pyrrhotite, chalcopyrite, and pentlandite. The sulfides rarely exceed about 5 percent of the float.

Bittenbender and others (2007) collected several samples. Most grab samples from the extensive fresh peridotite at the prospect contained no metals of note. A float sample of iron-stained peridotite with 3 to 5 percent sulfides contained 553 parts per billion (ppb) platinum, 3,821 ppb palladium, 148 ppb gold, 2,190 parts per million (ppm) copper and 2,970 ppm nickel. Bittenbender and others (2007) concluded that the mineralized area is small and unlikely to be economic.

Alteration:

The ultramafic rocks are serpentinized.

Age of mineralization:

Probably Late Triassic; synchronous with emplacement of the mafic-ultramafic rocks.

Generic deposit model:

Deposit model:

Disseminated chromite in layered mafic-ultramafic complex and nickel-copper-PGE mineralization in a differentiated mafic-ultramafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

The occurrence was found during geologic reconnaissance by the USGS in the early 1990s and examined by industry in about 2001 (W.T. Ellis, unpublished field notes, 2001). In 2001, the prospect was on claims of the MAN project of Pure Nickel Inc. Sampled by the Bureau of Land Management in 2003.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Kurtak, J.M., Southworth, D.D., Balen, M.D., and Clautice, K.H., 1992, Mineral investigations in the Valdez Creek mining district, south-central Alaska: U.S. Bureau of Mines Open-File Report 1-92, 659 p., 2 plates, scale 1:250,000.

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Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1966, Geological and geochemical investigations in the Eureka Creek and Rainy Creek areas, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 20, 41 p., 3 maps [figures], scale 1:40,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Bird's Beak; Bird Beak

Site type: Prospect

ARDF no.: MH094

Latitude: 63.3174 **Quadrangle:** M B-5

Longitude: 146.3966

Location description and accuracy:

The Bird Beak prospect is at an elevation of about 5,900 feet, about 1,600 feet southwest of peak 6120 and about 0.8 mile west of lower Eureka Glacier. It is in about 0.7 mile northwest of the center of section 34, T. 18 S., R. 7 E., of the Fairbanks Meridian. Bittenbender and others (2007, figure 14) show an aerial view of the prospect.

Commodities:

Main: Ni, Pd, Pt

Other: Au, Cr, Cu

Ore minerals: Chalcopyrite, chromite, magnetite, moncheite, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

The Bird Beak prospect is in an Upper Triassic ultramafic and mafic sill-like complex in fault contact with a Tertiary to Cretaceous composite granitic to dioritic pluton (Nokleberg and others, 1991). Rose (1966) mapped dunite bodies associated with diorite, quartz diorite, and gabbro in this area. Mafic and ultramafic rocks in the Broxson Gulch thrust may have lubricated the footwall of the thrust (Kurtak and others, 1992). The hanging wall of the thrust consists of schist. Olivine metagabbro and serpentinized dunite host the ore minerals at the prospect.

The U.S. Bureau of Mines collected samples of dunite and gabbro from the prospect (Kurtak and others, 1992). Sample 3038 of olivine gabbro with disseminated pyrrhotite and chalcopyrite assayed 0.15 percent copper, 0.21 percent chromium, 0.36 percent nickel, 550 parts per billion (ppb) palladium, and 80 ppb platinum. Sample 2644 of limonite-stained serpentine contained 0.13 percent copper, 896 parts per million (ppm) nickel, 280 ppb palladium, and 570 ppb platinum. A pentlandite(?)-bearing pyroxenite sample assayed 0.2 percent nickel and 25 ppb platinum.

Foley (1992) reported similar values in red, iron-oxide-stained, sulfide-rich, olivine gabbro; microprobe examination of the gabbro showed minute particles of moncheite (PtTe) along grain boundaries between chalcopyrite and ferromagnesian silicate minerals.

Bittenbender and others (2007) sampled the prospect. Their best samples were from a gabbro sill that cuts peridotite. Two selected samples contained up to 167 ppm gold, 462 ppb platinum, 385 ppb palladium, 1,820 ppm copper, and 4,450 ppm nickel. A more representative sample of approximately a 10 by 10 foot area of the gabbro contained 34 ppb gold, 105 ppb platinum, 94 ppb palladium, 592 ppm copper, and 1,815 ppm nickel. They indicate that the mineralization is well exposed but is unlikely to be of significant size.

In 2001, the prospect was on claims of the MAN project of Pure Nickel Inc. Pure Nickel sampled the Bird's Beak showing in 2011 and grab samples returned values of 1.39 percent nickel, 0.48 percent copper, and 7.0 grams of platinum group elements + gold + silver per tonne (Pure Nickel Inc., 2011).

Alteration:

All of the ultramafic rock units are moderately to strongly serpentinized (Bittenbender and others, 2007).

Age of mineralization:

Probably Late Triassic; synchronous with emplacement of the mafic-ultramafic complex (Nokleberg and others, 1991).

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The prospect was sampled by the U.S. Bureau of Mines (Kurtak and others, 1992) and the Bureau of Land Management (Bittenbender and others, 2007).

In 2001, the prospect was on claims of the MAN project of Pure Nickel Inc. Pure Nickel sampled the Bird's Beak showing in 2011 and grab samples returned values of 1.39 percent nickel, 0.48 percent copper, and 7.0 grams of platinum group elements + gold + silver per tonne (Pure Nickel Inc., 2011).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Foley, J.Y., 1992, Ophiolite and other ultramafic metallogenic provinces in Alaska (west of the 141th meridian): U.S. Geological Survey Open-File Report 92-20-B, 55 p.

Kurtak, J.M., Southworth, D.D., Balen, M.D., and Clautice, K.H., 1992, Mineral investigations in the Valdez Creek mining district, south-central Alaska: U.S. Bureau of Mines Open-File Report 1-92, 659 p., 2 plates, scale 1:250,000.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Pure Nickel Inc., 2011, Pure Nickel MAN Alaska Exploration Update: http://www.purenickel.com/s/NewsReleases.asp?ReportID=497855 (News release, December 21, 2011, as of December 2, 2014).

Rose, A.W., 1966, Geological and geochemical investigations in the Eureka Creek and Rainy Creek areas,

[figures], scale 1:40,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group); W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-10

Site name(s): BOS

Site type: Prospect

ARDF no.: MH101

Latitude: 63.3345

Quadrangle: M B-5

Longitude: 146.3224

Location description and accuracy:

The BOS prospect as identified by Bittenbender and others (2007) is at the terminus of a hanging glacier about 0.7 mile east-northwest of elevation 6568 and about 6.3 miles northwest of the junction of Eureka Creek and Broxson Gulch. It is about 0.3 mile south of the center of section 24, T. 18 S., R. 7 E. The location is accurate.

Commodities:

Main: Au, Cu, Ni, Pd, Pt

Other:

Ore minerals: Chalcopyrite, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

The BOS prospect is in the Late Triassic, Eureka mafic-ultramafic complex. The host for the complex is Pennsylvanian to Permian rocks of the Slana Spur Formation which is intruded by Late Jurassic to Cretaceous granodiorite (Nokleberg and others, 1991). At the prospect, the complex is mainly a sill-like body of serpentinized peridotite, with lesser pyroxenite and gabbro (Bittenbender and others, 2007). The complex crops out along strands of the Broxson Gulch thrust fault (W.T. Ellis, oral communication, 2001).

As described by W.T. Ellis (oral communication, 2001) the mineralization consists of coarsely-crystalline clots and disseminations of pyrrhotite, chalcopyrite, and pentlandite in olivine melagabbro and feldspathic peridotite. Sulfide abundance rarely exceeds about 5 percent. A float sample contained 117 parts per billion (ppb) gold, 393 ppb platinum, 493 ppb palladium, 0.14 percent copper, and 0.4 percent nickel.

Bittenbender and others (2007) could not locate mineralized rock at the Ellis's supposed location and samples they took in that area had insignificant metal values. However, after talking with industry geologists in 2004, they determined that the most likely location for what is commonly known as the BOS prospect is at the coordinates used for this record. (The Ellis location may be about a mile to the northwest but it uncertain whether there are two sites of mineralization or confusion about the location of a single location.) A sample collected by Bittenbender and others (2007) across 1 foot of peridotite with about 1 percent chalcopyrite contained 36 ppb gold, 106 ppb platinum, 86 ppb palladium, 594 parts per million (ppm) copper, and 2,030 ppm nickel. A sample of serpentinite with disseminated sulfides contained 11 ppb gold, 292 ppb platinum, 308 ppb palladium, 1,145 ppm copper, and 3,710 ppm nickel. The prospect is at the toe of a small ice field and may extend under the ice.

Alteration:

Moderate to strong serpentinization of ultramafic rocks.

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Examined and sampled by American Copper and Nickel Company in the early 2000s and by Pure Nickel Inc. as part of their MAN project. As of 2001, the prospect was on claims held by Pure Nickel. Sampled by the Bureau of Land Management in 2003.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

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Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Boot Flap

Site type: Prospect

ARDF no.: MH102

Latitude: 63.3226 **Quadrangle:** M B-5

Longitude: 146.3174

Location description and accuracy:

The Boot Flap prospect is at an elevation of 5,100 feet about three-quarters of a mile east of the lower Eureka Glacier and 6.8 mile northwest of the junction of Eureka Creek and Broxton Gulch. It is about 5.5 mile south of peak 6563 and about 0.3 mile south of the center of section 25, T. 18 S., R. 7 E.

Commodities:

Main: Cr, Cu, Ni, Pd, Pt

Other:

Ore minerals: Chalcopyrite, magnetite, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

The Boot Flap prospect is associated with a east-trending, northward-dipping sill-like body of mafic and ultramafic rocks that are part of a Middle Triassic unit informally called the Eureka complex (Rose, 1966; Nokleberg and others, 1992 [MF]; 1992 [Open-File]; Bittenbender and others, 2007). The complex is mostly gabbro and serpentinized peridotite that occur along strands of the Broxson Gulch thrust fault (W.T. Ellis, unpublished data, 1996). The complex structurally overlies light-colored fine-grained andesite, dacite, and graywacke that are part of the Pennsylvanian to Permian, Slana Spur Formation.

The prospect was examined and sampled by several companies in the 1990s and 2000s and by the Alaska Division of Mines and Minerals, the U.S. Geological Survey, and the U.S. Bureau of Land Management at various times from the late 1980s to 2007.

The Boot Strap prospect as sampled by Bittenbender and others (2007) is in a sill of ultramafic rocks 50 to 200 feet thick that may extend for at least 5 miles based on aeromagnetic evidence. The sill which is largely gabbro has a base of serpentinized ultramafic rocks. It overlies volcanic rocks and underlies porphyritic granitic rocks.

The mineralization consists of: 1) disseminated sulfides in the serpentine; 2) up to 5 percent, net-textured pyrrhotite, with lesser chalcopyrite, pentlandite, and magnetite in olivine gabbro; and 3) gossan zones leached of sulfides in the gabbro (Bittenbender and others, 2007). Two representative samples of the serpentine contained up to 1,290 parts per million (ppm) chromium, 586 ppm, copper, 2,260 ppm nickel, 52 parts per billion (ppb) platinum, and 56 ppb palladium. Two samples of gossan from the gabbro contained 711 ppm copper, 1,515 ppm nickel, 112 ppb platinum, and 83 ppb palladium. Samples of the gabbro contained up to 17 ppb platinum, 28 ppb palladium, 1,75 ppm nickel, and 430 ppm chromium.

Alteration:

Ultramafic rocks at the bottom of the sill are moderately to strongly serpentinized.

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The prospect was examined and sampled by several companies in the 1990s and 2000s and by the Alaska Division of Mines and Minerals, the U.S. Geological Survey, and the U.S. Bureau of Land Management at various times from the late 1980s to 2007.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

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Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1966, Geological and geochemical investigations in the Eureka Creek and Rainy Creek areas, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 20, 41 p., 3 maps [figures], scale 1:40,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Tres Equis

Site type: Prospect

ARDF no.: MH104

Latitude: 63.2796 **Quadrangle:** M B-5

Longitude: 146.3087

Location description and accuracy:

The Tres Equis prospect is located one-quarter mile northwest of peak 3710, east of the headwaters of Eureka Creek below Eureka Glacier. The prospect is at the center of the SE1/4 section 12, T. 19 S., R.7 E., of the Fairbanks Meridian. The location is accurate to within 1/4 mile.

Commodities:

Main: Cu, Ni, Pd

Other: Co, Pt

Ore minerals: Chalcopyrite, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

The Tres Equis prospect is in the Fish Lake ultramafic-mafic intrusive complex, a layered lopolith of Late Triassic age considered to be a comagmatic with lava flows of the Nikolai Greenstone (Nokleberg and others, 1991). The rocks at the Tres Equis prospect consist of layered wehrlite cut by irregular, mainly gabbroic dikes. A 50- to 100-foot-thick layer of taxitic gabbro overlies the wehrlite and is overlain in turn by a thick, massive peridotite of a later magmatic cycle. The taxitic gabbro contains leucocratic and anothorositic phases and commonly has clinopyroxenitic margins. The dikes range from melagabbro to leucrocratic pegmatite.

Magmatic layering in the lopolith strikes east to southeast and dips 45 to 50 degrees to the south. The dikes also strike east to southeast but cut the layering at high angles. All units are cut by high-angle, north- to northeast- trending faults having offsets of 20 to 50 feet.

The Tres Equis deposit is a magmatic breccia in the lower portion of the gabbroic unit of the second magmatic cycle of the Fish Lake complex. The breccia strikes east to southeast, subparallel to the gabbroic dikes. The breccia is along the margin of an irregular dike and consists of clasts of peridotite and gabbro in an oxidized and leached (post-mineralization) matrix. Some of the clasts, which are as much as 2 feet in diameter, contain disseminated pyrrhotite, chalcopyrite, and pentlandite. The sulfides also form networks and massive clots containing individual crystals more than an inch across. The average grade of six clasts containing massive sulfides was 3.2 percent copper, 5.2 percent nickel, 0.33 percent cobalt, 1,750 parts per billion (ppb) palladium, and 28 ppb platinum. A net-textured clast assayed 0.3 percent copper, 1.0 percent nickel, 0.07 percent cobalt, 712 ppb palladium, and 100 ppb platinum (W.T. Ellis, unpublished data, 1996).

Pure Nickel sampled the Tres Equis showing in 2011 and grab samples returned values of 6.7 percent nickel, 1.0 percent copper, and 1.5 grams of platinum group elements per tonne. Diamond drill holes were drilled to test possible extensions of mineralization (Pure Nickel, 2011).

Alteration:

The host rock is oxidized and leached. The peridotite is moderately serpentinized; hairline joint fractures are filled with fibrous serpentine (chrysotile). The gabbro dikes are amphibolitized along their margins but are essentially fresh for a half-inch into the dikes (W.T. Ellis, Project Geologist, American Copper Nickel Inc., oral communication, 1996).

Age of mineralization:

Late Triassic, the age of the host rock (Nokleberg and others, 1991).

Generic deposit model:

Deposit model:

Nickel-copper-PGE in differentiated mafic-ultramafic sill.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

One hydraulically washed hand trench 20 to 30 feet wide and 100 feet long was completed in 1996. A 627-foot hole was drilled in 1997; two 200-foot holes were drilled in 1998. None of the drill holes penetrated significant mineralization.

Pure Nickel sampled the Tres Equis showing in 2011 and grab samples returned values of 6.7 percent nickel, 1.0 percent copper, and 1.5 grams of platinum group elements per tonne. Diamond drill holes were drilled to test possible extensions of mineralization (Pure Nickel, 2011).

Production notes:

None.

Reserves:

None.

Additional comments:

The Tres Equis breccia prospect is important because it demonstrates that the Fish Lake complex contains high-grade nickeliferous massive sulfide.

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Pure Nickel Inc., 2011, Pure Nickel MAN Alaska Exploration Update: http://www.purenickel.com/s/NewsReleases.asp?ReportID=497855 (accessed July 9, 2014).

Primary Reference: W.T. Ellis, unpublished data, 1996

Reporter(s): W.T. Ellis (Alaska Earth Science), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-10

Site name(s): Mini Y Landslide

Site type: Prospect

ARDF no.: MH106

Latitude: 63.3221 **Quadrangle:** M B-5

Longitude: 146.2872

Location description and accuracy:

The Mini Y Landslide prospect is at an elevation of about 5,100 feet, about 1.5 miles east of the toe of the Eureka Glacier and about 5.9 miles northwest of the junction of Eureka Creek and Broxton Gulch. The prospect is about 0.2 mile south of the center of section 30, T. 18 S., R. 8 E.

Commodities:

Main: Cu, Ni, Pd, Pt

Other: Au, Cr

Ore minerals: Chalcopyrite, magnetite, pentlandite, pyrrhotite

Gangue minerals: Diopside, epidote, serpentine

Geologic description:

The rocks in the vicinity of the Mini Y Landslide prospect consists of Upper Triassic serpentinized peridotite and mafic gabbro interlayered with quartz diorite (Rose, 1966). The serpentinized rocks, informally called the Eureka ultramafic complex, occupy strands of the Broxson Gulch thrust fault (Nokleberg and others, 1991).

The prospect was examined and sampled by several companies in the 1990s and the 2000s and at various times from the 1980s to the early 2000s by the Alaska Division and Mines and Minerals, the U.S. Geological Survey, and the U.S. Bureau of Land Management.

Disseminated sulfide minerals are present in several types of ultramafic rocks and in skarn of probable ultramafic parentage in upper Landslide Creek. Plagioclase peridotite with pyrite, pyrrhotite, pentlandite, and chalcopyrite assayed 0.15 percent copper, 0.35 percent nickel, 0.4 percent chromium, 300 parts per billion (ppb) palladium, and 380 ppb platinum. A sample of magnetite-chalcopyrite-epidote-diopside skarn assayed 0.5 percent copper and 130 ppb gold (Foley and others, 1989; Foley and Summer, 1990; Foley, 1992; W.T. Ellis, unpublished data, 1996).

Bittenbender and others (2007) did not find any outcrop at this site; rather they found rubble that may be piled up by recent glaciation. They collected four samples of ultramafic and mafic rocks from the rubble; the best contained 13 ppb gold, 118 parts per million (ppm) cobalt, 806 ppm copper, 2,420 ppm nickel, 45 ppb platinum, and 41 ppb palladium.

Alteration:

All of the ultramafic rock units are moderately to strongly serpentinized; diopside-epidote skarn is locally developed.

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:
Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:
The prospect was examined and sampled by several companies in the 1990s and the 2000s and at various times from the 1980s to the early 2000s by the Alaska Division and Mines and Minerals, the U.S. Geological Survey, and the U.S. Bureau of Land Management.

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Foley, J.Y., 1992, Ophiolite and other ultramafic metallogenic provinces in Alaska (west of the 141th meridian): U.S. Geological Survey Open-File Report 92-20-B, 55 p.

Foley, J.Y., and Summers C.A., 1990, Source and bedrock distribution of gold and platinum-group metals in the Slate Creek area, northern Chistochina mining district, east-central Alaska: U.S. Bureau of Mines Open File Report 14-90, 49 p.

Foley, J.Y., Burns, L.E., Schneider, C.L., and Forbes, R.B., 1989, Preliminary report of platinum group element occurrences in Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 89-20, 32 p., 1 map sheet, scale 1:2,500,000.

Rose, A.W., 1966, Geological and geochemical investigations in the Eureka Creek and Rainy Creek areas, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 20, 41 p., 3 maps [figures], scale 1:40,000.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): UM Landslide; Dunite Diatreme

Site type: Prospect

ARDF no.: MH107

Latitude: 63.3054 **Quadrangle:** M B-5

Longitude: 146.2795

Location description and accuracy:

This mile-long and half-mile-wide prospect is on the west side of an southeast-flowing tributary of Eureka Creek that is informally called Landslide Creek. It is about 5.1 mile northwest of the junction of Eureka Creek and Broxson Gulch, about 0.7 mile southeast of the center of section 31, T. 17 S., R. 8 E, and about 0.3 mile southeast of peak southeast of peak 5460. The site includes not only conglomerate outcrops on the 5460 ridge but also a large landslide that flows down to the east from peak 5460.

Commodities:

Main: Au, Cu, Ni, Pd, Pt

Other: Hg

Ore minerals: Cinnabar, gold, magnetite, pyrite

Gangue minerals:

Geologic description:

The geology of this prospect has been variously interpreted. Most early workers have interpreted it as a sedimentary conglomerate composed mostly of clasts of peridotite and dunite and lesser gabbro in a serpentine matrix with hematite. (Moffit, 1912; Rose, 1966, Stout, 1976; Foley, 1992; Nokleberg and others, 1992 ([MF]; Nokleberg and others, 1992 [Open-File]) . The conglomerate caps the ridge of hill 5460 and is the source of landslide material below it to the east. The landslide covers an area about a mile long and one-half mile wide. Conglomeratic material in the slide consists of angular to subrounded boulders, cobbles, and pebbles of ultramafic rocks, mainly dunite, in a sand-size serpentine matrix rich in magnetite. The magnetite particles are as much as an inch in diameter. However, L.D. Hulbert (oral communication, 2000) interpreted the conglomerate as a diatreme that contains as much as 700 parts per billion (ppb) platinum and palladium.

Grab samples of the conglomerate and heavy-mineral concentrates produced by panning pulverized conglomerate and regolith overlying the conglomerate contained traces of gold and platinum-group minerals (Foley and others, 1989; Foley and Summers, 1990). The panned samples contained up to 102 ppb gold, 150 ppb palladium, and 240 ppb platinum. Panned concentrates from the creek to the east of peak 5640, informally named Landslide Creek, contained abundant pyrite and cinnabar and gold particles as heavy as 4 milligrams.

Bittenbender and others (2007) visited and resampled the prospect and concluded that it is in a conglomerate. Samples contained up to 9 ppb gold, 132 parts per million (ppm) copper, 1,810 ppm nickel, 70 ppb platinum, and 52 ppb palladium.

Alteration:

The ultramafic clasts in the conglomerate are remarkably fresh looking and essentially unaltered (L. Hulbert, oral communication, 2000).

Age of mineralization:

The landslide and associated placer deposits are Holocene. The source of the mafic and ultramafic rocks in

the conglomerate are probably the Late Triassic, Eureka ultramafic-mafic complex that is widely exposed in the vicinity.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au-PGE (Cox and Singer, 1986; model 39a); conglomerate with precious metal values.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Active

Workings/exploration:

Examined and sampled by a succession of companies and government agencies from before 1912 into the 2000s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

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Moffit, F.H., 1912, Headwater regions of Gulkana and Susitna Rivers, Alaska, with accounts of the Valdez Creek and Chistochina placer districts: U.S. Geological Survey Bulletin 498, 82 p.

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Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1966, Geological and geochemical investigations in the Eureka Creek and Rainy Creek areas, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 20, 41 p., 3 maps [figures], scale 1:40,000.

Stout, J.H., 1976, Geology of the Eureka Creek area, east-central Alaska Range: Alaska Division of Geological and Geophysical Surveys, Geologic Report 46, 32 p., 1 sheet, scale 1:63,360.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Lower Crash

Site type: Prospect

ARDF no.: MH108

Latitude: 63.3146 **Quadrangle:** M B-5

Longitude: 146.2585

Location description and accuracy:

The Lower Crash prospect is at an elevation of about 4,700 feet, about 5.0 miles northwest of the junction of Broxson Gulch and Eureka Creek. It is on the east side of a southeast-flowing tributary of Eureka Creek that is locally called Landslide Creek. It is about 0.5 mile north-northwest of the center of section 32, T. 18 S., R. 8 E.

Commodities:

Main: Au, Cu, Pd, Pt

Other: As, Cr, Hg, Mn

Ore minerals: Chalcopyrite, magnetite, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

The Lower Crash prospect is in an east-trending, northward-dipping sill of Late Triassic, ultramafic and mafic rocks that is part of Triassic Eureka complex (Rose, 1966; Nokleberg and others, 1992 [MF]; Nokleberg and others, 1992 [Open-File]. The rocks at the prospect consist mainly of peridotite, gabbro and serpentine. The peridotite contains up to 5 percent sulfides, mainly pyrrhotite with sparse chalcopyrite, and pentlandite.

The prospect was found by industry in about 1990 and they may have dug a 50-foot trench on the mineralization (Bittenbender and others, 2007). Bittenbender and others (2007) collected six rock-chip samples; they contained up to 56 parts per billion (ppb) gold, 93 ppb platinum, 91 ppb palladium, 1,385 parts per million (ppm) copper, and 2,590 ppm nickel.

They also collected several samples below the prospect in the complex; one notable float sample contained 2.59 percent copper, 11.6 ppm silver, 282 ppm arsenic, 150 ppb gold, 668 ppm chromium, 0.68 ppm mercury, 2,490 ppm manganese, and 115 ppb palladium.

Alteration:

Moderate to strong serpentinization of the ultramafic rocks.

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

Found by industry in the 1990s; they may have dug a 50-foot trench. Examined and sampled by the Bureau of Land Management in the 2000s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

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Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Stout, J.H., 1976, Geology of the Eureka Creek area, east-central Alaska Range: Alaska Division of Geological and Geophysical Surveys, Geologic Report 46, 32 p., 1 sheet, scale 1:63,360.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): West Crash

Site type: Prospect

ARDF no.: MH110

Latitude: 63.313 **Quadrangle:** M B-5

Longitude: 146.2392

Location description and accuracy:

The West Crash prospect is at an elevation of about 5,330 feet, about 4.6 miles northwest of the junction of Eureka Creek and Broxson Gulch. It is about 0.6 mile west-northwest of the center of section 33, T. 18 S., R. 8 E. The location is accurate.

Commodities:

Main: Cu, Ni, Pd, Pt

Other: Au, Cr

Ore minerals: Chalcopyrite, garnierite, magnetite, malachite, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

The West Crash prospect is in an east-trending, northward-dipping sill of Late Triassic, ultramafic and mafic rocks that are part of the Eureka complex (Rose, 1966; Nokleberg and others, 1992 [MF]; Nokleberg and others, 1992 [Open-File]. The sill is about 100 feet thick at this prospect; it dips north about 40 degrees, and consists of differentiated pyroxenite and gabbro. The footwall of the sill is siliceous volcanic rocks; the hanging wall is argillite, slate, and graywacke. The rocks are locally iron-stained and altered with plagioclase going to saussurite and pyroxene going to actinolite. Malachite and garnierite staining is locally prominent.

The West Crash prospect was found by industry in the 1990s. It was examined and sampled by the Bureau of Land Management in about 2003. Bittenbender and others (2007) collected four samples. Two samples of gossanous material contained up to 37 parts per billion (ppb) gold, 399 parts per million (ppm) chromium, 872 ppm copper, 4,020 ppm nickel, 118 ppb platinum, and 168 ppb palladium. The other two did not have any notable metals.

Alteration:

The ultramafic rocks rock units are moderately to strongly serpentinized. The rocks are locally iron-stained and altered with plagioclase going to saussurite and pyroxene going to actinolite. Malachite and garnierite staining is locally prominent.

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic sill.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Found by industry in the 1990s. Examined and sampled by the Bureau of Land Management in about 2003.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Stout, J.H., 1976, Geology of the Eureka Creek area, east-central Alaska Range: Alaska Division of Geological and Geophysical Surveys, Geologic Report 46, 32 p., 1 sheet, scale 1:63,360.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Notar

Site type: Prospect

ARDF no.: MH112

Latitude: 63.3173

Quadrangle: M B-5

Longitude: 146.2028

Location description and accuracy:

The Notar prospect is at an elevation of about 4,900 feet about 3.8 miles north-northwest of the junction of Broxson Gulch and Eureka Creek. It is near the northwest corner of section 34, T. 18 S., R. 8 E. The location is accurate.

Commodities:

Main: Cr, Cu, Ni, Pd, Pt

Other: Au

Ore minerals: Chalcopyrite, magnetite, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

The Notar prospect is in an east-trending, northward-dipping sill of Late Triassic, ultramafic and mafic rocks that are part of the Eureka complex (Rose, 1966; Nokleberg and others, 1992 [MF]; Nokleberg and others, 1992 [Open-File]; Bittenbender and others, 2007). The rocks in the area are mainly variably serpentinized dunite with some peridotite and gabbro.

The prospect was found by industry in the 1990s (W.T. Ellis, unpublished data, 1996). The mineralization is in olivine melagabbro that contains as much as 7 percent disseminated sulfides, mainly pyrrhotite with small amounts of chalcopyrite and pentlandite, and magnetite. Samples contained up to 0.11 percent copper, 0.17 percent nickel, 42 parts per billion (ppb) palladium, and 40 ppb platinum.

The prospect was examined and sampled by Bittenbender and others (2007). They collected 5 samples that contained up to 17 ppb gold, 88 ppb platinum, 344 parts per million (ppm) copper, 822 ppm chromium, and 2,900 ppm nickel. A sample of peridotite they collected south of the prospect contained 49 ppb gold, 27 ppb platinum, 22 ppb palladium, 653 ppm copper, and 1,540 ppm nickel.

Alteration:

Dunite is variably serpentinized.

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic sill.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

Found and sampled by industry in the 1990s; examined and sampled by the Bureau of Land Management in the early 2000s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1966, Geological and geochemical investigations in the Eureka Creek and Rainy Creek areas, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 20, 41 p., 3 maps [figures], scale 1:40,000.

Stout, J.H., 1976, Geology of the Eureka Creek area, east-central Alaska Range: Alaska Division of Geological and Geophysical Surveys, Geologic Report 46, 32 p., 1 sheet, scale 1:63,360.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Crash

Site type: Prospect

ARDF no.: MH114

Latitude: 63.316 **Quadrangle:** M B-5

Longitude: 146.225

Location description and accuracy:

The Crash prospect is at an elevation of about 5,120 feet, about 4.1 miles northwest of the junction of Broxson Gulch and Eureka Creek. It is about 0.4 mile east of peak 5540 and about 0.5 mile north of the center of section 33, T. 18 S., R. 8 E. The location is accurate.

Commodities:

Main: Au, Cu, Ni, Pd, Pt

Other: Cr

Ore minerals: Chalcopyrite, chromite, magnetite, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

The Crash prospect is in an east-trending, northward-dipping sill of Late Triassic, ultramafic and mafic rocks that are part of the Eureka complex (Rose, 1966; Nokleberg and others, 1992 [MF]; Nokleberg and others, 1992 [Open-File]; Bittenbender and others, 2007). The prospect was found by industry in the 1990s (W.T. Ellis, unpublished data, 1996). At this prospect, the sill is about 100 feet thick; it dips north about 40 degrees; and consists of differentiated pyroxenite and gabbro. The footwall of the sill is siliceous volcanic rocks; the hanging wall is argillite, slate, and graywacke. A layer in the sill is altered with plagioclase going to saussurite and pyroxene going to actinolite; malachite and garnierite staining is prominent locally. The gabbro contains as much as 7 percent disseminated sulfides and magnetite. The sulfides are mainly pyrrhotite with small amounts of chalcopyrite and pentlandite. Samples assayed as much as 0.09 percent copper, 0.42 percent nickel, 630 parts per billion (ppb) palladium, and 475 ppb platinum (W.T. Ellis, unpublished data, 1996).

Bittenbender and others (2007) examined and sampled the prospect. Their best sample was from iron-stained peridotite that contained 1,315 parts per million (ppm) copper, 2,180 ppm nickel, 322 ppb platinum, 414 ppb palladium, and 85 ppb gold.

Alteration:

The ultramafic rocks units are moderately to strongly serpentinized.

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic sill.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

Found and sampled by industry in the 1990s; examined and sampled by the Bureau of Land Management in the early 2000s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1966, Geological and geochemical investigations in the Eureka Creek and Rainy Creek areas, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 20, 41 p., 3 maps [figures], scale 1:40,000.

Stout, J.H., 1976, Geology of the Eureka Creek area, east-central Alaska Range: Alaska Division of Geological and Geophysical Surveys, Geologic Report 46, 32 p., 1 sheet, scale 1:63,360.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (near Broxson Gulch)

Site type: Occurrence

ARDF no.: MH121

Latitude: 63.3458 **Quadrangle:** M B-5

Longitude: 146.0829

Location description and accuracy:

This occurrence is at an elevation of about 4,900 feet on the easternmost narrow ridge between the two forks of of Broxson Gulch that meet just above its mouth on Eureka Creek. It is about 1.8 mile northeast of elevation 4080 and about 0.6 mile northeast of the center of section 19, T. 18 S., R. 9 E.

Commodities:

Main: Cu

Other: Ag, Au, Co, Ni, Pd, Pt, Zn

Ore minerals: Chalcopyrite, covellite, digenite, pentlandite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

As originally described by Rose (1965), this occurrence is in amphibolitized 'serpentinite' inferred to be in the hanging wall of a major thrust fault. Rose (1966) later described the rock as basalt, part of the Mississippi to Pennsylvanian, Rainy Creek basalt unit which is at least 1,500 feet thick. Boulders containing massive sulfides were found along a 20-foot-wide zone on the north side of the ridge. Rose's samples contained 0.9 percent copper, a trace of zinc, and less than 0.1 percent nickel. Fifty feet south, a layer of pyrrhotite a few inches thick crops out for several feet. Nokleberg and others (1991) collected a sample with pyrite, pyrrhotite, pentlandite, and chalcopyrite that contained 500 parts per million (ppm) cobalt. Samples collected by Foley (1992) of massive-sulfide-bearing boulders in the area contained as much as 2.4 percent copper, 0.66 percent nickel, 0.1 percent cobalt, 13 ppm silver, 416 ppm gold, and 137 parts per billion (ppb) platinum, and 137 ppb palladium.

Bittenbender and others (2007) reexamined and sampled the site. They identified the rocks as strongly altered volcaniclastic rocks made up mainly of fine-grained amphibole and epidote with relict plagioclase clots. They sampled boulders up to 1.5 feet in size which originally identified by Rose. The volcaniclastic rocks contain small pockets of disseminated pyrrhotite and chalcopyrite with minor covellite and digenite and semi-massive sulfides. Samples contained up to 4,800 ppm copper, 633 ppm cobalt and up to 23 parts per billion (ppb) gold and 23 ppb platinum-group elements.

A 1982 unpublished report by the Bureau of Mines (cited in Bittenbender and others, 2007) describe a '...persistently mineralized sulfide zone adjacent to the contact of hornblende gabbro with thermally metamorphosed limestone. The mineralization has a width of 15 to 20 feet and was traced intermittently along strike for approximately 600 feet...'. Samples were said to contain from 0.1 to 1 percent copper and 0.2 to 0.4 percent cobalt. However, the 1982 Bureau of Mines report notes the presence of limestone, a significant difference from the descriptions of Rose (1965, 1966) and Bittenbender and others (2007).

Alteration:

Host rocks are highly altered but may be due to metamorphism.

Age of mineralization:

Ambiguous in view of the different descriptions of the rocks in the area.

Generic deposit model:

Deposit model:

Massive sulfides with chalcopyrite and pyrrhotite but notably different descriptions of the geology.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Sampled by state and federal agencies several times between 1966 and the early 2000s. Claims staked over it in the 2000s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Foley, J.Y., 1992, Ophiolite and other ultramafic metallogenic provinces in Alaska (west of the 141th meridian): U.S. Geological Survey Open-File Report 92-20-B, 55 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1965, Geology and mineral deposits of the Rainy Creek area, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 14, 57 p., 1 sheet, scale 1:36,000.

Rose, A.W., 1966, Geological and geochemical investigations in the Eureka Creek and Rainy Creek areas, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 20, 41 p., 3 maps [figures], scale 1:40,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Green Wonder

Site type: Prospect

ARDF no.: MH126

Latitude: 63.3067 **Quadrangle:** M B-5

Longitude: 146.081

Location description and accuracy:

The Green Wonder prospect is at an elevation of about 4,400 feet about 2.6 miles northeast of the junction of the two forks of Broxson Gulch that diverge just about its mouth. The prospect is about 0.6 mile west-southwest of the center of section 32, T. 18 S., R. 9 E.

Commodities:

Main: Cu, Zn

Other: Ag, Cr, Cu, Ni, V

Ore minerals: Chalcopyrite, pyrite, sphalerite

Gangue minerals: Diopside, quartz, uvarovite garnet

Geologic description:

Rose (1965) describes the geology of the area as near the contact of volcanic and sedimentary rocks to the north and Rainy Creek basalt to the south. Nokleberg and others (1992 [MF[; 1992 [Open-File]) assigned the rocks in the area to the Lower Permian to Middle Pennsylvania, Slana Spur Formation. The rocks are intensely faulted and deformed.

As described by Rose (1965) and Bittenbender and others (2007), the occurrence is in an outcrop about 2 feet by 6 feet in size of a bright-green stained, almost white marble with quartz, epidote, uvarovite (green garnet), blebs of epidote, chrome diopside, and traces of sphalerite. The green staining may be garnierite, a secondary nickel mineral. Bittenbender and others (2007) tentatively classify the deposit as a skarn, possibly related to nearby ultramafic rocks based on the presence of nickel and chromium in analyzed samples. Rose's samples contained 10 percent or more zinc, 4 percent chromium, and 2 percent nickel. Samples collected by Bittenbender and his colleagues contained up to 9,980 parts per million (ppm) nickel, 2,190 ppm chromium, and 1,195 ppm zinc.

A 60-foot-wide diabase dike with disseminated chalcopyrite cuts meta-andesite near the prospect (Nokleberg and others, 1991). A sample contained 0.72 percent copper, 0.3 percent vanadium, and 7 ppm silver.

The deposit apparently was found by Moneta-Porcupine prior to 1965. They reportedly did some minor hand trenching but there was little sign of it by the early 2000s. Bittenbender and others (2007) suggest that the prospect may be more of interest to rock collectors for its green marble than as a valuable metal deposit.

Alteration:

Development of quartz-uvarovite-diopside skarn(?) in small marble outcrop.

Age of mineralization:

Unclear but younger than the Pennsylvanian or Permian host rocks.

Generic deposit model:

Deposit model:

Zinc-nickel-chromium skarn?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

The deposit apparently was found by Moneta-Porcupine prior to 1965. They reportedly did some minor hand trenching but there was little sign of it by the early 2000s. Subsequently examined and sampled by state and federal geologists.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1965, Geology and mineral deposits of the Rainy Creek area, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 14, 57 p., 1 sheet, scale 1:36,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (lower Broxson Gulch)

Site type: Occurrence

ARDF no.: MH127

Latitude: 63.3018 **Quadrangle:** M B-5

Longitude: 146.0826

Location description and accuracy:

This occurrence is at an elevation of about 4,150 feet, about 2.1 mile northeast of the junction of the two forks of Broxton Gulch that diverge just about its mouth. The occurrence is about 0.6 mile northeast of the center of section 6, T. 19 S., R. 9 E.

Commodities:

Main: Au, Cu, Ni

Other:

Ore minerals: Chalcopyrite, gold, malachite, pentlandite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

Rose (1965) first described this occurrences in altered limestone with copper staining and serpentine. Nokleberg and others (1992 [OF]; 1992 {MF]) assigns the ultramafic rocks to the Triassic. Bittenbender and others (2007) describes the deposit as being in bleached white limestone with epidote and garnet. Sporadic small pods and lenses, generally about a foot in size, of semi-massive sulfides occur for about 500 feet along the contact of limestone and oxidized ultramafic rocks. The sulfides are mostly pyrrhotite, chalcopyrite, and pyrite, with some pentlandite. One sample contained 1.97 percent copper but most contained less than 0.5 percent. The highest gold value was 27 parts per billion; the highest nickel value was 2,180 parts per million but most samples contained much less. Bittenbender and others (2007) classify the deposit as a skarn.

Alteration:

Mineralized skarn developed at limestone-serpentine contact.

Age of mineralization:

Triassic or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Copper-nickel skarn.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only brief examination and sampling by state and federal geologists.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1965, Geology and mineral deposits of the Rainy Creek area, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 14, 57 p., 1 sheet, scale 1:36,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): East Broxson Gold

Site type: Prospect

ARDF no.: MH130

Latitude: 63.3471 **Quadrangle:** M B-5

Longitude: 146.0033

Location description and accuracy:

The East Broxton Gold prospect is at an elevation of about 4,400 feet in the headwaters of east fork of Broxson Gulch near the terminus of two unnamed glaciers. It is about 0.8 mile northwest of elevation 6045 and about 0.5 mile north of the center of section 22, T. 18 S., R. 9 E.

Commodities:

Main: Au, Cu, Pd, Pt

Other:

Ore minerals: Chalcopyrite, gold, pyrrhotite

Gangue minerals:

Geologic description:

The East Broxson Gold prospect is in the Late Triassic Rainey ultramafic-mafic complex that intrudes the Slana Spur Formation of Pennsylvanian and Permian age. The Rainy complex is up to 5,000 feet thick, dips shallowly north and is mainly serpentinized dunite with subordinate peridotite, pyroxenite, and gabbro (Nokleberg and others, 1992 [Open-File]; Nokleberg and others, 1992 [MF]; Bittenbender and others, 2007). In this area, the base of the complex is a layered gabbro as much as 1,500 feet thick.

From 1995 to 1999, the prospect was explored by American Copper and Nickel Company (ACNC) working with Fort Knox Gold Resources, Inc. in their regional search for copper-nickel-PGE mineralization. Their work in the area included rock sampling, and airborne and ground geophysical surveys W.T. Ellis, oral communication, 2001). Claims held by MAN Resources were active through at least 2001 (W.T. Ellis, personal communication, 2001).

The mineralization consists of disseminated pyrrhotite and pentlandite in a peridotite near the northern contact of the Rainy complex (W.T. Ellis, oral communication, 2001). A mineralized sample contained 0.05 percent nickel, 0.58 percent copper, 1,950 parts per billion (ppb) gold, 36 ppb palladium, and 140 ppb platinum. (W.T. Ellis, oral communication, 2001). Bittenbender and others (2007) searched the area but could not find mineralized rock. They collected three samples but none had base or precious metals significantly above background.

Alteration:

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Gold-nickel-copper-PGE mineralization in a differentiated mafic-ultramafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

From 1995 to 1999, the prospect was explored by American Copper and Nickel Company (ACNC) working with Fort Knox Gold Resources, Inc. in their regional search for copper-nickel-PGE mineralization. Their work in the area included rock sampling, and airborne and ground geophysical surveys W.T. Ellis, oral communication, 2001). Claims held by MAN Resources were active through at least 2001 (W.T. Ellis, personal communication, 2001). Examined and sampled by the Bureau of Land Management in the early 2000s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

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Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Primary Reference: This record.

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): East Canyon

Site type: Occurrence

ARDF no.: MH131

Latitude: 63.3382 **Quadrangle:** M B-4

Longitude: 145.9984

Location description and accuracy:

The East Canyon prospect is about 0.8 mile north-northwest of peak 6346 at an elevation of about 4,850 feet. It is about 4.6 miles northwest of the junction of the North Fork and West Fork of Rainy Creek, near the center of section 22, T. 18 S., R. 9 E.

Commodities:

Main: Cu, Ni, Pd, Pt

Other:

Ore minerals: Native copper, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

The East Canyon prospect is in the Late Triassic Rainy ultramafic-mafic complex that intrudes the Slana Spur Formation of Pennsylvanian and Permian age. The Rainy complex is up to 5,000 feet thick, dips shallowly north and is mainly serpentinized dunite with subordinate peridotite, pyroxenite, and gabbro (Nokleberg and others, 1992 [Open-File]; Nokleberg and others, 1992 [MF]; Bittenbender and others, 2007). In this area a basal layered gabbro is as much as 1,500 feet thick.

From 1995 to 1999, the prospect was explored by American Copper and Nickel Company (ACNC) working with Fort Knox Gold Resources, Inc. Their work included rock sampling, and airborne and ground geophysical surveys (W.T. Ellis, oral communication, 2001). MAN Resources held active claims through at least 2001 (W.T. Ellis, personal communication, 2001). The mineralization consists of disseminated pyrrhotite and pentlandite in a peridotite near the southern contact of the Rainy complex. A mineralized sample contained 0.187 percent nickel, 282 parts per billion (ppb) palladium, and 108 ppb platinum (W.T. Ellis, oral communication, 2001).

Bittenbender and others ((2007) examined the prospect and found little but native copper and copper-staining associated with discontinuous veinlets of serpentine, magnetite, and chrysotile or antigorite that cut serpentinized peridotite. The only metal of note in the two samples they collected was 1,905 parts per million copper in one sample.

Alteration:

The olivine melagabbro and peridotite are variably serpentinized.

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

From 1995 to 1999, the prospect was explored by American Copper and Nickel Company (ACNC) working with Fort Knox Gold Resources, Inc. Their work in the area included rock sampling, and airborne and ground geophysical surveys W.T. Ellis, oral communication, 2001). MAN Resources held active claims through at least 2001 (W.T. Ellis, personal communication, 2001). Examined and sampled by the Bureau of Land Management in the early 2000s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (near head of east fork of Broxson Gulch)

Site type: Occurrence

ARDF no.: MH132

Latitude: 63.3346 **Quadrangle:** M B-5

Longitude: 146.0087

Location description and accuracy:

This occurrence is at an elevation of about 4,900 feet about a mile south of the head of the east fork of Broxson Gulch. It is about 0.7 mile northwest of peak 6346, about 0.4 mile northeast of peak 5995, and about 0.6 mile southwest of the center of section 22, T. 18 S., R. 9 E.

Commodities:

Main: Ag, Au, Cu, Zn

Other:

Ore minerals: Chalcopyrite, magnetite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

The rocks in the area are limestone and calcareous sedimentary rocks of the Pennsylvanian and Permian, Slana Spur Formation that are intruded by Triassic gabbro dikes (Rose, 1965; Nokleberg and others, 1992 [MF]; 1992 [Open-File]). Bittenbender and others (2007) identified an area about 5 feet by 20 feet in outcrop of iron-stained clinopyroxene-garnet-magnetite skarn with a small amount of chalcopyrite, pyrrhotite, and pyrite. A sample contained more than 15 percent iron, but only 177 parts per million (ppm) copper and no gold. A sample collected by Nokleberg and others (1991) contained 1.2 ppm gold, 300 ppm silver, and 720 ppm zinc. The source of the mineralization at this occurrence may be the gabbro dikes.

Alteration:

Silver-gold-copper mineralization in skarn near gabbro dikes.

Age of mineralization:

Possibly related to nearby Triassic gabbro dikes.

Generic deposit model:

Deposit model:

Skarn related to gabbro dikes.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Examined and sampled only by state and federal agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1965, Geology and mineral deposits of the Rainy Creek area, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 14, 57 p., 1 sheet, scale 1:36,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): West Bowl; Rainy

Site type: Prospect

ARDF no.: MH133

Latitude: 63.3384 **Quadrangle:** M B-4

Longitude: 145.9767

Location description and accuracy:

The West Bowl prospect extends between 5,200 to 5,600 feet in elevation in a cirque basin west of the upper North Fork Rainy Creek. The occurrences are centered about 0.4 mile south-southeast of elevation 6045 and about 0.4 miles west-southwest of the center of section 23, T. 18 S., R. 9 E.

Commodities:

Main: Ag, Au, Cu, Pd

Other:

Ore minerals: Bornite, chalcocite, chalcopyrite, covellite, digenite, pyrite pyrrhotite

Gangue minerals:

Geologic description:

The rocks in the vicinity of the West Bowl prospect are limestone and calcareous sedimentary rocks of the Pennsylvanian and Permian, Slana Spur Formation. It has been intruded by sills or dikes of Triassic mafic and ultramafic rocks, part of the Rainy complex, that varies from gabbro to dunite Rose, 1965; Nokleberg and others, 1992 [MF]; 1992 [Open-File]; Bittenbender and others, 2007).

The prospect was discovered by MAN Resources in 2000 (L.D. Hulbert, oral communication, 2001) but apparently has no workings on it. MAN Resources transferred the property to Nevada Star Resources who held claims on it until at least 2005. Bittenbender and others (2007) of the Bureau of Land Management examined and sampled the prospect in the early 2000s.

The prospect includes two sites of mineralization about a 1,000 feet apart. One is a mineralized skarn inclusion within the mafic-ultramafic complex, and the other is mineralized skarn at the contact of the complex. The skarn has varying proportions of calcite, vesuvianite, garnet, wollastonite, epidote, olivine, and clinopyroxene, and minor plagioclase and actinolite. The ore minerals occur in pods that consist mainly of pyrrhotite, bornite, and chalcopyrite with minor digenite, chalcocite, covellite, and pyrite.

Samples of the skarn collected by MAN Resources within the mafic-ultramafic complex contained up to 4.6 percent copper, 1,040 parts per billion (ppb) gold, 7.7 parts per million (ppm) silver, 52 ppb palladium, and 11 ppb platinum (L.D. Hulbert, oral communication, 2001). Samples of the skarn at the contact of the mafic-ultramafic complex contained up to 2.5 percent copper, 258 ppb gold, 263 ppb palladium, and 55 ppb platinum. Bittenbender and others (2007) collected 6 samples. The highest metal values were 1.21 percent copper, 237 ppb gold, 19.7 ppm silver, and 57 ppb palladium.

Alteration:

Limestone adjacent or in a Triassic mafic-ultramafic complex is altered to a mineralized skarn.

Age of mineralization:

Source of the mineralization is probably the Triassic mafic-ultramafic complex at the prospect.

Generic deposit model:

Deposit model:

Copper skarn adjacent to and within a mafic-ultramafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

The prospect was discovered by MAN Resources in 2000 (L.D. Hulbert, oral communication, 2001) but apparently has no workings on it. MAN Resources transferred the property to Nevada Star Resources who held claims on it until at least 2005. Bittenbender and others (2007) of the Bureau of Land Management examined and sampled the prospect in the early 2000s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1965, Geology and mineral deposits of the Rainy Creek area, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 14, 57 p., 1 sheet, scale 1:36,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (east of peak 6346)

Site type: Prospect

ARDF no.: MH134

Latitude: 63.3249 **Quadrangle:** M B-4

Longitude: 145.981

Location description and accuracy:

This prospect is on the southeast side of a ridge about 0.4 mile southeast of the top of peak 6346 at an elevation of about 5,900 feet. It is on the west side of the North Fork Rainy Creek about 0.4 mile west of the center of section 26, T. 18 S., R. 9 E., Fairbanks Meridian.

Commodities:

Main: Au, Cu, Ni, Pd, Pt

Other:

Ore minerals: Chalcopyrite, magnetite, pentlandite, pyrrhotite

Gangue minerals: Serpentine

Geologic description:

This prospect is in the Late Triassic, Rainy complex, a shallowly north-dipping ultramafic-mafic body that varies from less than 100 feet to more than 5,000 feet thick and extends for more than 12 miles (Nokleberg and others, 1992 Open-file]; Nokleberg and others, 1992 [MF]; Bittenbender and others, 2007). It is largely dunite with lesser peridotite and gabbro. A discontinuous marginal gabbro extends along most of the southern (lower) contact and is more discontinuous along the northern (upper) contact (W.T. Ellis, oral communication, 2001). The body intrudes the Pennsylvanian-Permian, Slana Spur Formation of the Wrangellia terrane.

The prospect was found by the American Copper and Nickel Company (ACNC) in 1994. Working in conjunction with Fort Knox Gold Resources Inc. they sampled and mapped it, did airborne and ground geophysical surveys over it, and diamond drilled one hole (W.T. Ellis, oral communication, 2001). Sampled by the Bureau of Land Management in the early 2000s (Bittenbender and others, 2007).

The prospect is in the footwall of the complex in a layered marginal gabbro. The layer, which is up to 1,500 feet thick at the prospect includes gabbronorite, coarsely-crystalline clinopyroxene gabbro, wehrlite, and mineralized mafic gabbro. The mineralized gabbro contains 5 to 15 percent disseminated pyrrhotite with minor chalcopyrite and pentlandite and is iron and copper stained. Two samples contained 0.15 to 0.23 percent copper, 0.12 to 0.21 percent nickel, 153 to 180 parts per billion (ppb) palladium, 58 to 72 ppb platinum, and 18 to 51 ppb gold (W.T. Ellis, oral communication, 2001).

Bittenbender and others (2007 collected two samples from the mineralized gabbro. A sample with about 5 percent pyrrhotite and chalcopyrite contained 29 ppb gold, 75 ppb platinum, 236 ppb palladium, 1,690 parts per million (ppm) copper, and 1,045 ppm nickel. They also sampled a thin dike of leucocratic, pegmatitic gabbro dike that had disseminated chalcopyrite; an analysis showed insignificant precious and base metals.

Alteration:

Mafic and ultramafic rocks are variably serpentinized.

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic sill.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The prospect was found by the American Copper and Nickel Company (ACNC) in 1994. Working in conjunction with Fort Knox Gold Resources Inc. they sampled and mapped it, did airborne and ground geophysical surveys over it, and diamond drilled one hole (W.T. Ellis, oral communication, 2001). Sampled by the Bureau of Land Management in the early 2000s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Rainy; East Peak

Site type: Prospect

ARDF no.: MH135

Latitude: 63.3281 **Quadrangle:** M B-4

Longitude: 145.9917

Location description and accuracy:

The East Peak prospect is a few hundred feet east of peak 6346 at an elevation of 6,000 feet. It is about 4.0 miles northwest of the mouth of the West Fork of Rainy Creek and about 0.4 mile northeast of the center of section 27, T. 18 S., R. 9 E., of the Fairbanks Meridian. The location is accurate to within 1/4 mile.

Commodities:

Main: Cu, Ni, Pd, Pt

Other: Au, Co, Cr

Ore minerals:

Gangue minerals:

Geologic description:

The East Peak prospect is in an Upper Triassic ultramafic-mafic Rainy complex which intrudes the Slana Spur Formation of Pennsylvanian and Permian age (Nokleberg and others, 1992; Nokleberg and others, 1992; Bittenbender and others, 2007). In this area the complex includes a basal layered gabbro sequence as much as 1,500 feet thick; prominent rock types are gabbronorite, coarsely-crystalline clinopyroxene melagabbro, wherlite, and minor serpentinized dunite.

From 1995 to 1999, the prospect was explored by American Copper and Nickel Company (ACNC) working with Fort Knox Gold Resources, Inc. Their work included rock sampling, airborne and ground geophysical surveys, and one diamond drill hole (W.T. Ellis, oral communication, 2001). Active claims were held by MAN Resources through at least 2001.

Mineralization consists of 5 to 15 percent disseminated pyrrhotite with minor chalcopyrite and pentlandite in coarse-grained olivine melagabbro with 15 to 25 percent feldspar. Two rock samples collected by American Copper and Nickel Company contained 0.27 and 0.30 percent copper, 0.13 and 0.08 percent nickel, 84 and 510 parts per billion (ppb) palladium, and 110 and 55 ppb platinum. A sample collected by MAN Resources contained 46 ppb gold, 0.03 percent copper, 0.085 percent nickel, 510 ppb palladium, and 55 ppb platinum (W.T. Ellis, oral communication, 2001).

Bittenbender and others (2007) collected two samples at the prospect and 5 more in the general area. The two samples from the prospect contained up to 100 ppb platinum, 65 ppb palladium, 36 ppb gold, 2,010 parts per million (ppm) copper, and 1,175 ppm nickel. The five samples nearby contained lesser precious metals but up to 2,590 ppm nickel, 1,090 ppm chromium and 138 ppm cobalt.

In 2011, Pure Nickel Inc. reported a mapping program on the Rainy complex, identifying several gossanous areas at the complex's contact with the sedimentary host rocks. Grab samples from these gossanous contact rocks returned values up to 130 ppb gold, 150 ppb platinum, and 550 ppb palladium. The gossanous zones are interpreted to reflect deposition of sulfides at the basal contact of the Rainy complex and, thus this stratigraphic interval is thought to offer significant potential for economic mineralization (Pure Nickel Inc., 2011).

Alteration:

The olivine melagabbro and dunite are locally serpentinized (Bittenbender and others, 2007).

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex (Nokleberg and others, 1992).

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

From 1995 to 1999, the prospect was explored by American Copper and Nickel Company (ACNC) working with Fort Knox Gold Resources, Inc. Their work included rock sampling, airborne and ground geophysical surveys, and one diamond drill hole (W.T. Ellis, oral communication, 2001). Claims held by MAN Resources were active through at least 2001. Examined and sampled by the Bureau of Land Management in the early 2000s.

In 2011, Pure Nickel Inc. reported a mapping program on the Rainy complex, identifying several gossanous areas at the complex's contact with the sedimentary host rocks. Grab samples from these gossanous contact rocks returned values up to 130 parts per billion (ppb) gold, 150 ppb platinum, and 550 ppb palladium. The gossanous zones are interpreted to reflect deposition of sulphides at the basal contact of the Rainy complex and, thus this stratigraphic interval is thought to offer significant potential for economic mineralization (Pure Nickel Inc., 2011).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

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Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

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of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Pure Nickel Inc., 2011, Pure Nickel MAN Alaska Exploration Update: http://www.purenickel.com/s/NewsReleases.asp?ReportID=497855 (accessed July 9, 2014).

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-11

Site name(s): Unnamed (West Fork Rainy Creek)

Site type: Prospect

ARDF no.: MH143

Latitude: 63.2938 **Quadrangle:** M B-4

Longitude: 145.9666

Location description and accuracy:

This prospect is at an elevation of about 4,000 feet, about 2.2 miles west-northwest of the junction of the North and West Forks of Rainy Creek. It is 0.3 mile southeast of the center of section 2, T. 19 S., R. 9 E.

Commodities:

Main: Ag, Cu, Ni

Other: Zn

Ore minerals: Chalcopyrite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

The rocks in the area are tuffs and sediments that are interbedded with Triassic mafic and ultramafic rocks (Rose, 1965; Nokleberg and others, 1992 [MF], 992 [Open-File]). Bittenbender and others (2007) found an iron-stained outcrop of gabbro about 10 by 20 feet in size with pyrrhotite, pyrite, and chalcopyrite. Samples contained up to 7,040 parts per million (ppm) copper, 1,720 ppm nickel, 2.9 ppm silver, and 258 ppm zinc; most samples contained about a 10th as much. They identified a 30 by 50 foot xenolith nearby of garnet-epidote skarn in gabbro as well as several smaller such bodies. The skarn has a few percent disseminated chalcopyrite. They ascribe the source of the mineralization and the skarns to Triassic(?) gabbro intrusions nearby.

Alteration:

Mineralized skarn developed near gabbro intrusions.

Age of mineralization:

Mineralization possibly related to Triassic(?) gabbro.

Generic deposit model:

Deposit model:

Copper-nickel mineralization in skarn and gabbro.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Examined and sampled by Bureau of Management in the early 2000s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1965, Geology and mineral deposits of the Rainy Creek area, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 14, 57 p., 1 sheet, scale 1:36,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (south of West Fork Rainy Creek)

Site type: Occurrence

ARDF no.: MH144

Latitude: 63.3008 **Quadrangle:** M B-4

Longitude: 146.001

Location description and accuracy:

The prospect is at an elevation of about 4,800 feet, about 3.3 miles northeast of the mouth of Specimen Creek on Eureka Creek. It is about 0.3 mile north-northeast of the center of section 3, T. 19 S., R. 9 E.

Commodities:

Main: Ag, Au, Cu, Ni

Other:

Ore minerals: Chalcopyrite, marcasite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

As described by Nokleberg and others (1992 [OF]; 1992 [MF]), the rocks in the area are Triassic gabbro to the south and Triassic greenstone to the north. Rose (1965) described the mineralization as a flat-lying lens about 3 feet thick and 10 feet long that consists of massive pyrrhotite, pyrite, and minor pyrite. The pyrrhotite is partly altered to marcasite. The lens is overlain by white, bleached marble with diopside and brown garnet; gabbro is beneath it (Bittenbender and others, 2007). A sample collected by Rose (1965) contained 0.37 percent copper, 0.5 percent nickel, 0.03 ounce of gold per ton, and 0.33 ounce of silver per ton. A sample collected by Nokleberg and others (1991) contained 0.43 percent copper and 12.5 parts per million silver. Bittenbender and others (2007) collected a sample across 2.5 feet of the lens of mineralization; it contained more than 15 percent iron, 659 ppm copper, 982 ppm nickel, 0.0003 ounce of gold per ton, and 0.009 ounce of silver per ton. As of 2007, the prospect was covered by a large block of claims held by Nevada Star Resource Corp. but there was no indication of any workings on it.

Alteration:

Pyrrhotite oxidized to marcasite. Lens of mineralization associated with a diopside-garnet marble.

Age of mineralization:

Possible Triassic or younger based on the age of some of the host rocks in the area but may be related to nearby Permian intrusive rocks.

Generic deposit model:

Deposit model:

Copper-nickel skarn deposit?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

As of 2007, the prospect was on claims held by Nevada Star Resource Corp. but there was no indication of any substantial workings on it.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

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Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1965, Geology and mineral deposits of the Rainy Creek area, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 14, 57 p., 1 sheet, scale 1:36,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (northeast side of West Fork Rainy Creek)

Site type: Prospect

ARDF no.: MH145

Latitude: 63.3036 **Quadrangle:** M B-4

Longitude: 145.984

Location description and accuracy:

This prospect is at an elevation of about 4,200 feet on the north side of West Fork Rainy Creek. It is about 0.7 mile northwest of the center of section 2 T. 19 S., R. 9 E.

Commodities:

Main: Ag, Au, Cu, Zn

Other:

Ore minerals: Chalcopyrite, gold, magnetite, malachite, pyrite, pyrrhotite

Gangue minerals: Amphibole, calcite, epidote, garnet, pyroxene, quartz

Geologic description:

Mineralization in Rainy Creek has been known since 1916 (Brooks, 1918; Martin, 1920). There has been some hand trending of unknown age at this prospect and it was covered by regionally extensive claims staked by MAN Resources as of 2007. It was examined and sampled in several episodes by state and federal agencies from 1964 to the 2000s.

The prospect is in Pennsylvanian to Permian limestone to limey sedimentary rocks of the Slana Spur Formation (Rose, 1965; Nokleberg and others, 1992 [MF]; 1992 [Open-File]; Bittenbender and others, 2007).

The mineralization is associated with a band of magnetite-pyroxene-garnet skarn about 200 feet long. The limestone adjacent to the skarn is bleached and silicified. There is a gabbro dike nearby that may be related to the nearby Late Triassic Rainy mafic-ultramafic complex. Chalcopyrite occurs widely in the skarn in small amounts and there are lenses of sulfides made up mainly of pyrrhotite, pyrite, and chalcopyrite. Rose (1965) collected a sample of skarn that contained 0.42 percent copper, 0.01 ounce of gold per ton, and 0.40 ounce of silver per ton. The U.S. Geological Survey collected grab samples that contained up to 5.6 percent copper, 0.07 percent zinc, 0.009 ounce of silver per ton, and 0.035 ounce of gold per ton (Nokleberg and others, 1991). Bittenbender and others (2007) collected a sample from a pile of massive-sulfide rubble that contained 2.49 parts per million (ppm) gold, 4,770 ppm copper, and 3.4 ppm silver.

Alteration:

Mineralization associated with a band of magnetite-pyroxene-garnet skarn.

Age of mineralization:

Perhaps related to a nearby Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Silver-gold-copper skarn near a Triassic mafic-ultramafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

The mineralization at this prospect has been known since 1916 (Brooks, 1918; Martin, 1920). There has been some hand trending of unknown age on it and it was covered by regionally extensive claims staked by MAN Resources as of 2007. It was examined and sampled several times by state and federal agencies from 1964 to the the 2000s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Brooks, A.H., 1918, Mineral resources of Alaska, 1916: U.S. Geological Survey Bulletin 662, 469 p.

Martin, G.C., 1920, The Alaska mining industry in 1918: U.S. Geological Survey Bulletin 712-A, p. 1-52.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

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Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1965, Geology and mineral deposits of the Rainy Creek area, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 14, 57 p., 1 sheet, scale 1:36,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Moneta-Porcupine

Site type: Prospect

ARDF no.: MH149

Latitude: 63.3167 **Quadrangle:** M B-4

Longitude: 145.9924

Location description and accuracy:

The Moneta-Porcupine prospect is along a narrow ridge about 4.3 miles northeast of the mouth of Specimen Creek on Eureka Creek. It is about 0.5 mile north-northeast of the center of section 34, T. 18 S., R. 9 E.

Commodities:

Main: Ag, Au, Cu

Other:

Ore minerals: Bornite, chalcopyrite, malachite

Gangue minerals:

Geologic description:

As originally described by Rose (1965), chalcopyrite and bornite occur in tactite or hornfels about 3 feet thick. As described by Bittenbender and others (2007), the mineralization is in a small xenolith or pendant of light-colored skarn developed from Pennsylvanian or Permian marble that is in serpentinized ultramafic rocks. The skarn is copper stained and has small areas of disseminated bornite. Bornite also occurs in a foot-wide zone in a thin, silicified gabbro dike several feet from the marble. A select sample of the skarn contained 1.65 percent copper and a representative sample across the dike contained 0.34 percent copper.

Nokleberg and others (1991; 1992 [MF]; 1992 [Open-File]) have a notably different description of the prospect. They identified chalcopyrite, bornite, and malachite in and next to north-northeast-trending fractures in meta-andesite that is part of the Slana Spur Formation of Pennsylvanian and Permian age. The sulfide-bearing zones are as much as a meter thick and several meters long.

The prospect was staked by Moneta-Porcupine in 1964 but there is no indication that they did any substantial work on it. Claims held by MAN Resources Corp. were active in 2007.

Alteration:

Mineralization associated with skarn xenolith or pendant in serpentinized ultramafic rocks. Silicification of gabbro dike.

Age of mineralization:

Generic deposit model:

Deposit model:

Cu skarn associated with serpentinized ultramafic rocks.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The prospect was staked by Moneta-Porcupine in 1964 but there is no indication that they did any substantial work on it. Claims held by MAN Resources Corp. were active in 2007.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

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Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1965, Geology and mineral deposits of the Rainy Creek area, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 14, 57 p., 1 sheet, scale 1:36,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (west of upper North Fork Rainy Creek)

Site type: Occurrence

ARDF no.: MH150

Latitude: 63.3201 **Quadrangle:** M B-4

Longitude: 145.9692

Location description and accuracy:

This occurrence is at an elevation of about 4,950 feet on the hillside west of the middle section of the North Fork Rainy Creek. It is about 3.1 miles northwest of the junction of the North and West Forks of Rainy Creek and about 0.4 mile south of the center of section 26, T. 18 S., R. 9 E.

Commodities:

Main: Ag, Au, Cu, Ni

Other:

Ore minerals: Chalcopyrite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

This occurrence is in a unit of hornfelsed calcareous sedimentary rocks that are part of the Pennsylvanian and Permian, Slana Spur Formation, which has been intruded by Triassic gabbro dikes and sills (Rose, 1965; Nokleberg and others, 1992 [MF], 1992 [Open-File]). Bittenbender and others (2007) describe discontinuous lenses with sulfides, mainly pyrrhotite, with minor chalcopyrite and pyrite, that they traced for about 700 feet in silicified sedimentary rocks. The source of the metals may be the nearby gabbro dikes. A sample of mineralized hornfels collected by Rose (1965) contained less than 0.1 percent each of copper and nickel, 0.02 ounce of gold per ton, and 0.4 ounce of silver per ton Nokleberg and others (1991) cited a sample that contained 0.6 percent copper, 0.2 percent cobalt, 0.004 ounce of gold per ton, and 0.09 ounce of silver per ton.

Examined and sampled by the Alaskan geological survey before 1965, by the U.S. Geological Survey in before 1991, and by the Bureau of Land Management before 2007. Covered by a regionally extensive block of MAN Resources claims in 2007.

Alteration:

Scattered copper-nickel mineralization is associated with hornfelsed and silicified sedimentary rocks near gabbro dikes.

Age of mineralization:

Source of metals may be nearby Triassic gabbro dikes.

Generic deposit model:

Deposit model:

Weak copper-nickel mineralization in sedimentary rocks cut by gabbro dikes.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Examined and sampled by the Alaskan geological survey before 1965, by the U.S. Geological Survey in before 1991, and by the Bureau of Land Management before 2007. Covered by a regionally extensive block of MAN Resources claims in 2007.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

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Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1965, Geology and mineral deposits of the Rainy Creek area, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 14, 57 p., 1 sheet, scale 1:36,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Hail Creek

Site type: Prospect

ARDF no.: MH152

Latitude: 63.3264 **Quadrangle:** M B-4

Longitude: 145.931

Location description and accuracy:

The Hail Creek prospect is at an elevation of about 4,200 feet, about 2.8 miles north-northwest of the junction of the North Fork and West Fork of Rainy Creek. It is about 0.2 mile east of the center of section 25, T. 18 S., R. 9 E.

Commodities:

Main: Cu, Ni, Pd, Pt

Other: Co, Cr, Zn

Ore minerals: Chalcopyrite, magnetite, malachite, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

The North Rainy prospect is in the Late Triassic, Rainy ultramafic-mafic complex that intrudes the Slana Spur Formation of Pennsylvanian and Permian age. The Rainy complex is up to 5,000 feet thick, dips shallowly north, and can be traced for more than 15 miles; it is mainly serpentinized dunite with subordinate peridotite, pyroxenite, and gabbro (Nokleberg and others, 1992 [Open-File]; Nokleberg and others, 1992 [MF]; Bittenbender and others, 2007). The base of the complex is a layered gabbro as much as 1,500 feet thick.

The area was staked by American Copper and Nickel Company ACNC in 1995 but the Hail Creek prospect was not discovered until 1998 when their exploration followed up a reconnaissance large-loop geophysical survey and an anomalous float sample found in 1995 (W.T. Ellis, oral communication, 2001). They drilled a 250-foot hole in 1998 but it failed to intersect mineralization.

The Hail Creek prospect is on an elongate east-northeast-trending magnetic high that coincides with nine airborne electromagnetic anomalies (W.T. Ellis, oral communication, 2001). The eastern string of four anomalies marks an iron oxide-stained, serpentinized and silicified zone in a dunite that contains local copper- and iron-stained fractures. (W.T. Ellis, oral communication, 2001). Downhill to the west along this trend, the dunite is intruded by variably serpentinized olivine gabbro. A copper-stained, sulfide-bearing serpentinized zone is present at one location along the poorly exposed gabbro contact. The sulfide minerals range from a trace to 2 percent disseminated chalcopyrite, pentlandite, pyrrhotite, and magnetite. Strong large-loop electromagnetic geophysical conductors were detected on three surveyed lines.

Float sample contained up to 0.39 percent nickel, 0.24 percent copper, 0.09 percent cobalt, 216 parts per billion (ppb) palladium, and 295 ppb platinum. A rock grab sample from the prospect assayed 0.25 percent nickel, 0.48 percent copper, 68 ppb palladium, and 95 ppb platinum. The 250-foot drill hole failed to intersect significant mineralization at one of the stronger geophysical anomalies.

Bittenbender and others (2007) examined and sampled the prospect in 2002. A sample with copper sulfides and copper staining from a contact zone between a gabbro dike and serpentinized dunite contained 2,430 parts per million (ppm) copper, 578 ppm zinc, 31 ppm chromium, 70 ppm nickel, 1.3 ppb platinum, and 2 ppb palladium. A sample of dunite contained 455 ppm chromium, 1,910 ppm nickel, 21 ppb platinum, and 19 ppb palladium.

Alteration:

Local silicification and serpentinization of dunite and gabbro.

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The area was staked by American Copper and Nickel Company ACNC in 1995 but the Hail Creek prospect was not discovered until 1998 when their exploration followed up a reconnaissance large-loop geophysical survey and an anomalous float sample (W.T. Ellis, oral communication, 2001). A 250-foot hole was drilled in 1998 but failed to intersect mineralization. Examined and sampled by the Bureau of Land Management in 2002.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): North Rainy

Site type: Prospect

ARDF no.: MH153

Latitude: 63.342 **Quadrangle:** M B-4

Longitude: 145.9333

Location description and accuracy:

The North Rainy prospect is at an elevation of about 4,200 feet on the east side of the North Fork Rainy Creek about 3.8 miles north-northwest of its mouth. It is about 0.2 mile northeast of the center of section 24, T. 18 S., R. 9 E. The location is accurate.

Commodities:

Main: Cu, Ni, Pd, Pt

Other: Co

Ore minerals:

Gangue minerals:

Geologic description:

The North Rainy prospect is in the Late Triassic, Rainy ultramafic-mafic complex that intrudes the Slana Spur Formation of Pennsylvanian and Permian age. The Rainy complex is up to 5,000 feet thick, dips shallowly north and is mainly serpentinized dunite with subordinate peridotite, pyroxenite, and gabbro (Nokleberg and others, 1992 [Open-File]; Nokleberg and others, 1992 [MF]; Bittenbender and others, 2007). In this area, the base of the complex is a layered gabbro as much as 1,500 feet thick.

The rocks at this prospect are variably serpentinized dunite near fine-grained gabbro. Near the hanging wall contact of the complex, there is a well-developed breccia zone at a dunite-gabbro contact that is locally mineralized. The breccia consists of angular dunite clasts of various sizes and at least one large inclusion of hornfelsed sedimentary rocks in a fine-grained gabbro matrix.

From 1995 to 1999, the area was explored by American Copper and Nickel Company (ACNC) working with Fort Knox Gold Resources, Inc. in their regional search for copper-nickel-PGE mineralization. Their work in the area included rock sampling, and airborne and ground geophysical surveys W.T. Ellis, oral communication, 2001). They found the North Rainy prospect in 1998 and carried out a large-loop geophysical survey. over it. There were active claims on the prospect to at least 2002. It was examined and sampled by the Bureau of Land Management in the early 2000s.

The mineralization consists of 2 to 4 percent sulfides, mainly pyrrhotite, with chalcopyrite, and pentlandite (?), disseminated in gabbro, (W.T. Ellis, oral communication, 2001). Float of sulfide-bearing dunite, gossan, and copper-stained serpentinite occur in a few places along the breccia contact. Rock samples contained as much as 0.18 percent nickel, 0.63 percent copper, 0.02 percent cobalt, 76 parts per billion (ppb) palladium, and 80 ppb platinum.

Bittenbender and others (2007) examined and sampled the prospect. Their best sample was dunite that contained 74 ppb platinum, 62 ppb palladium, 29 ppb gold, and 2,590 ppm nickel. They also identified: 1) lenses of massive to semi-massive sulfides, mainly pyrite or pyrrhotite and chalcopyrite, and 2) mineralized silica-flooded fault zones in an area of about 150 square feet in hornfelsed sedimentary rocks at the contact of the complex. Samples of the massive sulfides contained up to 158 ppb gold and 1.04 percent copper. Samples from the mineralized fault zones contained up to 445 ppb gold, 25 parts per million (ppm) silver, 2.08 percent copper, and 4,070 ppm lead.

Alteration:

Irregular serpentinization; oxidization of iron and copper minerals.

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic complex; massive sulfides and mineralized veins near the contact of the complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

From 1995 to 1999, the area was explored by American Copper and Nickel Company (ACNC) working with Fort Knox Gold Resources, Inc. in their regional search for copper-nickel-PGE mineralization. Their work in the area included rock sampling, and airborne and ground geophysical surveys W.T. Ellis, oral communication, 2001). They found the North Rainy prospect in 1998 and carried out a large-loop geophysical survey. over it. There were active claims on the prospect to at least 2002. It was examined and sampled by the Bureau of Land Management in the early 2000s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

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Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (north fork of Ann Creek)

Site type: Prospect

ARDF no.: MH155

Latitude: 63.3484 **Quadrangle:** M B-4

Longitude: 145.8777

Location description and accuracy:

This prospect is at the head of the north fork of Ann Creek at an elevation of about 4,300 feet. It is about 0.6 mile south-southwest of peak 5317 and about 0.6 mile south of the center of section 17, T. 18 S., R. 10 E.

Commodities:

Main: Au, Cu

Other:

Ore minerals: Chalcopyrite, malachite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

As described by W.T. Ellis (oral communication, 2001), this prospect consists of copper stained pods of pyrrhotite, chalcopyrite, and pyrite in hornfelsed sedimentary rocks of the Pennsylvanian and Permian, Slana Spur Formation. The sedimentary rocks are below serpentinized peridotite of the Upper Triassic, Rainy mafic-ultramafic complex (Rose, 1965; Nokleberg and others, 1992 [MF; 1992 [Open-File]). Samples contained up to 1.3 percent copper and 629 parts per billion gold.

Bittenbender and others (2007) identified slivers of hornfelsed sedimentary rocks in faulted ultramafic rocks here. They found only sparse disseminated sulfides in both the sedimentary rocks and the ultramafic rocks and none of their samples contained nearly the metal values of the Ellis samples.

Alteration:

Peridotite is serpentinized; the sedimentary rocks are hornfelsed; copper minerals are oxidized.

Age of mineralization:

Probably related to the Late Triassic mafic and ultramafic rocks in the area.

Generic deposit model:

Deposit model:

Cu in hornfels (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b

Production Status: None

Site Status: Inactive

Workings/exploration:

Limited sampling by government and industry.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Bittenbender, P.E., and Gensler, E.G., 2003, Mineral investigations in the Delta River Mining District, east-central Alaska, 2001-2002: U. S. Bureau of Land Management- Alaska, Open-File Report 91, 82 p.

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Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1965, Geology and mineral deposits of the Rainy Creek area, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 14, 57 p., 1 sheet, scale 1:36,000.

Stout, J.H., 1976, Geology of the Eureka Creek area, east-central Alaska Range: Alaska Division of Geological and Geophysical Surveys, Geologic Report 46, 32 p., 1 sheet, scale 1:63,360.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Rainy Breccia

Site type: Prospect

ARDF no.: MH156

Latitude: 63.3328 **Quadrangle:** M B-4

Longitude: 145.9002

Location description and accuracy:

The Rainy Breccia prospect is at an elevation of about 5,600 feet, 2.9 miles north of the junction of the North and West Forks of Rainy Creek. It is 0.6 mile south-southwest of the center of section 19, T. 18 S., R. 10 E.

Commodities:

Main: Cu, Ni, Pd, Pt

Other: Co

Ore minerals: Chalcopyrite, magnetite, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

The Rainy Breccia prospect is near the north margin of the Late Triassic, Rainy Creek ultramafic-mafic complex that intrudes volcanic and sedimentary rocks of the Tetelna Volcanics and the Slana Spur Formations, both of Pennsylvanian and Permian age (Stout, 1976, Nokleberg and others, 1992 [MF]; 1992 [Open-File]; Bittenbender and others, 2007). The complex is up to 5,000 feet thick, dips shallowly north, and can be traced for more than 15 miles. It is mainly serpentinized dunite with subordinate peridotite, pyroxenite, and gabbro. The base of the complex is a layered gabbro as much as 1,500 feet thick.

The prospect was discovered by the American Copper and Nickel Company (ACNC) in 1995 and later examined and sampled by the Bureau of Land Management (Bittenbender and others, 2007). As described by W.T. Ellis (oral communication, 2001), the Rainy Breccia prospect is in breccia that consists of subrounded clasts of dunite in a dark-colored gabbronorite matrix. The unit is several hundred feet long and approximately 50 feet thick. The breccia strikes S65E and dips 75N. The mineralization in the matrix consists of up to 6 percent disseminated pyrrhotite and magnetite, with traces of chalcopyrite and pentlandite as inclusions in the pyrrhotite. A grab sample of the sulfide-bearing breccia contained 0.12 percent nickel, 0.15 percent copper, 0.01 percent cobalt, 26 parts per billion (ppb) palladium, and 25 ppb platinum.

Bittenbender and others (2007) examined the area but were not certain that they located the the prospect described by Ellis. They did locate two breccia zones with disseminated sulfides in the immediate area; one with peridotite clasts in a leucogabbro matrix and the other brecciated peridotite. However, their samples had low base- and precious-metal values. The best contained 135 parts per million (ppm) copper, 1,285 ppm nickel, 13.9 ppb platinum, and 16 ppb palladium.

Alteration:

Irregular serpentinized zones occur along the breccia contact.

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic sill.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

The prospect was discovered by the American Copper and Nickel Company (ACNC) in 1995 and was later examined and sampled by the Bureau of Land Management (Bittenbender and others, 2007).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Foley, J.Y., 1992, Ophiolite and other ultramafic metallogenic provinces in Alaska (west of the 141th meridian): U.S. Geological Survey Open-File Report 92-20-B, 55 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Stout, J.H., 1976, Geology of the Eureka Creek area, east-central Alaska Range: Alaska Division of Geological and Geophysical Surveys, Geologic Report 46, 32 p., 1 sheet, scale 1:63,360.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): White Band

Site type: Prospect

ARDF no.: MH158

Latitude: 63.3179 **Quadrangle:** M B-4

Longitude: 145.9143

Location description and accuracy:

The White Band prospect is at an elevation of about 4,800 feet on the east valley wall of upper North Fork Rainy Creek. It is about 2.1 miles north-northwest of the junction of the North and West Forks of Rainy Creek and about 0.6 mile south-southwest of the center of section 30, T. 18 S., R. 10 E.

Commodities:

Main: Au, Cu, Ni, Pd, Pt

Other:

Ore minerals: Chalcopyrite, malachite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

The White Band prospect is in the Late Triassic, Rainy mafic-ultramafic complex which intrudes the Slana Spur Formation of Pennsylvanian and Permian age. The complex is up to 5,000 feet thick, dips shallowly north, and can be traced for more than 15 miles; it is mainly serpentinized dunite with subordinate peridotite, pyroxenite, and gabbro (Nokleberg and others, 1992 [MF]; 1992 [Open-File]; Bittenbender and others, 2007). The base of the complex is a layered gabbro as much as 1,500 feet thick.

The White Band prospect was found in the 1990s by American Copper and Nickel Company during their regional exploration for nickel and copper (W.T. Ellis, oral communication, 2001). The prospect consists of 2 to 3 percent of disseminated pyrite, pyrrhotite, and chalcopyrite in a prominent band of white, anorthosite gabbro in a peridotite unit near the southern contact of the Rainy complex. Samples of the sulfide-bearing white gabbro contained 3,688 parts per billion (ppb) gold, 210 ppb palladium, 95 ppb platinum, 0.27 percent copper, and 0.11 percent nickel (W.T. Ellis, oral communication, 2001). Samples of apparently the same rock collected by Bittenbender and others (2007) contained lower precious metal values: up to 16 ppb gold, 74 ppb platinum, 2,700 parts per million (ppm) copper, and 2,030 ppm nickel. They also collected a float sample of iron- and copper-stained melagabbro about 300 feet higher in elevation from the white gabbro that contained 1,070 ppb gold, 227 ppb platinum, 348 ppb palladium, 1,570 ppm copper, and 1,270 ppm nickel.

Alteration:

The olivine-bearing ultramafic rocks are variably serpentinized; copper minerals are locally oxidized.

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The White Band prospect was found in the 1990s by American Copper and Nickel Company during their regional exploration for nickel and copper (W.T. Ellis, oral communication, 2001). Examined and sampled by the Bureau of Land Management in the early 2000s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Foley, J.Y., 1992, Ophiolite and other ultramafic metallogenic provinces in Alaska (west of the 141th meridian): U.S. Geological Survey Open-File Report 92-20-B, 55 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Ann Fork

Site type: Prospect

ARDF no.: MH163

Latitude: 63.3278 **Quadrangle:** M B-4

Longitude: 145.8641

Location description and accuracy:

The Ann Fork prospect is at an elevation of about 4,280 feet, about 2.8 mile north-northeast of the junction of the North Fork and West Forks of Rainy Creek. It is about 0.5 mile east-northeast of the center of section 29, T. 18 S., R. 10 E.

Commodities:

Main: Au, Cu, Ni, Pd, Pt

Other:

Ore minerals: Chalcopyrite, ilmenite, magnetite, pentlandite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

The Ann Fork prospect is near the north margin of the Late Triassic, Rainy mafic-ultramafic complex that intrudes volcanic and sedimentary rocks of the Tetelna and Slana Spur Formations of Pennsylvanian and Permian age (Stout, 1976, Nokleberg and others, 1992; Nokleberg and others, 1992; Bittenbender and others, 2007). The complex is up to 5,000 feet thick, dips shallowly north, and can be traced for more than 15 miles; it is mainly serpentinized dunite with subordinate peridotite, pyroxenite, and gabbro . The bas of the complex is a layered gabbro as much as 1,500 feet thick.

The prospect was first sampled by Barker (1988); it was examined and sampled by industry in the early 1990s, and it was examined and sampled by the Bureau of Land Management in 2002 (Bittenbender and others, 2007).

The mineralization at the Ann Fork prospect consists of semi-massive, net-textured, and disseminated sulfides, mainly pyrrhotite, with pentlandite, chalcopyrite, magnetite, and ilmenite, in gabbro dikes(?) that cut serpentinized peridotite and pyroxenite (Bittenbender and others, 2007). The mineralization is locally brecciated and oxidized to gossan; the brecciated mineralization is probably remobilized from primary magmatic mineralization in the Rainy complex. Some of the semi-massive mineralization has up to 80 percent sulfides across 1 to 2 feet. Garnet-pyroxene skarn has replaced marble beds near the contact of the Rainy ultramafic-mafic complex. Dunite in the complex is strongly serpentinized near a diorite intrusion at the contact.

Bittenbender and others (2007) collected 4 samples up to 6.5 feet long in the gabbro. The highest grade was a sample of semi-massive sulfides with 39 parts per billion (ppb) gold, 2.15 percent copper, 1,820 parts per million nickel, 72 ppb platinum, and 375 ppb palladium. Barker (1988) had previously analyzed samples that showed similar metal values.

Alteration:

Garnet-pyroxene skarn has replaced marble beds near the contact of the Rainy ultramafic-mafic complex. Dunite in the complex is strongly serpentinized near a diorite intrusion at the contact.

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Primary and remobilized nickel-copper-PGE mineralization in and adjacent to a differentiated mafic-ultramafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

The prospect was first sampled by Barker (1988); it was examined and sampled by industry in the early 1990s, and it was examined and sampled by the Bureau of Land Management in 2002 (Bittenbender and others, 2007).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Barker, J.C., 1988, Distribution of platinum-group elements in an ultramafic complex near Rainbow Mountain, east-central Alaska Range, IN Vassilou, A.H., Hausen, D.M., and Carson, D.J.T, eds, Process Mineralogy VII, Applications to mineral beneficiation: Proceedings of the Metal Society SME/AIME Joint [Annual] Meeting, Denver, Colo., p. 197-220.

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Foley, J.Y., 1992, Ophiolite and other ultramafic metallogenic provinces in Alaska (west of the 141th meridian): U.S. Geological Survey Open-File Report 92-20-B, 55 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

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Stout, J.H., 1976, Geology of the Eureka Creek area, east-central Alaska Range: Alaska Division of Geological and Geophysical Surveys, Geologic Report 46, 32 p., 1 sheet, scale 1:63,360.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): East Rainy

Site type: Prospect

ARDF no.: MH164

Latitude: 63.3301 **Quadrangle:** M B-4

Longitude: 145.8792

Location description and accuracy:

The East Rainy prospect is at an elevation of 4,900 feet about 2.8 miles N10E from the junction of the North and West Forks of Rainy Creek. It is about 0.4 mile north of the center of section 29, T. 18 S., R. 10 E., of the Fairbanks Meridian. Figure 18 of Bittenbender and others (2007) is a geologic map of the prospect.

Commodities:

Main: Cu, Ni, Pd, Pt

Other: Au, Co, Ir, Os, Rh, Ru

Ore minerals: Chalcopyrite, magnetite, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

The East Rainy prospect is near the north margin of the Late Triassic, Rainy Creek ultramafic-mafic complex that intrudes volcanic and sedimentary rocks of the Tetelna Volcanics and the Slana Spur Formations, both of Pennsylvanian and Permian age (Stout, 1976, Nokleberg and others, 1992 [MF]; 1992 [Open-File]; Bittenbender and others, 2007). The complex is up to 5,000 feet thick, dips shallowly north, and can be traced for more than 15 miles; it is mainly serpentinized dunite with subordinate peridotite, pyroxenite, and gabbro. The base of the complex is a layered gabbro as much as 1,500 feet thick.

The East Rainy prospect was discovered by American Copper and Nickel Company in 1995 or 1996 using data from airborne resistivity and magnetic geophysical surveys (Bittenbender and others, 2007). A joint venture with Fort Knox Gold Resources drilled a 246-foot hole in 1998. The property was acquired by Nevada Star Resources who drilled 7 holes totaling 980 feet in 2003 (Freeman, 2004).

The rocks at the East Rainy prospect are layered and gradually grade upward from porphyritic gabbro, through dunite, peridotite, feldspathic peridotite, and mafic-rich gabbro. There are at least two leucocratic gabbro dikes. (Figure 18 of Bittenbender and others (2007) is a geologic map of the geology). The mineralization is mostly in the feldspathic and mafic gabbro. The mineralization consists mainly of disseminated or net-textured pyrrhotite, pentlandite, and chalcopyrite.

Bittenbender and others (2007) collected 5 samples to characterize the mineralization. They averaged 4,085 parts per million (ppm) copper, 4,516 ppm nickel, 679 parts per billion (ppb) platinum, 774 ppb palladium, and 322 ppb gold. The highest platinum value was 950 ppb; the highest palladium value was 898 ppb.

Freeman (2004) reported that two holes in the 2003 Nevada Star drilling were in bad ground and the others did not intersect mineralization. The only notable mineralization were two, 5-foot intercepts in one hole. One intercept in feldspathic peridotite contained 1,366 ppm nickel, 833 ppm copper, 150 ppb platinum, and 148 ppb palladium. The other in leucogabbro contained 2,488 ppm nickel, 1,443 ppm copper, 205 ppb platinum, and 215 ppb palladium. The drilling indicated that the the mineralization is cut off at shallow depth by a younger intrusive body.

In 2011, Pure Nickel Inc., drilled two drill holes at East Rainy, totaling 488 meters. Platinum Group Element (PGE) values of up to 650 ppb over 2.52 meters of drill core were reported. Pure Nickel also

completed a mapping and sampling program in 2011. Highlights of metal concentrations from grab sampling at East Rainy are 2.0 percent nickel, 1.3 percent copper, and 7.9 grams of PGE + gold + silver per tonne (Pure Nickel, 2011).

Alteration:

The gabbroic rocks are moderately serpentinized (Bittenbender and others, 2007).

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex (Bittenbender and others, 2007).

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The East Rainy prospect was discovered by American Copper and Nickel Company in 1995 or 1996 using data from airborne resistivity and magnetic geophysical surveys (Bittenbender and others, 2007). A joint venture with Fort Knox Gold Resources drilled a 246-foot hole in 1998. The property was acquired by Nevada Star Resources who drilled 7 holes totaling 980 feet in 2003 (Freeman, 2004). The prospect was examined and sampled by the Bureau of Land Management in the early 2000s.

In 2011, Pure Nickel Inc., drilled two drill holes at East Rainy, totaling 488 meters. Platinum Group Element (PGE) values of up to 650 parts per billion over 2.52 meters of drill core were reported. Pure Nickel also completed a mapping and sampling program in 2011. Highlights of metal concentrations from grab sampling at East Rainy are 2.0 percent nickel, 1.3 percent copper, and 7.9 grams of PGE + gold + silver per tonne (Pure Nickel, 2011).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Freeman, C.J., 2004, Executive summary report for the MAN project, Delta River Mining District, Alaska: Unpublished report prepared by Avalon Development Corporation, Geology Report MN04EXE1, 40 p.

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Stout, J.H., 1976, Geology of the Eureka Creek area, east-central Alaska Range: Alaska Division of

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-11

Site name(s): Marsha

Site type: Prospect

ARDF no.: MH165

Latitude: 63.3436 **Quadrangle:** M B-4

Longitude: 145.848

Location description and accuracy:

The Marsha prospect is at an elevation of about 4,300 feet, about 3.3 miles west of the mouth of Ann Creek. It is about 0.4 mile north-northwest of the center of section 21, T. 18 S., R. 10 E.

Commodities:

Main: Cu, Ni, Zn

Other:

Ore minerals: Chalcopyrite, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

The Marsha prospect is associated with the Late Triassic, Rainy Creek ultramafic-mafic complex that intrudes volcanic and sedimentary rocks of the Tetelna Volcanics and the Slana Spur Formations, both of Pennsylvanian and Permian age (Stout, 1976, Nokleberg and others, 1992 [MF]; 1992 [Open-File]; Bittenbender and others, 2007). The complex is up to 5,000 feet thick, dips shallowly north, and can be traced for more than 15 miles. It is mainly serpentinized dunite with subordinate peridotite, pyroxenite, and gabbro. The prospect is just south of the Broxson Gulch thrust fault and is between splays of imbricated thrust faults that juxtapose slivers of dark ultramafic rocks with volcaniclastic rocks of the Slana Spur Foundation. Both are intruded by gabbro dikes up to 30 feet thick.

From the late 1980s into at least the 1990s, the Marsha prospect was examined and sampled by several companies, including Teck Cominco America, Northeast Mining Company, MAN Resources Inc., and Nevada Star Resource Corp. but there are no workings on it. Examined and sampled by the Bureau of Land Management in the early 2000s (Bittenbender and others, 2007).

At least three discontinuous lenses and nodules of oxidized chalcopyrite, pyrrhotite, and pentlandite are along the contact of a gabbro dike and serpentinized ultramafic rock. The largest sulfide lens is about 6 feet by 5 feet in area. Samples contained up to 6.25 percent copper, 1,540 parts per million (ppm) nickel, and 1,470 ppm zinc. The mineralization is discontinuous and does not extend far along strike.

Alteration:

The ultramafic rocks are extensively serpentinized.

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

From the late 1980s into at least the 1990s, the Marsha prospect was examined and sampled by several companies, including Teck Cominco America, Northeast Mining Company, MAN Resources Inc., and Nevada Star Resource Corp. but there are no workings on it. Examined and sampled by the Bureau of Land Management in the early 2000s (Bittenbender and others, 2007).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

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Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

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Stout, J.H., 1976, Geology of the Eureka Creek area, east-central Alaska Range: Alaska Division of Geological and Geophysical Surveys, Geologic Report 46, 32 p., 1 sheet, scale 1:63,360.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Ann Creek

Site type: Prospect

ARDF no.: MH166

Latitude: 63.3392 **Quadrangle:** M B-4

Longitude: 145.7794

Location description and accuracy:

The Ann Creek prospect trends northwest for about a mile and parallels a short tributary to lower Ann Creek. The center of the prospect is about is 1.2 miles west of the mouth of Ann Creek and near the center of section 23, T. 18 S., R. 10 E. Figure 20 of Bittenbender and others (2007) has an aerial photography of the prospect.

Commodities:

Main: Ag, Au, Cu, Ni

Other: Co, Cr, Pb, Pd, Pt

Ore minerals: Chalcopyrite, galena, pentlandite, pyrite, pyrrhotite, sperrylite

Gangue minerals:

Geologic description:

The Ann Creek prospect is in a tabular ultramafic-mafic sill 80 to 120 feet thick that trends approximately east for about a mile on the north side of a small tributary to lower Ann Creek (Rose, 1965). The rocks north of the sill are dark, siliceous sedimentary rocks and light-colored tuff. The rocks south of the sill are andesite and dacite. The rocks on both sides are part of the Pennsylvanian and Permian, Slana Spur Formation; the different lithologies rocks suggests it was intruded along a fault (Rose, 1965). Airborne magnetic data indicate that this body may connect with the Late Triassic, Rainy ultramafic-mafic complex three miles to the west (W.T. Ellis, oral communication, 2001). The Rainy complex is up to 5,000 feet thick, dips shallowly north, and can be traced for more than 15 miles. It is mainly serpentinized dunite with subordinate peridotite, pyroxenite, and gabbro (Stout, 1976; Nokleberg and others, 1992 [MF]; 1992 [Open-File]; Bittenbender and others, 2007). The base of the sill is a layered gabbro as much as 1,500 feet thick.

The Ann Creek prospect was discovered in the 1950s (Barker and others, 1985) and subsequently examined and sampled by Saunders (1962), Hanson (1963), Rose (1965), and the Bureau of Mines from 1981 to 1984 (Barker and other, 1985; Barker, 1988). Falconbridge Exploration U.S., Inc. examined the property in 1997 and had airborne, total-field-magnetics and resistivity surveys flown over it (Wells, 1998; Pritchard, 1997). The Bureau of Land Management examined and sampled the prospect several times in the early 2000s (Bittenbender and others, 2007).

The rocks in the sill at the Ann Creek prospect vary from fresh dunite, peridotite, and mafic gabbronorite to serpentinite. A dike of serpentinized peridotite extends southeast from the gabbronorite; it appears to be cut off by a fault. Near the east end of the sill, shattered and serpentinized diorite or quartz diorite is in contact with the dunite. Rose (1965) believed that the diorite may be a differentiate of the ultramafic-mafic Rainy complex.

Small lenses of massive sulfide occur in an approximately 50-foot-thick layer of gabbro that also contains disseminated pyrrhotite, pyrite, pentlandite, chalcopyrite, and a trace of galena (Rose, 1965). Serpentinite at this location also carries small amounts of sulfides. Disseminated and massive sulfide samples contained 0.17 to 2.01 percent nickel and 0.1 to 0.61 percent copper (Saunders, 1962). Samples of sulfides from a 1-foot vein assayed 0.20 ounce of gold per ton and 0.32 ounce of silver per ton (Rose, 1965). Foley (1992) collected a sample from a massive-sulfide lens that contained 1.9 percent nickel, 3.5 percent copper, 0.02

percent cobalt, 540 parts per billion (ppb) palladium, and 340 ppb platinum. Sperrylite was identified in a gabbronorite sample that contained 0.44 percent nickel, 0.3 percent copper, 0.02 percent cobalt, and 340 ppb palladium.

The Bureau of Land Management examined the Ann Creek prospect on several occasions in the early 2000s and collected 35 samples (Bittenbender and others, 2007). Their best sample was from a massive sulfide lens about 1 foot thick in serpentinized peridotite. It contained 35 ppb gold, 483 ppb platinum, 825 ppb palladium, 7,890 parts per million (ppm) copper, 6.74 percent nickel, and 1,765 ppm cobalt. Such massive sulfide lens were rare. They also collected several measured samples to determine the average grade of the deposit. A sample 40 feet long averaged 30 ppb gold, 1 ppm silver, 100 ppm cobalt, 1,000 ppm copper, 1,800 ppm nickel, 105 ppb platinum, and 145 ppb palladium.

Alteration:

Local serpentinization.

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic sill.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

The Ann Creek prospect was discovered in the 1950s (Barker and others, 1985) and subsequently examined and sampled by Saunders (1962), Hanson (1963), Rose (1965) and the Bureau of Mines from 1981 to 1984 (Barker and others, 1985; Barker, 1988). Falconbridge Exploration U.S., Inc. examined the property in 1997 and had airborne, total-field-magnetics and resistivity surveys flown over it (Wells, 1998; Pritchard, 1997). The Bureau of Land Management examined and sampled the prospect several times in the early 2000s (Bittenbender and others, 2007).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Barker, J.C., 1988, Distribution of platinum-group elements in an ultramafic complex near Rainbow Mountain, east-central Alaska Range, IN Vassilou, A.H., Hausen, D.M., and Carson, D.J.T, eds, Process Mineralogy VII, Applications to mineral beneficiation: Proceedings of the Metal Society SME/AIME Joint [Annual] Meeting, Denver, Colo., p. 197-220.

Foley, J.Y., Barker, J.C., and Brown, L.L., 1985, Critical and strategic minerals investigation in Alaska -

chromium: U.S. Bureau of Mines Open-File Report 97-85, 54 p., 1 sheet.

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

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Rose, A.W., 1965, Geology and mineral deposits of the Rainy Creek area, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 14, 57 p., 1 sheet, scale 1:36,000.

Saunders, R.H., 1961, Report on the Emericks nickel prospect (Rainbow Mountain): Alaska Territorial Department of Mines Prospect Examination 68-07, 13 p.

Saunders, R.H., 1962, Report on the Emerick west delta nickel prospect, Mt. Hayes quadrangle: Alaska Territorial Department of Mines Prospect Examination 68-08, 11 p.

Stout, J.H., 1976, Geology of the Eureka Creek area, east-central Alaska Range: Alaska Division of Geological and Geophysical Surveys, Geologic Report 46, 32 p., 1 sheet, scale 1:63,360.

Wells, K., 1998, Report on the 1997 work program for Falconbridge Exploration U.S., Inc. on the Forbes Nickel Project (PN 5-998)-Mt. Hayes quadrangle, Alaska: Unpublished report, Falconbridge Exploration U.S., Inc., 41 p.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Foley

Site type: Prospects

ARDF no.: MH167

Latitude: 63.3179 **Quadrangle:** M B-4

Longitude: 145.9238

Location description and accuracy:

The Foley prospect includes several prospects centered at an elevation of about 4,300 feet about 2.1 miles north-northwest of the junction of the North and West Forks of Rainy Creek It is near the northeast corner of section 36, T. 18 S., R. 9 E.

Commodities:

Main: Cu, Ni, Pd, Pt

Other: Au, Co, Cr, Ir, Rh, Ru

Ore minerals: Chalcopyrite, chromite, cobaltite, magnetite, malachite, pentlandite, pyrite, pyrrhotite, safflorite

Gangue minerals: Garnet, olivine, pyroxene, serpentine

Geologic description:

These prospect consist of: 1) several sulfide-bearing, garnet-pyroxene skarns in carbonate beds intruded by the Rainy ultramafic-mafic complex, and 2) sulfide-bearing basalt, diorite, gabbro, and serpentinite in the complex (Foley, 1992). The Rainy complex intrudes the Slana Spur Formation of Pennsylvanian and Permian age; the Formation includes some some carbonate layers. The Rainy complex is up to 5,000 feet thick, dips shallowly north, and can be traced for more than 15 miles; it is mainly serpentinized dunite with subordinate peridotite, pyroxenite, and gabbro (Nokleberg and others, 1992; Nokleberg and others, 1992; Bittenbender and others, 2007). The base of the complex is a layered gabbro as much as 1,500 feet thick.

The prospects were found by industry in the 1990s; examined and sampled by the Bureau Mines (Foley, 1992), the U.S. Geological Survey (Nokleberg and others, 1991), and the Bureau of Land Management (Bittenbender and others, 2007).

The mineralization examined by Nokleberg and others (1991) consists of disseminated and nearly massive pods of pyrite, pyrrhotite, magnetite, and chalcopyrite with trace pentlandite, cobaltite, and safflorite, in chromite-bearing olivine cumulates. A sample contained more than 5,000 parts per million (ppm) chromium. A U.S. Bureau of Mines sample of gabbronorite rubble contained 0.9 percent nickel, 0.25 percent copper, 0.02 percent cobalt, 1,070 parts per billion (ppb) palladium, 725 ppb platinum, 300 ppb iridium, 70 ppb rhodium, and 60 ppb ruthenium. Massive sulfide float contains 0.41 percent copper, 0.09 percent cobalt, and 65 ppb palladium (Foley, 1992). Mineralized skarn samples taken near the contact of the Rainy complex contain as much as 6.2 ppm silver, 85 ppb gold, 0.05 percent cobalt, 2.0 percent copper, and 0.09 percent nickel. The area was examined by Bittenbender and others (2007) but they did not locate the prospects.

Alteration:

Age of mineralization:

Genetically related to the emplacement of a Late Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic complex; disseminated chromite in a layered mafic-ultramafic complex; Cu skarn (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b

Production Status: None

Site Status: Active?

Workings/exploration:

Found by industry in the 1990s. Examined and sampled by the Bureau Mines (Foley, 1992), the U.S. Geological Survey (Nokleberg and others, 1991), and the Bureau of Land Management (Bittenbender and others, 2007).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Foley, J.Y., 1992, Ophiolite and other ultramafic metallogenic provinces in Alaska (west of the 141th meridian): U.S. Geological Survey Open-File Report 92-20-B, 55 p.

Foley, J.Y., Burns, L.E., Schneider, C.L., and Forbes, R.B., 1989, Preliminary report of platinum group element occurrences in Alaska: Alaska Division of Geological and Geophysical Surveys Public Data File 89-20, 32 p., 1 map sheet, scale 1:2,500,000.

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Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Primary Reference: Nokleberg and others, 1991; Foley, 1992

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Emerick; Rainbow; Talnakh

Site type: Prospect

ARDF no.: MH209

Latitude: 63.3564 **Quadrangle:** M B-4

Longitude: 145.701

Location description and accuracy:

The Emerick prospect is at an elevation of about 2,900 feet south of the terminus of the Canwell Glacier and about 1.1 mile southeast of Millers Roadhouse on the Richardson Highway. It is about 0.6 mile east-northeast of the center of section 18, T. 18 S., R. 11 E. Figure 23 in Bittenbender and others (2007) is a geologic map of the prospect.

Commodities:

Main: Cu, Ni, Pd, Pt

Other: Au, Co, Ir, Os, Rh

Ore minerals: Bornite, chalcopyrite, garnierite, malachite, pentlandite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

The Emerick prospect is in a fault-bounded sliver of Triassic serpentinized dunite, peridotite, and gabbro (Nokleberg and others, 1992 [MF]; 1992 [Open-File]]; Bittenbender and others, 2007). The prospect is in sheared and mineralized body of gabbronorite that was initially thought to be a dike (Barker, 1988; Foley and others, 1989; Foley, 1992), but is more likely a fault block within the ultramafic rocks (Wells, 1998; Bittenbender and others, 2007). The prospect is adjacent to the Broxson Gulch fault near its intersection with the Denali fault.

The prospect was discovered in 1955 by Rollie Emerick (Saunders, 1962; Bittenbender and others, 2007). Through the late 1950s, the property was examined by several individuals, the Alaska Alaska Department of Mines, and the U.S. Bureau of Mines (Saunders, 1961, 1962). Newmont Mining Company optioned the claims and dug a 1,600-foot road cut along the deposit. In 1971, the U.S. Bureau of Mines reexamined the property (Barker and others, 1985). Cominco Alaska re-staked the property in 1980s as the Rainbow claims, dug several long trenches with a dozer in 1988, and mapped and sampled them. Falconbridge Exploration U.S., Inc. staked the Talnakh claims over the property in 1990. They mapped the geology, did ground and aerial geophysical surveys over the claims, and drilled one hole 350 meters deep. Northridge Exploration re-excavated the old trenches and dug more trenches from 2000 to 2002.

The mineralization consists of several massive sulfide lenses in the ultramafic rocks and gabbro 'dike', and disseminated sulfides. (Figure 23 in Bittenbender and others (2007) is a geologic map of the prospect.) The ore minerals are mainly pyrrhotite and pentlandite with minor chalcopyrite and pyrite; bornite and garnierite have been noted and the copper minerals are locally oxidized to malachite. Saunders (1962) described nine mineralized lenses up to 20 feet long and 10 feet wide. They generally parallel the northwest trend of the ultramafic and mafic rocks (Hanson, 1963; Rose, 1965). The rocks adjacent to the lenses are strongly sheared and brecciated.

Samples from the northernmost prospect pit averaged 0.91 percent copper and 3.4 percent nickel; those from the southernmost pit averaged 1.0 percent copper and 2.6 percent nickel (Saunders, 1961). Samples of three other showings between the two pits respectively averaged 1.1, 2.6, 0.6 percent copper and 7.6, 8.1, and 2.6 percent nickel. U.S. Bureau of Mines samples from the Emerick property averaged about 1.0 percent copper and nickel and 0.02 percent cobalt, 193 parts per billion (ppb) gold, 977 ppb palladium, 989

ppb platinum, and minor amounts of osmiridium, osmium, and rhodium (Barker, 1988). Samples collected by the U.S. Bureau of Mines contained merenskyite, palarstanide, and irarsite which were identified with a scanning-electron microprobe. Samples collected by Bittenbender and others (2007) from the peridotite contained up to 6.31 percent nickel, 2.5 percent copper, 1,175 parts per billion (ppb) platinum, and 2.280 ppb palladium. Samples from the gabbro contained up to 8,050 parts per million (ppm) copper, 1.38 percent nickel, 1,175 ppb platinum, and 1,330 ppb palladium. Samples consistently show high chromium values, some more than 2,000 ppm.

Alteration:

The peridotite and gabbronorite are sheared and serpentinized. Copper minerals are oxidized.

Age of mineralization:

Probably genetically related to the emplacement of a Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic dike or fault silver.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

The prospect was discovered in 1955 by Rollie Emerick (Saunders, 1962; Bittenbender and others, 2007). Through the late 1950s, the property was examined by several individuals, the Alaska Alaska Department of Mines, and the U.S. Bureau of Mines (Saunders, 1961, 1962). Newmont Mining Company optioned the claims and dug a 1,600-foot road cut along the deposit. In 1971, the U.S. Bureau of Mines reexamined the property (Barker and others, 1985). Cominco Alaska re-staked the property in the 1980s as the Rainbow claims, dug several long trenches with a dozer in 1988, and mapped and sampled them (Hinderman, 1989). Falconbridge Exploration U.S., Inc. staked the Talnakh claims over the property in 1990. They mapped the geology, did ground and aerial geophysical surveys, and drilled one hole 350 meters deep. Northridge Exploration re-excavated the old trenches and dug more from 2000 to 2002.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Barker, J.C., 1988, Distribution of platinum-group elements in an ultramafic complex near Rainbow Mountain, east-central Alaska Range, IN Vassilou, A.H., Hausen, D.M., and Carson, D.J.T, eds, Process Mineralogy VII, Applications to mineral beneficiation: Proceedings of the Metal Society SME/AIME Joint [Annual] Meeting, Denver, Colo., p. 197-220.

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Wells, K., 1998, Report on the 1997 work program for Falconbridge Exploration U.S., Inc. on the Forbes Nickel Project (PN 5-998)-Mt. Hayes quadrangle, Alaska: Unpublished report, Falconbridge Exploration U.S., Inc., 41 p.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Glacier Lake; Forbes

Site type: Prospect

ARDF no.: MH216

Latitude: 63.3515 **Quadrangle:** M B-4

Longitude: 145.662

Location description and accuracy:

The Glacier Lake prospect is at an elevation of about 3,700 feet. It is south of the terminus of the Canwell Glacier, about 2.3 miles east-southeast of Millers Roadhouse and about 0.5 mile west-southwest of the center of section 16, T. 18 S., R. 11 E. Figure 22 of Bittenbender and others (2007) is a geologic map of the prospect.

Commodities:

Main: Cu, Ni, Pd, Pt

Other: Au, Co, Ir, Os, Rh

Ore minerals: Chalcopyrite, pentlandite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

The oldest unit in the area is the Pennsylvania to Early Permian, Slana Spur Formation which consists mainly of volcaniclastic sedimentary rocks (Nokleberg and others, 1992 [MF]; 1992 [Open-File]); Bittenbender and others, 2007). It hosts the Canwell mafic-ultramafic complex that varies from dunite to gabbronorite and includes much serpentinized rock. Both of these units are intruded by Cretaceous quartz diorite to granodiorite. The rocks at the Glacier Lake prospect are serpentine intruded by granodiorite and quartz diorite (Bittenbender and others, 2007).

The Glacier Lake prospect was discovered in 1962 by R.B. Forbes of the University of Alaska (Forbes, 1962; Hanson, 1963). Several companies explored the prospect within the next few years, including Newmont Mining Company (Barker and others, 1988). The property was examined and sampled by the Alaska Division of Mines and Minerals in 1963 (Kaufman, 1963) and by the U.S. Bureau of Mines from 1981 to 1984 (Barker, 1988). Claims were held by Northridge Exploration from 1997 to at least 2002. Falconbridge optioned the property in 1997 and the property was examined for Pacific Northwest Capital Corp. in 2002 (Freeman, 2002). The Bureau of Land Management examined and sampled the prospect in 2004 (Bittenbender and others, 2007). The work on the property includes considerable geologic mapping and sampling and several geophysical surveys.

The area of mineralization is about 25 feet long and 3 feet wide (Hanson, 1963; Barker, 1988; Bittenbender and others, 2007). It is at the contact of a nearly circular outcrop about 25 feet in diameter of granodiorite and quartz diorite (perhaps a roof pendant?) that is surrounded by serpentinite, serpentinized gabbro, peridotite and irregular masses of the granitic intrusive rocks. Pyrrhotite, chalcopyrite, and pentlandite occur in a narrow zone at a contact of peridotite and gabbro; chalcopyrite and pyrite are disseminated in the granodiorite and quartz diorite. The gabbro locally contains quartz lenses with 20 to 50 percent pyrrhotite; chalcopyrite and pentlandite. Disseminated sulfides are present in serpentinized peridotite away from the contact. Local hydrothermal alteration is characterized by secondary chlorite, epidote, mica, and anthophyllite veins near the contact of the serpentinite and quartz diorite.

There are two interpretations of the source of the mineralization. Barker (1988) and some industry geologists concluded that the mineralization is a result of the intrusion of Cretaceous quartz diorite into the ultramafic rocks. Rose (1965) and Bittenbender and others (2007) thought that it is a magmatic segregation

in the mafic and ultramafic rocks.

Grab samples of a massive sulfide lens in gabbro and of quartz diorite with disseminated sulfides at the contact of serpentinized peridotite contained as much as 16,000 parts per million (ppm) copper, 7 ppm silver, 700 ppm cobalt, and more than 5,000 ppm nickel (Nokleberg and others, 1991). Samples containing disseminated sulfides assayed from 1.9 to 6.0 percent copper, 1.0 to 1.5 percent nickel, and a trace to 0.4 ounce of gold per ton. A massive sulfide lens assayed 1.1 percent copper, 6.6 percent nickel, and 0.04 ounce of gold per ton (Hanson, 1963). A 3-foot chip sample across the contact of peridotite and diorite assayed 2.1 percent copper, 0.05 percent nickel, a trace of gold, and 0.35 ounce of silver per ton, and a massive sulfide sample contained 8.1 percent nickel (Rose, 1965). The U.S. Bureau of Mines collected nine mineralized samples that averaged 1.46 percent copper, 2.89 percent nickel, 0.07 percent cobalt, 25 parts per billion (ppb) gold, 90 ppb iridium, 495 ppb palladium, 410 ppb platinum, 57 ppb rhodium, and 29 ppb ruthenium (Barker, 1988). Samples collected by Bittenbender and others (2007) along 24.5 feet of the mineralization averaged 122 ppb gold, 450 ppb platinum, 658 ppb palladium, 560 ppm cobalt, 1.97 percent copper, and 2.59 percent nickel.

Alteration:

The peridotite and gabbro are extensively silicified and serpentinized near the quartz diorite-granodiorite contact. Local hydrothermal alteration is characterized by secondary chlorite, epidote, mica, and anthophyllite near the contact of the serpentinite and quartz diorite.

Age of mineralization:

Interpreted as either related to a Cretaceous quartz diorite to granodiorite intrusion or as a magmatic segregation deposit in a Triassic ultramafic-mafic complex.

Generic deposit model:

Deposit model:

Intrusion-related copper-nickel-PGE deposit or a magmatic segregation deposit in a ultramafic-mafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The Glacier Lake prospect was discovered in 1962 by R.B. Forbes of the University of Alaska (Forbes, 1962; Hanson, 1963). Several companies explored the prospect within the next few years, including Newmont Mining Company (Barker and others, 1988). The property was examined and sampled by the Alaska Division of Mines and Minerals in 1963 (Kaufman, 1963) and by the U.S. Bureau of Mines from 1981 to 1984 (Barker, 1988). Claims were held by Northridge Exploration from 1997 to at least 2002. Falconbridge optioned the property in 1997 and the property was examined for Pacific Northwest Capital Corp. in 2002 (Freeman, 2002). The Bureau of Land Management examined and sampled the prospect in 2004 (Bittenbender and others, 2007). The work on the property includes considerable geologic mapping and sampling and several geophysical surveys.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Barker, J.C., 1988, Distribution of platinum-group elements in an ultramafic complex near Rainbow Mountain, east-central Alaska Range, IN Vassilou, A.H., Hausen, D.M., and Carson, D.J.T, eds, Process Mineralogy VII, Applications to mineral beneficiation: Proceedings of the Metal Society SME/AIME Joint [Annual] Meeting, Denver, Colo., p. 197-220.

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Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1965, Geology and mineral deposits of the Rainy Creek area, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 14, 57 p., 1 sheet, scale 1:36,000.

Wells, K., 1998, Report on the 1997 work program for Falconbridge Exploration U.S., Inc. on the Forbes Nickel Project (PN 5-998)-Mt. Hayes quadrangle, Alaska: Unpublished report, Falconbridge Exploration U.S., Inc., 41 p.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Upper Glacier

Site type: Prospect

ARDF no.: MH217

Latitude: 63.3386 **Quadrangle:** M B-4

Longitude: 145.6199

Location description and accuracy:

The Upper Glacier prospect is at an elevation of 4,150 feet on the southwest valley wall of lower Canwell Glacier. It is about 2.1 miles east-northeast of VABM 5422 'Canwell' near the center of section 22, T. 18 S., R. 11 E. The location is accurate.

Commodities:

Main: Au, Co, Cu, Ni, Pd, Pt

Other:

Ore minerals: Chalcopyrite, magnetite, malachite, pentlandite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

The Upper Glacier prospect is in the Triassic, Canwell mafic-ultramafic complex (Nokleberg and others, 1992 [MF]; 1992 [Open-File]]; Bittenbender and others, 2007). The complex is a sill-like body that trends west-northwest for about 3.5 miles, dips to the south at about 40 degrees, and is about 2,000 to 3,000 feet thick. It has a dunite core that grades outward to wehrlite, peridotite, and gabbro. The body was subsequently intruded by a Cretaceous quartz-diorite to granodiorite pluton.

The Upper Glacier prospect was found in 1995 by American Copper and Nickel Company (ACNC) working with Fort Knox Gold Resources Inc. (Bittenbender and others, 2007). ACNC flew an airborne geophysical survey over the prospect in 1997 (Burns and Clautice, 2003). Nevada Star Resources Corp. did a Max-Min electromagnetic survey in 2004 and drilled 5 holes in 2003(?) and 2004. The Bureau of Land Management examined and sampled the prospect in the early 2000s (Bittenbender and others, 2007).

The mineralization consists of disseminated pyrrhotite, pyrite, and traces of chalcopyrite and pentlandite in feldspathic peridotite near the base of the Canwell complex (W.T. Ellis, oral communication, 1998; Bittenbender and others, 2007). The peridotite is surrounded by dunite and it is cut by high-angle faults; the peridotite is copper-stained and is cut by magnetite seams as much as 1 inch thick. The mineralized rock extends north-northwest for about 200 feet and is about 75 feet thick. Bittenbender and others (2007) collected 5 samples. A chip sample across 21 feet of mineralized peridotite contained 35 parts per billion (ppb) gold, 102 ppb platinum, 132 ppb palladium, 798 parts per million (ppm) copper, and 3,140 ppm nickel. Their highest grade sample was from peridotite with 3-5 percent coarsely-crystalline, disseminated sulfides. It contained 144 ppb gold, 259 ppb platinum, 280 ppb palladium, 2,330 ppm copper, and 3,600 ppm nickel.

Alteration:

Oxidation of copper minerals.

Age of mineralization:

Probably genetically related to the emplacement of a Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a differentiated mafic-ultramafic sill.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

The Upper Glacier prospect was found in 1995 by American Copper and Nickel Company (ACNC) working with Fort Knox Gold Resources Inc. (Bittenbender and others, 2007). ACNC flew an airborne geophysical survey over the prospect in 1997 (Burns and others, 2003). Nevada Star Resources Corp. did a Max-Min electromagnetic survey in 2004 and drilled 5 holes in 2003(?) and 2004. The Bureau of Land Management examined and sampled the prospect in the early 2000s (Bittenbender and others, 2007).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Burns, L.E., and Clautice, K.H., 2003 Portfolio of aeromagnetic and resistivity maps of the southern Delta River area: Alaska Division of Geological and Geophysical Surveys, Geophysical Report 2003-8, 16 p.

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Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Odie

Site type: Prospect

ARDF no.: MH218

Latitude: 63.3322 **Quadrangle:** M B-4

Longitude: 145.6151

Location description and accuracy:

The Odie prospect is at an elevation of about 4,200 feet on the southwest valley wall of lower Canwell Glacier. It is about 2.2 miles east of VABM 5422 'Canwell' at the north end of Rainbow Ridge and 0.6 mile south-southeast of the center of section 22, T. 18 S., R. 11 E.

Commodities:

Main: Au, Co, Cu, Ni, Pd, Pt

Other: Ir, Os, Rh, Ru

Ore minerals:

Gangue minerals:

Geologic description:

The Odie prospect is in the Triassic Canwell mafic-ultramafic complex (Nokleberg and others, 1992 [MF]; 1992 [Open-File]; Bittenbender and others, 2007). The complex is a sill-like body that trends west-northwest for about 3.5 miles, dips to the south at about 40 degrees, and is about 2,000 to 3,000 feet thick. It has a dunite core that grades outward to wehrlite, peridotite, and gabbro. The body was subsequently intruded by a Cretaceous quartz-diorite to granodiorite pluton.

The Odie prospect was found in 1995 by American Copper and Nickel Company (ACNC) working with Fort Knox Gold Resources Inc. (Bittenbender and others, 2007). ACNC flew an airborne geophysical survey over the prospect in 1997 (Burns and Clautice, 2003), and mapped and sampled it. Nevada Star Resources Corp. did a Max-Min electromagnetic survey in 2004 and drilled at least one hole in 2003 or 2004 that was at least 400 feet deep. The Bureau of Land Management examined and sampled the prospect in the early 2000s (Bittenbender and others, 2007). There are some small trenches.

The rocks at the Odie prospect are mostly weakly serpentinized dunite that has been intruded by a gabbronorite dike that is about 15 feet thick and can be traced for about 100 feet. The dike throughout has clots of or disseminated magnetite and pyrrhotite with minor chalcopyrite and pentlandite. It is locally copper stained and gossanous. The Nevada Star drilling cut 12 feet that contained 0.56 percent nickel, 0.15 percent copper, 106 parts per billion (ppb) platinum, and 136 ppb palladium. W.T. Ellis (oral communication, 1998) reported a high-grade sample that contained 0.86 percent copper, 1.2 percent nickel, 137 ppb gold, 12,330 ppb platinum, 1,247 ppb palladium, 537 ppb osmium, 289 ppb iridium, 89 ppb rhodium, and 662 ppb ruthenium. Bittenbender and others (2007) collected five samples. A chip sample across 16 feet of the dike contained 14 ppb gold, 47 ppb platinum, 49 ppb palladium, 124 parts per million (ppm) cobalt, 262 ppm copper, and 1,725 ppm nickel. A select sample of gossanous material near the footwall of the dike contained 2,120 ppb gold, 2,780 ppb platinum, 5,250 ppb palladium, 338 ppm cobalt, 1.70 percent copper, and 1.70 percent nickel.

Alteration:

Oxidation of copper minerals; some gossan.

Age of mineralization:

Probably genetically related to the emplacement of a Triassic mafic-ultramafic complex.

Generic deposit model:

Deposit model:

Nickel-copper-PGE mineralization in a gabbronorite dike that cuts a differentiated mafic-ultramafic sill.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

The Odie prospect was found in 1995 by American Copper and Nickel Company (ACNC) working with Fort Knox Gold Resources Inc. (Bittenbender and others, 2007). ACNC flew an airborne geophysical survey over the prospect in 1997 (Burns and others, 2003), and mapped and sampled it. Nevada Star Resources Corp. did a Max-Min electromagnetic survey in 2004 and drilled it in 2003(?) and 2004. The Bureau of Land Management examined and sampled the prospect in the early 2000s (Bittenbender and others, 2007). There are some small trenches.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

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Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Canwell Ridge; Canwell Glacier; Upper Canwell; Lower Canwell

Site type:

Prospect

ARDF no.: MH226

Latitude: 63.3291 **Quadrangle:** M B-4

Longitude: 145.5919

Location description and accuracy:

The Canwell Ridge prospect includes several exploration sites strung out for about 1,100 feet in an ultramafic-mafic complex. The center of the sites is about 2.8 miles east of VABM 5422 'Canwell' at the north end of Rainbow Ridge. It is about 0.3 mile north-northwest of the center of section 26, T. 18 S., R. 11 E., of the Fairbanks Meridian. This location is accurate to within 1/4 mile.

Commodities:

Main: Au, Co, Cu, Ni, Pd, Pt

Other: Ir, Rh, Ru

Ore minerals: Chalcopyrite, garnierite, malachite, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

The Canwell Ridge prospect is in the Triassic, Canwell mafic-ultramafic complex (Nokleberg and others, 1992 [MF]; 1992 [Open-File]; Bittenbender and others, 2007). The complex is a sill-like body that trends west-northwest for about 3.5 miles, dips to the south at about 40 degrees, and is about 1,000 feet thick at this prospect. It has a dunite core that grades outward to wherlite, peridotite, and gabbro. The complex is intruded by Cretaceous quartz-diorite to granodiorite.

Although mineralization at the the Canwell Ridge prospect was recognized earlier (Hanson, 1963, Barker, 1988), serious exploration began in 1994 when American Copper and Nickel Co. (ACNC) working with Fort Knox Gold Resources staked claims over the prospect and flew an airborne geophysical survey that collected magnetic and resistivity data.

Nevada Star Resources Corp. optioned the property in 2001. They drilled 5 holes in 2002. In 2003, Nevada Star built a road to the prospect, brought in a backhoe, dug six trenches across the mineralization, did additional ground geophysical surveys and collected geochemical samples to define drill targets. They drilled 6 holes in 2004 that totaled 2,275 feet. The Bureau of Land Management examined the prospect in the early 2000s and collected a few samples (Bittenbender and others, 2007).

The mineralization at the Canwell Ridge prospect consists of disseminated to massive pyrrhotite with chalcopyrite and pentlandite that is mainly in gabbro near the base of the Canwell complex. Additional sulfide mineralization was introduced in gabbro dikes. The 2003 trenching by Nevada Star indicated that the mineralization extends for 1,100 feet and is up to 25 feet wide. The most impressive mineralization is a layer of massive sulfides about a foot thick that parallels the trend of the Canwell complex and can be traced for about 300 feet.

There is abundant assay data from the many episodes of sampling and drilling by several companies and organizations (Ellis, 2002 [Delta River]; Ellis, 2002 [Eureka Creek}; Freeman, 2004; Bittenbender and others, 2007).

Alteration:

The gabbro is moderately silicified and serpentinized (Bittenbender and others, 2007).

Age of mineralization:

Magmatic sulfides are related to the emplacement of a Triassic mafic-ultramafic complex (Bittenbender and others, 2007).

Generic deposit model:

Deposit model:

Synorogenic-synvolcanic Ni-Cu (Cox and Singer, 1986; model 7a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

7a

Production Status: None

Site Status: Active?

Workings/exploration:

Although mineralization at the the Canwell Ridge prospect was recognized earlier (Hanson, 1963, Barker, 1988), serious exploration began in about 1995 when American Copper and Nickel Co. (ACNC) working with Fort Knox Gold Resources staked claims over the prospect and flew an airborne geophysical survey that collected magnetic and resistivity data. In 1997, a UTEM Ground geophysical survey identified several targets and they drilled two holes. They did additional ground geophysical surveys in 1998 and drilled five holes. Nevada Star Resources Corp. optioned the property in 2001 and after Fort Knox abandoned their claims, Nevada Star re-staked the property. They drilled 5 holes in 2002. In 2003, Nevada Star built a road to the prospect, brought in a backhoe, dug six trenches across the mineralization, did additional ground geophysical surveys and collected geochemical samples to define drill targets. They drilled 6 holes in 2004 that totaled 2,275 feet. The Bureau of Land Management examined the prospect in the early 2000s and collected a few samples (Bittenbender and others, 2007).

In 2009, Pure Nickel Inc. reported grab sample assay result highlights of up to 13.7 percent nickel, 2.9 percent copper, 0.2 percent cobalt, 19.9 grams per tonne of platinum, 5.13 grams per tonne of palladium, 0.19 grams per tonne of rhodium, 0.26 grams per tonne of iridium, and 0.36 grams per tonne of ruthenium (Pure Nickel Inc., 2009).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Barker, J.C., 1988, Distribution of platinum-group elements in an ultramafic complex near Rainbow Mountain, east-central Alaska Range, IN Vassilou, A.H., Hausen, D.M., and Carson, D.J.T, eds, Process Mineralogy VII, Applications to mineral beneficiation: Proceedings of the Metal Society SME/AIME Joint [Annual] Meeting, Denver, Colo., p. 197-220.

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Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Ellis, W.T., 2002, MAN Ni-Cu-PGE project - Delta River Mining District, Central Alaska Range: Report on 2002 exploration activities: Unpublished report prepared for the Nevada Star Resource Corp. by Alaska Earth Science Inc., 74 p.

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Hanson, L.G., 1963, Bedrock geology of the Rainbow Mountain area, Alaska Range, Alaska: Alaska Division of Mines and Minerals Geologic Report 2, 82 p., 2 plates.

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Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Pure Nickel Inc., 2009, Pure Nickel Update: http://www.purenickel.com/ppt/PNI_Investor_Presentation%20_May09.pdf (as of July 9, 2014).

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-08

Site name(s): Upper Canwell

Site type:

ARDF no.: MH227

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

The information for this prospect has been integrated into ARDF record MH226. Later work indicates that this site as well as ARDF sites MH226 and MH228 are all part of the same band of mineralization that have been studied or explored as a whole by a succession of companies and organizations.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Lower Canwell

Site type:

ARDF no.: MH228

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

The information for this prospect has been integrated into ARDF record MH226. Later work indicates that this site as well as ARDF sites MG226 and MH227 all part of the same band of mineralization that has been studied or explored as a whole by a succession of companies and organizations.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Summit Hill

Site type: Prospect

ARDF no.: MH241

Latitude: 63.1312 **Quadrangle:** M A-3

Longitude: 145.4738

Location description and accuracy:

The Summit Hill prospect is at an elevation of 3,600 feet, 0.75 mile east of mile 195 on the Richardson Highway. It is at the northeast corner of section 5, T. 20 S., R. 12 E.

Commodities:

Main: Cu, Ni, Pd, Pt

Other:

Ore minerals: Chalcopyrite, magnetite, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

The Summit Hill prospect was discovered and claimed in about 1998 by American Copper and Nickel Company (ACNC). It was restaked by Nevada Star Resource Corp. in 2003 and claims were active as of 2005.

An airborne geophysical survey over the region area defined a circular core zone mainly of biotite diorite with a low magnetic response and a surrounding magnetic high of pyroxene hornblendite and associated mafic-ultramafic rocks (Burns and Clautice, 2003). Bittenbender and others (2007) dated the diorite as 123.2 +/- 1.1 Ma by 40Ar/39Ar methods and the mafic-ultramafic rocks as 123.4 +/-1.3 Ma. Olivine in the mafic-ultramafic rocks is partly serpentinized, and the pyroxene is mostly altered to amphibole. There is also local iron staining.

An ACNC sample of mineralized, medium grained to pegmatitic olivine gabbro with magnetite, chalcopyrite, pyrrhotite, and pentlandite contained 1.07 percent copper, 1.58 percent nickel, 484 parts per billion (ppb) palladium, 300 ppb platinum, and 110 ppb gold (W.T. Ellis, oral communication, 1998). Bittenbender and others (2007) examined and sampled the prospect. Two samples of pyroxenite with 20-30 percent magnetite and minor chalcopyrite were from near the ACNC discovery. The highest metal values were less than 5 ppb platinum, 29 ppb palladium, 195 parts per million (ppm) copper, and 55 ppm nickel. They collected one sample of gabbro and two samples of diorite at the contact of the diorite and the mafic-ultramafic rocks. The highest metal content in them was 22 ppb gold and 495 ppm copper.

Alteration:

Olivine is partly serpentinized, and the pyroxene is mostly altered to amphibole. There is also local iron staining.

Age of mineralization:

Mid-Early Cretaceous (123 Ma) based on 40Ar/39Ar analyses.

Generic deposit model:

Deposit model:

Copper-nickel-PGE mineralization associated with a diorite surrounded by mafic and ultramafic rocks.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

The Summit Hill prospect was discovered and claimed in about 1998 by American Copper and Nickel Company (ACNC). It was restaked by Nevada Star Resource Corp. in 2003 and claims were active as of 2005. A 2003 airborne geophysical survey covered the area. Examined and sampled by the Bureau of Land Management in the early 2000s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Burns, L.E., and Clautice, K.H., 2003, Portfolio of aeromagnetic and resistivity maps of the southern Delta River area, east-central Alaska: Alaska Division of Geological and Geophysical Surveys, Geophysical Report 2003-8, 16 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (east of Gakona Glacier); JS

Site type: Occurrence

ARDF no.: MH267

Latitude: 63.2308 **Quadrangle:** M A-3

Longitude: 145.0992

Location description and accuracy:

This occurrence is at an elevation 6,400 feet on a sharp ridge east of Gakona Glacier. It is about 5.3 miles north-northeast of the center of Devils Lake in the terminus of Gakona Glacier and near the northeast corner of section 32, T. 19 S., R. 14 E.

Commodities:

Main: Ag, Au, Cu, Pd, Pt

Other:

Ore minerals: Bornite, chalcopyrite, covellite, digenite, magnetite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

Rose (1967) identified gabbro, pyroxenite, peridotite, and dunite here. Nokleberg and others (1992 [MF]; 1992 [Open-File]) included them in their 'ultramafic and associated rocks' unit that occur as klippen above thrust faults. The ultramafic rocks are thrust over volcanic and sedimentary rocks of the Pennsylvanian and Permian, Slana Spur Formation. Nokleberg and others suggest that an Early Cretaceous (123-126 Ma) age from the ultramafic unit probably represents regional metamorphism. However, Bittenbender and others (2007) suggest that Early Cretaceous ages on biotite and hornblende in similar rocks indicates primary crystallization.

Bittenbender and others (2007) identified several mineralized occurrences along the ridge in this vicinity. The rocks at the mineralized occurrences are mainly gabbro, pyroxenite and and peridotite that commonly contains patches of fresh biotite with minor tremolite and calcite (Bittenbender and others, 2007). The rocks are cut by thin, locally altered, pegmatitic gabbro dikes. The dikes contain 2-3 percent, chalcopyrite, bornite, and pyrrhotite, with minor digenite, covellite, and pyrite. Magnetite is a common accessory mineral and locally comprises up to 10 percent of the rock. At one location, 5-6 square feet in area, Bittenbender and others (2007) collected 5 iron-stained samples. The best contained 29 parts per billion (ppb) gold, 3.9 parts per million (ppm) silver, 363 ppb platinum, 72 ppb palladium, and 7,570 ppm copper. A 5.3-foot sample contained 17 ppb gold, 1.1 ppm silver, 258 ppb platinum, 68 ppb palladium, and 3.320 ppm copper. Other iron-stained occurrences in the area may be up to 100 feet long and 50 feet wide (Rose, 1967).

Alteration:

Rocks are generally fresh but thin mineralized gabbro dikes are locally altered.

Age of mineralization:

Unclear, possibly Early Cretaceous but may be older.

Generic deposit model:

Deposit model:

Disseminated copper-PGE minerals in thin gabbro dikes that cut mafic and ultramafic rocks.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only limited surface sampling by state and federal agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1967, Geology of the upper Chistochina River area, Mount Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 28, 41 p., 2 maps, scale 1:40,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (east of toe of Gakona Glacier)

Site type: Occurrence

ARDF no.: MH269

Latitude: 63.2005 **Quadrangle:** M A-3

Longitude: 145.0938

Location description and accuracy:

This occurrence is at an elevation of about 5,250 feet, about 2 miles east of the terminus of the Gakona Glacier and 1.0 mile north-northeast of VABM 5206 'Ona'. It is about 0.6 mile northeast of the center of section 8, T. 20 S., R. 14 E.

Commodities:

Main: Cu

Other:

Ore minerals: Chalcopyrite, copper, pyrite

Gangue minerals:

Geologic description:

Rose (1965) mapped the rocks in the area as argillite intruded by small diorite plutons. Nokleberg and others (1991; 1992 [MF]; 1992 [Open-File] considered that the argillite is part of the Pennsylvanian and Permian, Slana Spur Formation and that the diorite is Triassic. Bittenbender and others (2007) identified isolated outcrops of bleached white marble and mineralized skarn with chalcopyrite and pyrite here; they consider the diorite to be Cretaceous. The marble and skarn is copper stained near the contact with the diorite and their samples contained up to 2,020 parts per million copper and 18 parts per billion gold. They also identified thin veinlets of native copper in diorite rubble. The mineralization is spotty and discontinuous.

Alteration:

Skarn developed at marble-diorite contact.

Age of mineralization:

Unclear whether the diorite that developed the mineralized skarn is Cretaceous or Triassic.

Generic deposit model:

Deposit model:

Cu skarn deposit (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b

Production Status: None

Site Status: Inactive

Workings/exploration:

Only limited sampling by state and federal agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1965, Geology and mineral deposits of the Rainy Creek area, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 14, 57 p., 1 sheet, scale 1:36,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (northwest of the terminus of Chistochina Glacier)

Site type: Occurrence

ARDF no.: MH286

Latitude: 63.1998 **Quadrangle:** M A-2

Longitude: 144.8786

Location description and accuracy:

This occurrence is on a ridge on the northwest side of the terminus of the Chistochina Glacier at an elevation of about 5,700 feet. It is about 0.4 mile northeast of the center of section 9, T. 20 S., R. 15 E.

Commodities:

Main: Au, Cu, Pd, Pt

Other:

Ore minerals: Chalcopyrite, magnetite

Gangue minerals:

Geologic description:

The rocks in the area consist of mafic and ultramafic intrusive rocks associated with volcanic rocks, probably part of the Pennsylvanian to Permian, Slana Spur Formation (Rose, 1967; Nokleberg and others, 1992 [MF]; 1992 [Open-File]; Bittenbender and others, 2007). Nokleberg and others (2007 [MF] suggest that Cretaceous K/Ar dates (123-126 Ma) from the mafic and ultramafic rocks reflect regional metamorphism of rocks deposited in the Paleozoic. Bittenbender and others (2007) have also dated the rocks as Early Cretaceous but interpret the dates as the age of primary crystallization. The mafic and ultramafic rocks are cut by discontinues inch-wide veinlets of magnetite.

As described by Rose (1967), the host rock of the mineralization is dunite in a composite ultramafic body that also contains peridotite, pyroxenite, and hornblendite (Rose, 1967). Thin veinlets of cross-fiber chrysotile cut the dunite. Boulders of hornblendite near the site contain as much as 10 percent magnetite. Bittenbender and others (2007) examined the occurrence and collected four samples. The richest sample was from serpentinized pyroxenite with minor chalcopyrite and copper staining. It contained 1.8 percent copper, 125 parts per billion (ppb) palladium, 48 ppb platinum, and 58 ppb gold. A sample from a gabbro dike contained 3,870 parts per million (ppm) copper, 462 ppb palladium, 326 ppb platinum, and 348 ppb gold.

Alteration:

Mafic and ultramafic rocks are locally serpentinized.

Age of mineralization:

Uncertain whether the host rocks are Late Cretaceous or as old as Paleozoic.

Generic deposit model:

Deposit model:

Disseminated chalcopyrite and magnetite in mafic-ultramafic rocks.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only limited sampled by state and federal agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1967, Geology of the upper Chistochina River area, Mount Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 28, 41 p., 2 maps, scale 1:40,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (west of Chistochina Glacier)

Site type: Occurrence

ARDF no.: MH287

Latitude: 63.1932 **Quadrangle:** M A-2

Longitude: 144.8808

Location description and accuracy:

This occurrence is west of the terminus of the Chistochina Glacier and about 1.6 mile north of the mouth of Slate Creek on the Chistochina River. It is about 0.2 mile southeast of the center of section 9, T. 20 S., R. 15 E. There is some question about the location of this site in the old literature but this location is accurate as described by Bittenbender and others (2007).

Commodities:

Main: Au, Cu

Other: Ag, Ni

Ore minerals: Chalcopyrite?, magnetite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

The rocks in the area consist of mafic and ultramafic intrusive rocks associated with volcanic rocks, probably part of the Pennsylvanian to Permian, Slana Spur Formation (Rose, 1967; Nokleberg and others, 1992 [MF]; 1992 [Open-File]; Bittenbender and others, 2007). Nokleberg and others (2007 [MF] suggest that Cretaceous K/Ar dates (123-126 Ma) from the mafic and ultramafic rocks probably reflect regional metamorphism of rocks deposited in the Paleozoic. However, Bittenbender and others (2007) also dated the rocks as Early Cretaceous but interpret the dates as the age of primary crystallization.

As described by Rose (1967), this occurrence is in a mile-long northeast-trending body of gabbro and mafic gabbro south of quartz monzonite of probable Mesozoic age. Rose (1967) identified a 50-foot-wide zone of pyritized rocks at the contact between peridotite and monzonite. A grab sample collected contained 0.02 ounce of gold per ton, 0.18 ounce of silver per ton, 0.2 percent copper, and a trace of nickel.

Probably at or near the Rose location, Bittenbender and others (2007) identified a iron-stained, lens-shaped area about 125 feet long of coarse-grained pyroxenite, gabbro, and some dunite. The pyroxene in the gabbro is altered to amphibole and the plagioclase is saussuritized. The iron-stained area contains up to 10 percent ore minerals, mainly pyrite and magnetite with minor pyrrhotite and chalcopyrite. A composite chip sample across 54 feet contained 2.7 parts per million (ppm) gold and 837 ppm copper. No other of their samples contained more than 0.032 ppm gold and the highest copper value was 1,900 ppm.

Alteration:

The site is notable for its iron staining. The pyroxene in the gabbro host rock is altered to amphibole and the plagioclase is saussuritized.

Age of mineralization:

No definitive information.

Generic deposit model:

Deposit model:
Unclear; gabbro and peridotite with sulfides and anomalous gold.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:
Only limited sampling by state and federal agencies.

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1967, Geology of the upper Chistochina River area, Mount Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 28, 41 p., 2 maps, scale 1:40,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (near peak 5850 south of Chisna Pass)

Site type:

ARDF no.: MH299

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

The information for this site has been integrated into ARDF record MH365. The two sites are adjacent if not overlap and share essentially the same geology; they have also been sampled and examined by same companies and state and federal agencies.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Northland Mines

Site type: Prospect

ARDF no.: MH300

Latitude: 63.1371 **Quadrangle:** M A-2

Longitude: 144.8118

Location description and accuracy:

This prospect is on the north side of Powell Gulch about 0.7 mile northeast of its mouth. It is about 0.3 mile east of the center of section 35, T. 20 S., R. 15 E.

Commodities:

Main: Cu

Other: Ag, Fe, W

Ore minerals: Chalcopyrite, hematite

Gangue minerals: Garnet

Geologic description:

This record specifically describes the mineralization at this site as reported by Nokleberg and others (1991) and Bittenbender and others (2007). However, the work is within several generations of large block of claims and exploration that not only covers this site but several other sites nearby, notably ARDF sites MH380 and MH365. Those records may include data that applies to this site.

C.W. Monroe prospected in the area from 1964 to at least 1973 and staked more than 142 lode claims that covered this site and several square miles south of Chisna Pass (Bittenbender and others, 2007). Paul Glavinovich staked at least 36 claims in the area that may have covered this site and Resource Associates of Alaska (RAA) staked a large block of claims in the late 1970s and early 1980s that probably covered this site. The location of three holes that RAA drilled is uncertain but they were probably about 0.5 mile north at ARDF site MH365. AMAX Exploration was apparently active in the area in about 1990 and Cominco Alaska Exploration explored in the early 90s. In 2010, Corvus Gold Inc. drilled three holes about 0.5 mile to the north at ARDF site MH365 as part of an extensive regional exploration program (Taylor, 2010). Their work included surface sampling and mapping and geochemical and geophysical surveys that undoubtedly covered this prospect.

As described by Bittenbender and others (2007) citing Nokleberg and others (1992 [MF]; 1992 [Open-File]), the rocks in the area consist of hypabyssal Permian andesite to rhyolite, stocks, dikes, and sills that intrude marine volcanic rocks, volcaniclastic sedimentary rocks, and thin limestones of the Pennsylvanian and Permian, Slana Spur Formation. The area is cut by a series of high angle faults.

Rose (1967) did not visit the site but was shown specimens of chalcopyrite replacing silicified limestone. Nokleberg and others (1991) identified a skarn-like deposit about 75 feet wide and 270 feet long that parallels a dip slope. Veins as much as about 3 feet wide of chalcopyrite and massive hematite cut garnet skarn in limestone. A grab sample of chalcopyrite-bearing rock assayed 1.5 percent copper, 100 parts per million (ppm) tungsten, and 7 ppm silver.

Bittenbender and others (2007) described a steep, south-dipping, northwest-trending zone of near-massive specular hematite with disseminated chalcopyrite. The zone can be traced for at least 500 feet along strike and it is it up to 30 feet thick. A 20-foot sample across the hematite band averaged 3,770 ppm copper, 11.7 percent iron, and 428 ppm zinc. The hematite zone is underlain by limestone and overlain by volcaniclastic sedimentary rocks. Small outcrops of epidote-garnet-hematite skarn. are nearby. A 5-foot sample contained up to 2.89 percent copper, 776 ppm zinc, and more than 15 percent iron. The highest gold value was only 22

ppb. Bittenbender and others (2007) suggest that the mineralization is related to a 300.4 +/- Ma quartz monzonite intrusion nearby.

Alteration:

Small outcrops of mineralized skarn.

Age of mineralization:

Early Permian or younger.

Generic deposit model:

Deposit model:

Hematite layer with disseminated chalcopyrite; copper-iron skarn (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b

Production Status: None

Site Status: Undetermined

Workings/exploration:

C.W. Monroe prospected in the area from 1964 to at least 1973 and staked more than 142 lode claims that covered this site and several square miles south of Chisna Pass (Bittenbender and others, 2007). Paul Glavinovich staked at least 36 claims in the area that may have covered this site and Resource Associates of Alaska (RAA) restaked a large block of claims in the late 1970s and early 1980s that almost certainly covered this site. The location of the three holes RAA drilled is uncertain but they were probably about 0.5 mile north at ARDF site MH365. AMAX Exploration was apparently active in the area in about 1990 and Cominco Alaska Exploration explored in the early 90s. Corvus Gold Inc. drilled three holes about 0.5 mile north ARDF site MH365 as part of an extensive exploration program. The work included surface sampling and mapping and geochemical and geophysical surveys on a large block of claims that undoubtedly covered this prospect. Examined and sampled by several state and federal minerals agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

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Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E.,

Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1967, Geology of the upper Chistochina River area, Mount Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 28, 41 p., 2 maps, scale 1:40,000.

Taylor, Chris, 2010, Technical report on the Chisna copper gold project, Chistochina mining district, south-central Alaska: Unpublished technical report for International Tower Hill Mines Ltd., 107 p. (posted on www.sedar.com, July 15, 2010).

Primary Reference: Bittenbender and others, 2007

Reporter(s): W.T. Ellis (Alaska Earth Sciences), C.C. Hawley (Hawley Resource Group), and W.J. Nokleberg (USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): MID

Site type: Prospect

ARDF no.: MH340

Latitude: 63.2485

Quadrangle: M A-1

Longitude: 144.0965

Location description and accuracy:

The MID prospect is approximately 4 miles south-southeast of the junction of the Robertson River and Rumble Creek. It is at an elevation of about 5,700 feet at the toe of a remnant glacier on the section line between sections 16 and 17, T. 17 N., R. 7 E., Copper River Meridian. The deposit is concealed by glacial material. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Arsenopyrite, chalcopyrite, galena, gold, magnetite, pyrite, pyrrhotite, sphalerite

Gangue minerals: Quartz

Geologic description:

The MID massive sulfide deposit is in metarhyolite of the upper Lagoon unit of Devonian age. The deposit is a sheet-like body as much as 47 feet thick in its longest drill intersection. It is the thickest block in what was once a single continuous massive sulfide layer that extends more than 2 miles along strike and is more than 40 feet thick. The layer is now offset by high-angle faults into six segments . The MID deposit is a blind deposit covered by glacial ice and moraine (Dashevsky and others, 2003).

The massive sulfide mineralization was intersected by drilling through the overlying Tiger unit into the metavolcanic rocks of the upper Lagoon unit which hosts the mineralization. The rocks surrounding the MID prospect are part of the Tiger unit; however, the massive sulfide mineralization was intersected by drilling into the underlying metavolcanic rocks of the upper Lagoon unit that host the mineralization. The Lagoon unit is a succession of dark gray, rusty, phyllitic metamorphosed mudstones interbedded with light-gray to white to pale green siliceous quartz-sericite(-chlorite) schist. Locally the rocks contain coarse, blue quartz eyes and rare fragmental volcanic textures preserved as chloritized lithic fragments. The upper part of the unit is dominated by white to pale green, massive to laminated quartz-eye-bearing quartz-sericite(-chlorite-pyrite) schist; finely laminated schist with minor metamorphosed black mudstone; and thin intercalations of quartzite and fine-grained metamorphosed grit. The protoliths of the volcanic rocks of the upper Lagoon unit are mainly rhyodacite and dacite, but they also include rare rhyolite and minor andesite and basalt (Dashevsky and others, 2003).

MID was discovered when massive sulfide float boulders were found during stream-sediment reconnaissance in 1976 (Rodney A. Blakestad and others, unpublished Resource Associates of Alaska Inc. report, 1976). The MID deposit is a blind target beneath glacial ice and moraine. Electromagnetic geophysical surveys were instrumental in recognizing this deposit. Extensive geological, geochemical, geophysical surveys and drilling were conducted by Resource Associates of Alaska from 1976 to 1981, by Phelps Dodge in 1990, and by American Copper and Nickel Company from 1994 to 1997. The alteration associated with the mineralization is characterized by the development of sericite, quartz, pyrite, and carbonate in the hanging wall and extensive chlorite and magnesium enrichment and sodium depletion in the footwall. Fifteen core holes totaling 11,655 feet have been drilled by 2002 (S.S. Dashevsky, unpublished data, 2002). The Drum unit, which is part of the metamorphic sequence that includes the rocks at this

deposit is near the Devonian-Mississippian boundary on the basis of one SHRIMP U-Pb zircon age of 359 +/- 6 Ma at the nearby DD South prospect (MH325).

The MID deposit has an inferred resource of 7.2 million tons averaging 0.4 percent copper, 1.6 percent lead, 4.5 percent zinc, 62 parts per million (ppm) silver, and 1.6 ppm gold. The resource calculation includes only those contiguous bodies with a true thickness greater than 8 feet and a gross metal value of greater than $80.00 per ton at 1998 prices (S.S. Dashevsky and others, 2003).

In 2011, Heatherdale Resources Inc. (2011) drilled 3 holes at the MID prospect; two cut significant mineralization. Six intercepts were especially notable; they varied from 5.0 to 75.7 feet long with metal contents of from 0.12 to 0.56 percent copper, 0.01 to 5.21 percent zinc, 1.07 to 2.36 percent lead, 0.79 to 1.56 grams of gold per tonne, and 44 to 98 grams of silver per tonne. The best was 43.9 meters with 0.56 percent copper, 5.21 percent zinc, 2.36 percent lead, 1.56 grams of gold per tonne, and 85 grams of silver per tonne. Heatherdale also collected massive-sulfide boulders and outcrop samples. Thirty massive-sulfide boulders averaged 0.91 percent copper, 3.11 percent zinc, 3.57 percent lead, 14.86 grams of gold per tonne, and 477 grams of silver per tonne. Six outcrop samples contained 0.09 to 1.34 percent copper, 0.11 to 11.95 percent zinc, 0.59 to 11.54 percent lead, 0.25 to 11.25 grams of gold per tonne, and 28 to 280 grams of silver per tonne.

Alteration:

The alteration associated with the mineralization is characterized by the development of sericite, quartz, pyrite, and carbonate in the hanging wall and extensive chlorite and magnesium enrichment and sodium depletion in the footwall.

Age of mineralization:

The Drum unit, which is part of the metamorphic sequence that includes the rocks at this deposit is near the Devonian-Mississippian boundary on the basis of one SHRIMP U-Pb zircon age of 359 +/- 6 Ma at the nearby DD South prospect (MH325).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Active

Workings/exploration:

MID was discovered when massive sulfide float boulders were found during stream-sediment reconnaissance in 1976 (Rodney A. Blakestad and others, unpublished Resource Associates of Alaska Inc. report, 1976). The MID deposit is a blind target beneath glacial ice and moraine. Electromagnetic geophysical surveys were instrumental in recognizing this deposit. Extensive geological, geochemical, geophysical surveys and drilling were conducted by Resource Associates of Alaska from 1976 to 1981, by Phelps Dodge in 1990, and by American Copper and Nickel Company from 1994 to 1997. Fifteen core holes totaling 11,655 feet had been drilled to 2002 (S.S. Dashevsky, unpublished data, 2002). Heatherdale Resources Inc. (2011) drilled 3 holes in 2011, sampled massive-sulfide boulders, and collected outcrop samples.

Production notes:

None.

Reserves:

The MID deposit has an inferred resource of 7.2 million tons averaging 0.4 percent copper, 1.6 percent lead, 4.5 percent zinc, 62 parts per million (ppm) silver, and 1.6 ppm gold. The resource calculation includes only those contiguous bodies with a true thickness greater than 8 feet and a gross metal value of greater than $80.00 per ton at 1998 prices (S.S. Dashevsky and others, 2003).

Additional comments:

References:

Dashevsky, S.S., Schaefer, C.F., and Hunter, E.N., 2003, Bedrock geologic map of the Delta mineral belt, Tok mining district, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 122, 2 sheets, scale 1:63,360.

Heatherdale Resources Ltd., 2011, Drill hole 2011-154 intersects 43.9 feet of 0.56% Cu, 5.21% Zn, 2.36% Pb, 1.56 g/t/Au, and 85 g/t/Ag: http://www.heatherdaleresources.com/hdr/NewsReleases.asp?ReportID=490972&_Type=News-Releases&_Title=Heatherdale-Announces-Positive-Exploration-Results-From-The-Delta-VMS-Proje... (News release, November 16, 2011)

Lange, I. M., Nokleberg, W.J., Newkirk, S. R., Aleinikoff, J.N., Church, S.E., and Krouse, R.H., 1993, Devonian volcanogenic massive sulfide deposits and occurrences, southern Yukon-Tanana terrane, eastern

Primary Reference: Heatherdale Resources Ltd., 2011

Reporter(s): W.T. Ellis (Alaska Earth Sciences); A.W. Wyatt and S.S. Dashevsky (Northern Associates, Inc.); W.J. Nokleberg (USGS): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): POW; Chisna Ridge

Site type: Prospect

ARDF no.: MH365

Latitude: 63.1441 **Quadrangle:** M A-2

Longitude: 144.8069

Location description and accuracy:

The POW prospect is one of several in the area that have been repeatedly covered by large blocks of claims south of Chisna Pass and Slate Creek, that have repeatedly been explored by a succession of companies. The coordinates for this record are at the site of the 2010 Corvus Gold drilling. It is about 1.0 mile north of the junction of the Chisna River and Powell Gulch, near the northeast corner of section 35, T. 16 N., R. 14 E. The location is accurate.

Commodities:

Main: Ag, Au, Cu

Other: Pb, Zn

Ore minerals: Bornite, chalcopyrite, galena, gold, magnetite, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

This record specifically describes mineralization at this site as reported by Taylor (2010) and Bittenbender and others (2007). However, there has been a succession of large claim groups over this prospect and extensive work in the area that not only covers it but several other nearby ARDF sites, notably MH380 and MH300. Those records may include data that applies to this site.

C.W. Monroe prospected in the area from 1964 to at least 1973 and staked more than 142 lode claims that covered this site and several square miles south of Chisna Pass (Bittenbender and others, 2007). Paul Glavinovich staked at least 36 claims in the area that may have covered this site. Resource Associates of Alaska (RAA) staked a large block of claims in the late 1970s and early 1980s that covered this prospect and drilled three holes in 1980 that cannot now be accurately located. AMAX Exploration was apparently active in the area in about 1990 and Cominco Alaska Exploration explored in the early 90s. From 2006 to 2008, International Tower Hills Inc. (ITH) staked a large block of claims south of Chisna Pass and Slate Creek that covered this prospect and did considerable mapping and sampling, and carried out extensive geochemical and geophysical surveys. Corvus Gold Inc. (who spun off from ITH) drilled 3 holes in 2010 to test a breccia zone and did more geologic mapping, sampling, and geochemical and geophysical surveys. The prospect has also been examined and sampled by several several state and federal agencies.

There have been several descriptions of the mineralization here. As described by Nokleberg and others (1991), the mineralization consists of disseminated sulfides and local massive to semi-massive sulfides in the Permian (?) meta-andesite and meta-dacite. A prominent zone of sulfidized rock that strikes northwest crops out in a gully near the northeast corner of section 35, T. 20 S., R. 15 E. (Randy Moore and C. C. Hawley, written communication, 1996). One sample of semi-massive pyrite, chalcopyrite, and possibly bornite assayed 0.488 ounce of gold per ton and more than 1 percent copper. Other samples from the mineralized area collected by Moore and Hawley contained less than 500 parts per million (ppm) copper.

As described by Taylor (2010), the POW deposit consists of a structurally-controlled chalcopyrite-bearing breccia several meters wide in a 200-foot-wide, silica-pyrite alteration envelope. The host rocks are porphyritic andesite and dacite of the Devonian or Lower Carboniferous Chisna Formation, and flysch, chert, and limestone of the Pennsylvanian to Permian Mankomen Group. These rocks are cut by many

porphyry dikes and by stocks of diorite and monzonite. A large stock of gabbro notable for its magnetic anomaly is about 2 miles to the northwest at peak 5850.

Nokleberg and others (1991) report altered rocks with disseminated galena and sphalerite. Samples contained up to 28.4 parts per million (ppm) silver, 1,235 ppm arsenic, 2,690 ppm lead, and 1,560 ppm zinc. A sample, probably of massive sulfides assayed 2 ppm gold, 70 ppm silver, 2 percent copper, 1,500 ppm arsenic, 30 ppm tin, and 530 ppm zinc. They suggest that the deposit may be a distal porphyry copper deposit, possibly of Permian age.

Bittenbender and others (2007) examined and sampled the prospect. Samples of highly oxidized volcanic rocks from a small trench on what was probably the site of one of the 1980 holes RAA drilled contained up to 23.4 ppm gold, 53.9 ppm silver, and 3.2 percent copper. They also found skarn mineralization here or nearby. They suggest that the mineralization is related to a nearby 300.4 +/- 1.4 Ma (Pennsylvanian) quartz monzonite.

Although the three holes that were drilled by RAA in 1980 cannot be located exactly, it is known that their best intercept was 2 feet with 3.4 percent copper, 0.9 ounce of gold per ton, and 0.25 ounce of silver per ton (Taylor, 2010). An intercept 68 feet long averaged 0.676 percent copper, 0.306 ounce of silver per ton, and 0.0416 ounce of gold per ton. The holes indicated a complicated geologic structure. The best intercepts in the 2010 Corvus drilling was 0.35 meter with 3.69 grams of gold per tonne and 8.71 grams of silver per tonne; 1.98 meters with 0.26 percent copper, 1.58 grams of gold per tonne, and 4.67 grams of silver per tonne; and 23 meters with 0.38 percent copper, 0.43 gram of gold per tonne, and 7.5 grams of silver per tonne.

The preceding information is specific in location and geology to the immediate area around the Corvus 2010 POW drilling. However, their claims and their work covered an area at least 2 kilometers wide and 5,5 kilometers long oriented generally northwest of their POW drill site. Many of their samples in this broad contained 0.1 to 13.7 percent copper. ARDF sites MH380, MH290, MH314, and MH315 are in this area and further work will probably be necessary to fully understand the extent and continuity of the mineralization. Taylor (2010), for instance, notes that magnetite-breccia pipes are associated with porphyry dikes in the western half of the claim block.

In April 2016, Corvus Gold Inc. announced that its wholly owned Alaskan subsidiary, Raven Gold Alaska Inc. signed an agreement with Millrock Resources Inc. on the Chisna project in south-central Alaska (Athey and Werdon, 2017). The purchase included a proprietary exploration database covering the claims and the surrounding district. The data represents an estimated US$11 million worth of exploration work to date in the Chisna project area.

Alteration:

Strong silica-pyrite alteration zones.

Age of mineralization:

Conflicting or uncertain assignments from several companies and agencies; Pennsylvanian and Permian ages have been suggested.

Generic deposit model:

Deposit model:

Variously interpreted as a structurally controlled, copper-gold breccia zone; as disseminated, copper-gold massive and semi-massive sulfides in Paleozoic volcaniclastic rocks; as being a distal porphyry copper deposit, and as having skarn affinities.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

C.W. Monroe prospected in the area from 1964 to at least 1973 and staked more than 142 lode claims that covered this site and several square miles south of Chisna Pass (Bittenbender and others, 2007). Paul Glavinovich staked at least 36 claims in the area that may have covered this site. Resource Associates of Alaska (RAA)staked a large block of claims in the late 1970s and early 1980s that covered this prospect and drilled three holes in 1980 that cannot now be accurately located. AMAX Exploration was apparently active in the area in about 1990 and Cominco Alaska Exploration explored in the early 90s. From 2006 to 2008, International Tower Hills Inc. (ITH) staked a large block of claims south of Chisna Pass and Slate Creek that covered this prospect and did considerable mapping and sampling, and carried out extensive geochemical and geophysical surveys. Corvus Gold Inc. (who spun off from ITH) drilled 3 holes in 2010 to test a breccia zone and did more geologic mapping, sampling, and geochemical and geophysical surveys. The prospect has also been examined and sampled by several several state and federal agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Corvus Gold Inc., 2010 Corvus Gold Inc. intersects copper and gold mineralization in first drill holes in the POW target, Chisna project, Alaska: http://www.corvusgold.com/news/index.php?&content_id=36 (News release, Sept. 30, 2010)

Corvus Gold Inc., 2011, Corvus Gold announces discovery of new gold targets at the Chisna project, Alaska: http://www.corvusgold.com/news/index.php?&content_id=44.(News release, Jan. 18, 2011).

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Taylor, Chris, 2010, Technical report on the Chisna copper gold project, Chistochina mining district, south-central Alaska: Unpublished technical report for International Tower Hill Mines Ltd., 107 p. (posted on www.sedar.com, July 15, 2010).

Primary Reference: Bittenbender and others, 2007; Taylor, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Sneaker; Hadjukovich

Site type: Prospect

ARDF no.: MH366

Latitude: 63.5701 **Quadrangle:** M C-2

Longitude: 144.9801

Location description and accuracy:

The Sneaker prospect is on peak 4937, about 7.5 miles east-northeast of Mount Hajdukovich. It is near the center of section 35, T. 21 N., R 13 E. A detailed map of the Sneaker prospect is figure 7 of Freeman (2009).

Commodities:

Main: As, Au, Bi, Cu, Pb, Sb, Zn

Other: Ag, Mo, Sn, W, Zn

Ore minerals: Arsenopyrite, bismuth, bismuthinite, chalcopyrite, galena, gold, sphalerite, stibnite

Gangue minerals: Quartz, tourmaline

Geologic description:

The numerous prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005 Canaco Resources optioned the property and drilled 3 holes at the Sneaker prospect. They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco prospects. These claims were current as of 2009 and constitute the Hajdukovich project.

The geology of the area is dominated by a Paleocene multiphase, composite intrusive complex about 5 by 15 kilometers in size (Nokleberg and others, 1992; Freeman, 2009). The main rocks in the complex are mafic and ultramafic intrusive rocks, diorite and monzonite, alkali feldspar granite, and megacrystic granite; these are cut by a variety of aplite, rhyodacite, rhyolite, and basalt dikes. The intrusive rocks cut metamorphic rocks of the Jarvis Creek unit, which consists mainly of pelitic schist, gneiss, and quartzite. The Jarvis Creek unit is metamorphosed to greenschist facies north of the complex and to amphibolite(?) facies south of it. The structure of the area is dominated by steep northeast- and northwest-trending faults that range from the regional to the prospect-level scale. Six distinctive but related styles of mineralization have been identified in the Hajdukovich project area: 1) low sulfide, gold-quartz veins; 2) gold-sulfide-carbonate-quartz veins and veinlets; 3) sulfide-quartz veinlets; 4) gold-PGE-bearing chalcopyrite-magnetite pods and veins; 5) gold-bearing sulfide-quartz breccias; and 6) gold-bearing semi-massive sulfides.

Canaco drilled 3 holes at Sneaker in 2005 but they were relatively unsuccessful due to extremely fractured ground and equipment failures; the holes were terminated short of their intended targets (Freeman, 2009). At the Sneaker prospect there are two styles of mineralization: 1) low-sulfide gold-quartz veins, and 2) gold-sulfide-carbonate-quartz veins. There are 5 sets of northeast-trending, steeply dipping low-sulfide gold-quartz veins. They average about 15 centimeters wide, pinch and swell, and form a network of anastomosing veins and veinlets. They typically contain arsenopyrite, chalcopyrite, bismuthinite, native bismuth, and locally visible gold; analyses show anomalous silver, arsenic, bismuth, copper, molybdenum, and tungsten. The average gold values of 21 select samples from the low-sulfide gold-quartz veins was 9,022 parts per billion (ppb). The gold-sulfide-carbonate-quartz veins are along northwest-trending shear

zones and are characterized by pervasive carbonate and sericite alteration. They are generally less than 5 centimeters thick, have abundant black tourmaline and iron carbonate; the sulfides include arsenopyrite, stibnite, galena, and sphalerite. Analyses show anomalous gold, arsenic, lead, antimony, tin, and zinc. The average gold value of of 21 selected samples was 5,843 ppb. The host rock for both sets of veins is megacrystic granite and granodiorite.

Alteration:

Pervasive carbonate and sericite alteration.

Age of mineralization:

Paleocene or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Gold quartz veins; polymetallic gold-quartz veins (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active?

Workings/exploration:

The numerous prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005, Canaco Resources optioned the property and drilled 3 holes at the Sneaker prospect. They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold that covered almost all of the original Teck-Cominco prospects. These claims were current as of 2009 and constitute the Hajdukovich project.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Curtin, G.C., Tripp, R.B., and Nokleberg, W.J., 1989, Summary and Interpretation of geochemical maps for stream sediment and heavy mineral concentrate samples, Mount Hayes quadrangle, Eastern Alaska Range, Alaska: U.S.G.S. Miscellaneous Field Studies Map, 1 sheet, scale 1:250,000.

Freeman, C.J., 2006, Executive summary report for the Hadukovich gold project, Delta River mining district, Alaska: Unpublished report for Canaco Resources Inc., 70 p. (posted on www.sedar.com, June 9, 2006).

Freeman, C.J., 2009, Geology and mineralization of the Hajdukovich gold project, Delta River mining

district, Alaska: Unpublished report for Anglo- Alaska Gold Corp, 68 p. (as of Feb 10, 2011, on web at http://www.avalonalaska.com/Project_of_Month/HA-10EXE1-Form43.pdf)

Nokleberg, W.J., Aleinikoff, J.N., Lange, I.M., Silva, S.R., Miyaoka, R.T., Schwab, C.E., Zehner, R.E., Bond, G.C., Richter, D.H., Smith, T.E., and Stout, J.H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p., 1 sheet, scale 1:250,000.

Primary Reference: Freeman, 2009

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Snug; Hajdukovich

Site type: Prospect

ARDF no.: MH367

Latitude: 63.577 **Quadrangle:** M C-2

Longitude: 144.9849

Location description and accuracy:

The Snug prospect is about 0.3 mile north-northeast of peak 4937 and about 7 miles northeast of Mount Hajdukovich. It is about 0.5 mile north-northwest of the center of section 35, T. 21 N., R. 13 E. The location is accurate. A detailed map of the Sneaker prospect is figure 9 of Freeman (2009).

Commodities:

Main: As, Au, Mo, Sb

Other:

Ore minerals: Arsenopyrite, chalcopyrite, gold, molybdenite, stibnite

Gangue minerals: Quartz

Geologic description:

This and the other prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005 Canaco Resources optioned the property and drilled 3 holes at the nearby Sneaker prospect (MH366). They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco prospects. These claims were current as of 2009 and constitute the Hajdukovich project.

The geology of the area is dominated by a Paleocene multiphase, composite intrusive complex about 5 by 15 kilometers in size (Nokleberg and others, 1992; Freeman, 2009). The main rocks in the complex are mafic and ultramafic intrusive rocks, diorite and monzonite, alkali feldspar granite, and megacrystic granite; these are cut by a variety of aplite, rhyodacite, rhyolite, and basalt dikes. The intrusive rocks cut metamorphic rocks of the Jarvis Creek unit, which consists mainly of pelitic schist, gneiss, and quartzite. The Jarvis Creek unit is metamorphosed to greenschist facies north of the complex and to amphibolite(?) facies south of it. The structure of the area is dominated by steep northeast- and northwest-trending faults that range from the regional to the prospect-level scale. Six distinctive but related styles of mineralization have been identified in the Hajdukovich project area: 1) low sulfide, gold-quartz veins; 2) gold-sulfide-carbonate-quartz veins and veinlets; 3) sulfide-quartz veinlets; 4) gold-PGE-bearing chalcopyrite-magnetite pods and veins; 5) gold-bearing sulfide-quartz breccias; and 6) gold-bearing semi-massive sulfides.

The Snug prospect is in megacrystic granite that is cut by gold-quartz veins similar to those at the Sneaker prospect (MH366) (Freeman, 2009). A sample from a stibnite-quartz vein contained 8,820 parts per billion (ppb) gold); a sample from an arsenopyrite-quartz vein contained 392 ppb gold. Only limited surface sampling has been done at this prospect.

Alteration:

Mentioned without specific detail.

Age of mineralization:

Paleocene or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Gold quartz veins; polymetallic gold-quartz veins (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Undetermined

Workings/exploration:

This and the other prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005, Canaco Resources optioned the property and drilled 3 holes at the nearby Sneaker prospect (MH366). They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco prospects. There has been only limited surface sampling at this prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Curtin, G.C., Tripp, R.B., and Nokleberg, W.J., 1989, Summary and Interpretation of geochemical maps for stream sediment and heavy mineral concentrate samples, Mount Hayes quadrangle, Eastern Alaska Range, Alaska: U.S.G.S. Miscellaneous Field Studies Map, 1 sheet, scale 1:250,000.

Freeman, C.J., 2006, Executive summary report for the Hadukovich gold project, Delta River mining district, Alaska: Unpublished report for Canaco Resources Inc., 70 p. (posted on www.sedar.com, June 9, 2006).

Freeman, C.J., 2009, Geology and mineralization of the Hajdukovich gold project, Delta River mining district, Alaska: Unpublished report for Anglo- Alaska Gold Corp, 68 p. (as of Feb 10, 2011, on web at http://www.avalonalaska.com/Project_of_Month/HA-10EXE1-Form43.pdf)

Nokleberg, W.J., Aleinikoff, J.N., Lange, I.M., Silva, S.R., Miyaoka, R.T., Schwab, C.E., Zehner, R.E., Bond, G.C., Richter, D.H., Smith, T.E., and Stout, J.H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p., 1 sheet, scale 1:250,000.

Primary Reference: Freeman, 2009

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Sneaker-Cirque; Hajdukovich

Site type: Prospect

ARDF no.: MH368

Latitude: 63.5717 **Quadrangle:** M C-3

Longitude: 145.0075

Location description and accuracy:

The Sneaker-Cirque prospect is about 0.9 mile west of peak 4937 and about 6.7 miles northeast of Mount Hajdukovich. It is about 0.5 mile north-northwest of the center of section 35, T. 21 N., R. 13 E. The location is accurate. A map of the Sneaker prospect is figure 9 of Freeman (2009).

Commodities:

Main: As, Au, Sb

Other:

Ore minerals: Arsenopyrite, gold, pyrite, stibnite

Gangue minerals: Quartz

Geologic description:

This and the other prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005, Canaco Resources optioned the property and drilled 3 holes at the nearby Sneaker prospect (MH366). They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco prospects. These claims were current as of 2009 and constitute the Hajdukovich project.

The geology of the area is dominated by a Paleocene multiphase, composite intrusive complex about 5 by 15 kilometers in size (Nokleberg and others, 1992; Freeman, 2009). The main rocks in the complex are mafic and ultramafic intrusive rocks, diorite and monzonite, alkali feldspar granite, and megacrystic granite; these are cut by a variety of aplite, rhyodacite, rhyolite, and basalt dikes. The intrusive rocks cut metamorphic rocks of the Jarvis Creek unit, which consists mainly of pelitic schist, gneiss, and quartzite. The Jarvis Creek unit is metamorphosed to greenschist facies north of the complex and to amphibolite(?) facies south of it. The structure of the area is dominated by steep northeast- and northwest-trending faults that range from the regional to the prospect-level scale. Six distinctive but related styles of mineralization have been identified in the Hajdukovich project area: 1) low sulfide, gold-quartz veins; 2) gold-sulfide-carbonate-quartz veins and veinlets; 3) sulfide-quartz veinlets; 4) gold-PGE-bearing chalcopyrite-magnetite pods and veins; 5) gold-bearing sulfide-quartz breccias; and 6) gold-bearing semi-massive sulfides.

The mineralization at Sneaker-Cirque prospect consists of several subparallel, northwest-trending zones of intensely altered tourmaline-carbonate-sericite rock in mafic diorite near the contact with megacrystic granite, and of north-trending, steep sulfide-carbonate-quartz veins with arsenopyrite, stibnite, and pyrite (Freeman, 2009). One sample of a tourmaline-rich vein contained 59,000 parts per billion gold and 176 parts per million bismuth. Only limited surface sampling has been done at this prospect.

Alteration:

Tourmaline-carbonate-sericite alteration at one occurrence.

Age of mineralization:

Paleocene or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Polymetallic gold-quartz veins (Cox and Singer, 1986: model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Undetermined

Workings/exploration:

This and the other prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005, Canaco Resources optioned the property and drilled 3 holes at the nearby Sneaker prospect (MH366). They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco prospects. There has beenonly limited surface sampling at this prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Curtin, G.C., Tripp, R.B., and Nokleberg, W.J., 1989, Summary and Interpretation of geochemical maps for stream sediment and heavy mineral concentrate samples, Mount Hayes quadrangle, Eastern Alaska Range, Alaska: U.S.G.S. Miscellaneous Field Studies Map, 1 sheet, scale 1:250,000.

Freeman, C.J., 2006, Executive summary report for the Hadukovich gold project, Delta River mining district, Alaska: Unpublished report for Canaco Resources Inc., 70 p. (posted on www.sedar.com, June 9, 2006).

Freeman, C.J., 2009, Geology and mineralization of the Hajdukovich gold project, Delta River mining district, Alaska: Unpublished report for Anglo- Alaska Gold Corp, 68 p. (as of Feb 10, 2011, on web at http://www.avalonalaska.com/Project_of_Month/HA-10EXE1-Form43.pdf)

Nokleberg, W.J., Aleinikoff, J.N., Lange, I.M., Silva, S.R., Miyaoka, R.T., Schwab, C.E., Zehner, R.E., Bond, G.C., Richter, D.H., Smith, T.E., and Stout, J.H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p., 1 sheet, scale 1:250,000.

Primary Reference: Freeman, 2009

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Diamondback; Hajdukovich

Site type: Prospect

ARDF no.: MH369

Latitude: 63.5723 **Quadrangle:** M C-3

Longitude: 145.0322

Location description and accuracy:

The Diamondback prospect consists of three mineralized occurrences on the north flank of peak 7837. It is about 6.3 miles northeast of Mount Hajdukovich and about 0.6 mile west-northwest of the center of section 34, T. 21 N., R. 13 E. The location is accurate. A map of the Diamondback prospect is figure 9 of Freeman (2009).

Commodities:

Main: As, Au, Cu, Mo, Sb

Other:

Ore minerals: Arsenopyrite, chalcopyrite, pyrite, molybdenite

Gangue minerals: Carbonate, quartz

Geologic description:

The Diamondback and other prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005, Canaco Resources optioned the property and drilled 3 holes at the nearby Sneaker prospect (MH366). They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco prospects. These claims were current as of 2009 and constitute the Hajdukovich project.

The geology of the area is dominated by a Paleocene multiphase, composite intrusive complex about 5 by 15 kilometers in size (Nokleberg and others, 1992; Freeman, 2009). The main rocks in the complex are mafic and ultramafic intrusive rocks, diorite and monzonite, alkali feldspar granite, and megacrystic granite; these are cut by a variety of aplite, rhyodacite, rhyolite, and basalt dikes. The intrusive rocks cut metamorphic rocks of the Jarvis Creek unit, which consists mainly of pelitic schist, gneiss, and quartzite. The Jarvis Creek unit is metamorphosed to greenschist facies north of the complex and to amphibolite(?) facies south of it. The structure of the area is dominated by steep northeast- and northwest-trending faults that range from the regional to the prospect-level scale. Six distinctive but related styles of mineralization have been identified in the Hajdukovich project area: 1) low sulfide, gold-quartz veins; 2) gold-sulfide-carbonate-quartz veins and veinlets; 3) sulfide-quartz veinlets; 4) gold-PGE-bearing chalcopyrite-magnetite pods and veins; 5) gold-bearing sulfide-quartz breccias; and 6) gold-bearing semi-massive sulfides.

The Diamondback prospect includes three gold occurrences on the flanks of peak 7837 (Freeman, 2009). At the eastern occurrence, trachytic alkali-feldspar granite is cut by thin, gold-sulfide-quartz veins with arsenopyrite, chalcopyrite, and pyrite; samples contained up to 586 parts per billion gold. A molybdenite-quartz vein contained 2,220 parts per million (ppm) molybdenite. At the western occurrence, broken quartz vein material and carbonate-altered breccia occur in fault gouge; samples contained up to 205 ppb gold and 172 ppm antimony. At the north occurrence, rock samples contained up to 4,220 ppb gold. Only surface sampling has been done at this prospect.

Alteration:

Zones of intense tourmaline-carbonate-sericite alteration.

Age of mineralization:

Paleocene or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Polymetallic gold-quartz veins (Cox and Singer, 1986, model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Undetermined

Workings/exploration:

The Diamondback and other prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005, Canaco Resources optioned the property and drilled 3 holes at the nearby Sneaker prospect (MH366). They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco prospects. There has been only limited surface sampling at this prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Curtin, G.C., Tripp, R.B., and Nokleberg, W.J., 1989, Summary and Interpretation of geochemical maps for stream sediment and heavy mineral concentrate samples, Mount Hayes quadrangle, Eastern Alaska Range, Alaska: U.S.G.S. Miscellaneous Field Studies Map, 1 sheet, scale 1:250,000.

Freeman, C.J., 2006, Executive summary report for the Hadukovich gold project, Delta River mining district, Alaska: Unpublished report for Canaco Resources Inc., 70 p. (posted on www.sedar.com, June 9, 2006).

Freeman, C.J., 2009, Geology and mineralization of the Hajdukovich gold project, Delta River mining district, Alaska: Unpublished report for Anglo- Alaska Gold Corp, 68 p. (as of Feb 10, 2011, on web at http://www.avalonalaska.com/Project_of_Month/HA-10EXE1-Form43.pdf)

Nokleberg, W.J., Aleinikoff, J.N., Lange, I.M., Silva, S.R., Miyaoka, R.T., Schwab, C.E., Zehner, R.E., Bond, G.C., Richter, D.H., Smith, T.E., and Stout, J.H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p.,

1 sheet, scale 1:250,000.

Primary Reference: Freeman, 2009

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): UPEG Saddle; Hajdukovich

Site type: Mine?

ARDF no.: MH370

Latitude: 63.5773 **Quadrangle:** M C-3

Longitude: 145.0557

Location description and accuracy:

The UPEG Saddle prospect is about a mile northwest of peak 7837 and about 5.6 miles northeast of Mount Hajdukovich. It is near the northwest corner of section 33, T. 21 N., R. 13 E. The location is accurate. A map of the UPEG Saddle prospect is figure 11 of Freeman (2009).

Commodities:

Main: Ag, As, Au, Bi, Cu, Pb, Sb

Other:

Ore minerals: Arsenopyrite, gold, stibnite

Gangue minerals: Quartz

Geologic description:

The Upeg Saddle and other prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005, Canaco Resources optioned the property and drilled 3 holes at the nearby Sneaker prospect (MH366). They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco and Canaco prospects. These claims were current as of 2009 and constitute the Hajdukovich project.

The geology of the area is dominated by a Paleocene multiphase, composite intrusive complex about 5 by 15 kilometers in size (Nokleberg and others, 1992; Freeman, 2009). The main rocks in the complex are mafic and ultramafic intrusive rocks, diorite and monzonite, alkali feldspar granite, and megacrystic granite; these are cut by a variety of aplite, rhyodacite, rhyolite, and basalt dikes. The intrusive rocks cut metamorphic rocks of the Jarvis Creek unit, which consists mainly of pelitic schist, gneiss, and quartzite. The Jarvis Creek unit is metamorphosed to greenschist facies north of the complex and to amphibolite(?) facies south of it. The structure of the area is dominated by steep northeast- and northwest-trending faults that range from the regional to the prospect-level scale. Six distinctive but related styles of mineralization have been identified in the Hajdukovich project area: 1) low sulfide, gold-quartz veins; 2) gold-sulfide-carbonate-quartz veins and veinlets; 3) sulfide-quartz veinlets; 4) gold-PGE-bearing chalcopyrite-magnetite pods and veins; 5) gold-bearing sulfide-quartz breccias; and 6) gold-bearing semi-massive sulfides.

Several types of mineralization are at the UPEG Saddle prospect (Freeman, 2009). Pods of massive stibnite are exposed in old prospect pits and trenches along the ridge. Although, there apparently is no previous record of the massive stibnite here, Freeman (2009) suggests that it was mined in the 1940s as part of the war effort. Several samples were analyzed; none contained anomalous gold. South of the stibnite occurrence, east-trending aplite dikes cut porphyritic alkali-feldspar granite. The dikes are cut by arsenopyrite-quartz veins; samples contained up to 5,900 parts per billion (ppb) gold, 2.6 parts per million (ppm) silver, 64 ppm lead, and 327 ppm antimony. Still farther south, disseminated porphyry-style, copper-gold mineralization is in potassic-altered trachytic and porphyritic alkali-feldspar granite. Samples contained up to 6,850 ppb gold, 75.2 ppm silver, 4,230 ppm copper, and have anomalous amounts of bismuth, lead,

and antimony. The mineralized alkali-feldspar granite is cut in several places by quartz veins containing pyrite, arsenopyrite, and stibnite. The numerous samples from the UPEG Saddle prospect contained up to 6,850 ppb gold, more than 1 percent arsenic, 20,500 ppm copper, 2,090 ppm lead, 2,680 ppm antimony, and 584 ppm bismuth. Other than the old pits and trenches, there has been only surface sampling at this prospect.

Alteration:

Potassic alteration of trachytic and porphyritic alkali-feldspar granite associated with porphyry-style mineralization.

Age of mineralization:

Paleocene or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Polymetallic gold-quartz veins (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Undetermined

Workings/exploration:

This and the other prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005, Canaco Resources optioned the property and drilled 3 holes at the nearby Sneaker prospect (MH366). They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco prospects. Since the late 1990s, there has been only surface sampling at this prospect. However there are old prospect pits and trenches from which stibnite may have been mined during WWII.

Production notes:

Some stibnite may have been mined during the 1940s.

Reserves:

None.

Additional comments:

References:

Curtin, G.C., Tripp, R.B., and Nokleberg, W.J., 1989, Summary and Interpretation of geochemical maps for stream sediment and heavy mineral concentrate samples, Mount Hayes quadrangle, Eastern Alaska Range, Alaska: U.S.G.S. Miscellaneous Field Studies Map, 1 sheet, scale 1:250,000.

Freeman, C.J., 2006, Executive summary report for the Hadukovich gold project, Delta River mining district, Alaska: Unpublished report for Canaco Resources Inc., 70 p. (posted on www.sedar.com, June 9, 2006).

Freeman, C.J., 2009, Geology and mineralization of the Hajdukovich gold project, Delta River mining district, Alaska: Unpublished report for Anglo- Alaska Gold Corp, 68 p. (as of Feb 10, 2011, on web at http://www.avalonalaska.com/Project_of_Month/HA-10EXE1-Form43.pdf)

Nokleberg, W.J., Aleinikoff, J.N., Lange, I.M., Silva, S.R., Miyaoka, R.T., Schwab, C.E., Zehner, R.E., Bond, G.C., Richter, D.H., Smith, T.E., and Stout, J.H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p., 1 sheet, scale 1:250,000.

Primary Reference: Freeman, 2009

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Gert; West Gert; Hajdukovich

Site type: Prospect

ARDF no.: MH371

Latitude: 63.5853 **Quadrangle:** M C-3

Longitude: 145.1429

Location description and accuracy:

The Gert prospect is about 3.5 miles north-northwest of Mount Hajdukovich, near the center of section 25, T. 21 N., R. 13 E. The Gert West prospect is about 800 yards west of the Gert prospect. A map of the Gert and Gert West prospects is figure 13 of Freeman (2009).

Commodities:

Main: Ag, As, Au, Pb, Sb

Other: Bi, Cu

Ore minerals: Arsenopyrite, gold, pyrite

Gangue minerals: Calcite, quartz

Geologic description:

The Gert and Gert West prospects and the other prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005, Canaco Resources optioned the property and drilled 3 holes at the nearby Sneaker prospect (MH366). They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco and Canaco prospects. These claims were current as of 2009 and constitute the Hajdukovich project.

The geology of the area is dominated by a Paleocene multiphase, composite intrusive complex about 5 by 15 kilometers in size (Nokleberg and others, 1992; Freeman, 2009). The main rocks in the complex are mafic and ultramafic intrusive rocks, diorite and monzonite, alkali feldspar granite, and megacrystic granite; these are cut by a variety of aplite, rhyodacite, rhyolite, and basalt dikes. The intrusive rocks cut metamorphic rocks of the Jarvis Creek unit, which consists mainly of pelitic schist, gneiss, and quartzite. The Jarvis Creek unit is metamorphosed to greenschist facies north of the complex and to amphibolite(?) facies south of it. The structure of the area is dominated by steep northeast- and northwest-trending faults that range from the regional to the prospect-level scale. Six distinctive but related styles of mineralization have been identified in the Hajdukovich project area: 1) low sulfide, gold-quartz veins; 2) gold-sulfide-carbonate-quartz veins and veinlets; 3) sulfide-quartz veinlets; 4) gold-PGE-bearing chalcopyrite-magnetite pods and veins; 5) gold-bearing sulfide-quartz breccias; and 6) gold-bearing semi-massive sulfides.

The mineralization at the Gert prospect consists of vuggy quartz and calcite-quartz veins with sparse sulfides, mainly arsenopyrite, in monzodiorite and diorite near the contact with Jarvis Creek metamorphic rocks (Freeman, 2009). Selected samples from the veins contained up to 8,310 parts per billion (ppb) gold, 2.9 parts per million (ppm) silver, 4,110 ppm arsenic, 33 ppm bismuth, 206 ppm lead, and 150 ppm antimony. At the Gert West prospect, vuggy, oxidized quartz veins with pyrite and arsenopyrite are in trachytic and porphyritic alkali-feldspar granite. Samples of the veins contain up to 12,620 ppb gold, 399 ppm silver, more than 1 percent arsenic, 802 ppm copper, 2,200 ppm lead, and 2,500 ppm antimony. Only surface sampling has been done at this prospect.

Alteration:

Not specifically mentioned.

Age of mineralization:

Paleocene or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Polymetallic gold-quartz veins (Cox and Singer, 1986, model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Undetermined

Workings/exploration:

This and the other prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005, Canaco Resources optioned the property and drilled 3 holes at the nearby Sneaker prospect (MH366). They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco prospects. Only surface sampling has been done at this prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Curtin, G.C., Tripp, R.B., and Nokleberg, W.J., 1989, Summary and Interpretation of geochemical maps for stream sediment and heavy mineral concentrate samples, Mount Hayes quadrangle, Eastern Alaska Range, Alaska: U.S.G.S. Miscellaneous Field Studies Map, 1 sheet, scale 1:250,000.

Freeman, C.J., 2006, Executive summary report for the Hadukovich gold project, Delta River mining district, Alaska: Unpublished report for Canaco Resources Inc., 70 p. (posted on www.sedar.com, June 9, 2006).

Freeman, C.J., 2009, Geology and mineralization of the Hajdukovich gold project, Delta River mining district, Alaska: Unpublished report for Anglo- Alaska Gold Corp, 68 p. (as of Feb 10, 2011, on web at http://www.avalonalaska.com/Project_of_Month/HA-10EXE1-Form43.pdf)

Nokleberg, W.J., Aleinikoff, J.N., Lange, I.M., Silva, S.R., Miyaoka, R.T., Schwab, C.E., Zehner, R.E., Bond, G.C., Richter, D.H., Smith, T.E., and Stout, J.H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p.,

1 sheet, scale 1:250,000.

Primary Reference: Freeman, 2009

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Calypso; Hajdukovich

Site type: Prospect

ARDF no.: MH372

Latitude: 63.5824 **Quadrangle:** M C-3

Longitude: 145.166

Location description and accuracy:

The Calypso prospect is about 3.3 miles north-northwest of Mount Hajdukovich and about 0.2 mile southeast of the center of section 26. T. 21 N., R. 13 E. A map of the Calypso prospect is figure 13 of Freeman (2009).

Commodities:

Main: Ag, As, Au, Cu, Ni, Pb, Pd, Pt, Sb

Other:

Ore minerals: Arsenopyrite, galena, gold, magnetite, platinum-group minerals, stibnite

Gangue minerals: Quartz

Geologic description:

The Calypso and other prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005, Canaco Resources optioned the property and drilled 3 holes at the Sneaker prospect (MH366). They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco and Canaco prospects. These claims were current as of 2009 and constitute the Hajdukovich project. Although discovered during the exploration of the area by Teck Cominco and Canaco, the Calypso prospect is outside the Anglo Alaska block of claims.

The geology of the area is dominated by a Paleocene multiphase, composite intrusive complex about 5 by 15 kilometers in size (Nokleberg and others, 1992; Freeman, 2009). The main rocks in the complex are mafic and ultramafic intrusive rocks, diorite and monzonite, alkali feldspar granite, and megacrystic granite; these are cut by a variety of aplite, rhyodacite, rhyolite, and basalt dikes. The intrusive rocks cut metamorphic rocks of the Jarvis Creek unit, which consists mainly of pelitic schist, gneiss, and quartzite. The Jarvis Creek unit is metamorphosed to greenschist facies north of the complex and to amphibolite(?) facies south of it. The structure of the area is dominated by steep northeast- and northwest-trending faults that range from the regional to the prospect-level scale. Six distinctive but related styles of mineralization have been identified in the Hajdukovich project area: 1) low sulfide, gold-quartz veins; 2) gold-sulfide-carbonate-quartz veins and veinlets; 3) sulfide-quartz veinlets; 4) gold-PGE-bearing chalcopyrite-magnetite pods and veins; 5) gold-bearing sulfide-quartz breccias; and 6) gold-bearing semi-massive sulfides.

Several types of mineralization are in porphyritic alkali-feldspar granite and diorite at the Calypso prospect (Freeman, 2009). Vuggy quartz veins with trace to modest arsenopyrite, galena, and stibnite contained up to 4,750 parts per billion (ppb) gold, 98.6 parts per million (ppm) silver, 5,310 ppm arsenic, 3,390 ppm copper, 23,300 ppm lead, and 9,180 ppm antimony. Tech Cominco reported veinlets and pods of 'semi-massive' chalcopyrite and magnetite; samples contained up to 19.41 grams of gold per tonne, 6,120 ppm copper, 6,600 ppm silver, 890 ppb palladium, 73.5 ppb platinum, and 2,670 ppm nickel. A float sample of calc-silicate rock with semi-massive arsenopyrite and pyrite contained 1.16 grams of gold per

tonne. Only surface sampling has been done at this prospect.

Alteration:

Age of mineralization:

Paleocene or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Polymetallic gold-quartz veins (Cox and Singer, 1986; model 22c); 'semi-massive' chalcopyrite and magnetite; skarn?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Undetermined

Workings/exploration:

The Calypso and other prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005, Canaco Resources optioned the property and driled 3 holes at the nearby Sneaker prospect (MH366). They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco prospects. Only surface sampling has been done at this prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Curtin, G.C., Tripp, R.B., and Nokleberg, W.J., 1989, Summary and Interpretation of geochemical maps for stream sediment and heavy mineral concentrate samples, Mount Hayes quadrangle, Eastern Alaska Range, Alaska: U.S.G.S. Miscellaneous Field Studies Map, 1 sheet, scale 1:250,000.

Freeman, C.J., 2006, Executive summary report for the Hadukovich gold project, Delta River mining district, Alaska: Unpublished report for Canaco Resources Inc., 70 p. (posted on www.sedar.com, June 9, 2006).

Freeman, C.J., 2009, Geology and mineralization of the Hajdukovich gold project, Delta River mining district, Alaska: Unpublished report for Anglo- Alaska Gold Corp, 68 p. (as of Feb 10, 2011, on web at http://www.avalonalaska.com/Project_of_Month/HA-10EXE1-Form43.pdf)

Nokleberg, W.J., Aleinikoff, J.N., Lange, I.M., Silva, S.R., Miyaoka, R.T., Schwab, C.E., Zehner, R.E., Bond, G.C., Richter, D.H., Smith, T.E., and Stout, J.H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p., 1 sheet, scale 1:250,000.

Primary Reference: Freeman, 2009

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Caliente; Hajdukovich

Site type: Prospect

ARDF no.: MH373

Latitude: 63.5812 **Quadrangle:** M C-3

Longitude: 145.1824

Location description and accuracy:

The Caliente prospect is about 3.3 miles north-northeast of Mount Hajdukovich and about 0.4 mile southwest of the center of section 26, T. 21 N., R. 13 E. A map of the Caliente prospect is figure 13 of Freeman (2009).

Commodities:

Main: As, Au, Bi, Cu

Other:

Ore minerals: Chalcopyrite

Gangue minerals: Calcite, quartz

Geologic description:

The Caliente and other prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005, Canaco Resources optioned the property and drilled 3 holes at the nearby Sneaker prospect (MH366). They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco and Canaco prospects. These claims were current as of 2009 and comprise the Hajdukovich project. Although discovered during the exploration of the area by Teck Cominco and Canaco, the Caliente prospect is outside the Anglo Alaska block of claims.

The geology of the area is dominated by a Paleocene multiphase, composite intrusive complex about 5 by 15 kilometers in size (Nokleberg and others, 1992; Freeman, 2009). The main rocks in the complex are mafic and ultramafic intrusive rocks, diorite and monzonite, alkali feldspar granite, and megacrystic granite; these are cut by a variety of aplite, rhyodacite, rhyolite, and basalt dikes. The intrusive rocks cut metamorphic rocks of the Jarvis Creek unit, which consists mainly of pelitic schist, gneiss, and quartzite. The Jarvis Creek unit is metamorphosed to greenschist facies north of the complex and to amphibolite(?) facies south of it. The structure of the area is dominated by steep northeast- and northwest-trending faults that range from the regional to the prospect-level scale. Six distinctive but related styles of mineralization have been identified in the Hajdukovich project area: 1) low sulfide, gold-quartz veins; 2) gold-sulfide-carbonate-quartz veins and veinlets; 3) sulfide-quartz veinlets; 4) gold-PGE-bearing chalcopyrite-magnetite pods and veins; 5) gold-bearing sulfide-quartz breccias; and 6) gold-bearing semi-massive sulfides.

The Caliente prospect was not sampled in detail because of the steep and hazardous terrain. Quartz veins cut mineralized aplite dikes in monzonite and diorite (Freeman, 2009). The aplite dikes contain disseminated chalcopyrite; a sample contained 5,940 parts per billion (ppb) gold, 3.9 parts per million (ppm) silver, 8 ppm bismuth, and 3,500 ppm copper. A sample from a 1- to 3-centimeter-thick quartz-calcite vein contained 9,330 ppb gold, 212 ppm arsenic, 28 ppm bismuth, and 705 ppm copper. Only surface sampling has been done at this prospect.

Alteration:

Age of mineralization:

Paleocene or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Polymetallic gold-quartz veins (Cox and Singer, 1986, model 22c); disseminated chalcopyrite in aplite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Undetermined

Workings/exploration:

The Calinete and other prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005. Canaco Resources optioned the property and drilled 3 holes at the nearby Sneaker prospect (MH366). They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco prospects. Only surface sampling has been done at this prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Curtin, G.C., Tripp, R.B., and Nokleberg, W.J., 1989, Summary and Interpretation of geochemical maps for stream sediment and heavy mineral concentrate samples, Mount Hayes quadrangle, Eastern Alaska Range, Alaska: U.S.G.S. Miscellaneous Field Studies Map, 1 sheet, scale 1:250,000.

Freeman, C.J., 2006, Executive summary report for the Hadukovich gold project, Delta River mining district, Alaska: Unpublished report for Canaco Resources Inc., 70 p. (posted on www.sedar.com, June 9, 2006).

Freeman, C.J., 2009, Geology and mineralization of the Hajdukovich gold project, Delta River mining district, Alaska: Unpublished report for Anglo- Alaska Gold Corp, 68 p. (as of Feb 10, 2011, on web at http://www.avalonalaska.com/Project_of_Month/HA-10EXE1-Form43.pdf)

Nokleberg, W.J., Aleinikoff, J.N., Lange, I.M., Silva, S.R., Miyaoka, R.T., Schwab, C.E., Zehner, R.E., Bond, G.C., Richter, D.H., Smith, T.E., and Stout, J.H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p.,

1 sheet, scale 1:250,000.

Primary Reference: Freeman, 2009

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): PW; Hajdukovich

Site type: Prospect

ARDF no.: MH374

Latitude: 63.5431 **Quadrangle:** M C-3

Longitude: 145.0123

Location description and accuracy:

The PW prospect is about 8 miles east of Mount Hajdukovich, near the center of section 10, T. 21 N., R. 14 E. A map of the PW prospect is figure 15 of Freeman (2009).

Commodities:

Main: Ag, As, Au, Bi, Cu, Pb, Sb

Other: Sn, W, Zn

Ore minerals: Arsenopyrite, gold, pyrite

Gangue minerals: Calcite, quartz

Geologic description:

The PW and other prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005, Canaco Resources optioned the property and drilled 3 holes at the nearby Sneaker prospect (MH366). They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco and Canaco prospects. These claims were current as of 2009 and constitute the Hajdukovich project.

The geology of the area is dominated by a Paleocene multiphase, composite intrusive complex about 5 by 15 kilometers in size (Nokleberg and others, 1992; Freeman, 2009). The main rocks in the complex are mafic and ultramafic intrusive rocks, diorite and monzonite, alkali feldspar granite, and megacrystic granite; these are cut by a variety of aplite, rhyodacite, rhyolite, and basalt dikes. The intrusive rocks cut metamorphic rocks of the Jarvis Creek unit, which consists mainly of pelitic schist, gneiss, and quartzite. The Jarvis Creek unit is metamorphosed to greenschist facies north of the complex and to amphibolite(?) facies south of it. The structure of the area is dominated by steep northeast- and northwest-trending faults that range from the regional to the prospect-level scale. Six distinctive but related styles of mineralization have been identified in the Hajdukovich project area: 1) low sulfide, gold-quartz veins; 2) gold-sulfide-carbonate-quartz veins and veinlets; 3) sulfide-quartz veinlets; 4) gold-PGE-bearing chalcopyrite-magnetite pods and veins; 5) gold-bearing sulfide-quartz breccias; and 6) gold-bearing semi-massive sulfides.

Several types of mineralization are at the PW prospect (Freeman, 2009). A 3-centimeter-thick quartz vein with arsenopyrite and pyrite cuts gabbro; a sample contained 50,700 parts per billion (ppb) gold, 32.2 parts per million (ppm) silver, 43 ppm lead, and 719 ppm antimony. Several other narrow veins and veinlets are adjacent to rhyodacite and rhyolite dikes; samples of the veins contained up to 94 ppb gold, more than 1 percent arsenic, 172 ppm lead, and 32 ppm antimony. Samples of silicified breccias in the mafic rocks contained from 249 to 2,180 ppb gold, and up to 198 ppm silver, 7,290 ppm arsenic, 166 ppm copper, 1,345 ppm lead, 237 ppm antimony, and sporadic amounts of anomalous tin, tungsten, and zinc. There also is a horizon in the metamorphic that contains semi-massive sulfides up to 2 meters thick, associated with pervasive clay alteration and abundant black tourmaline. A sample contained 2,480 ppb gold, 23.6 ppm silver, more than 1 percent arsenic, 6 ppm bismuth, 583 ppm lead, and 324 ppm antimony. Only surface

sampling has been done at this prospect.

Alteration:

Clay alteration of semi-massive-sulfide horizon; silicified breccia.

Age of mineralization:

Paleocene or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Polymetallic gold-quartz veins (Cox and Singer, 1986, model 22c); 'semi-massive' sulfides.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Undetermined

Workings/exploration:

The PW and other prospects of the Hajdukovich project were first identified by Teck-Cominco from 1999 to 2001 through regional geochemical sampling followed by mapping and sampling in the steep terrain in the headwaters and east of the Little Gerstle River (Freeman, 2009). The area was dormant from 2002 to 2004. In 2005, Canaco Resources optioned the property and drilled 3 holes at the nearby Sneaker prospect (MH366). They terminated their option in 2006 and the property reverted to Teck-Cominco. Teck-Cominco abandoned the property in 2008. A contiguous block of 49 State of Alaska claims was staked by Anglo Alaska Gold Corp. that covered almost all of the original Teck-Cominco prospects. Only surface sampling has been done at this prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Curtin, G.C., Tripp, R.B., and Nokleberg, W.J., 1989, Summary and Interpretation of geochemical maps for stream sediment and heavy mineral concentrate samples, Mount Hayes quadrangle, Eastern Alaska Range, Alaska: U.S.G.S. Miscellaneous Field Studies Map, 1 sheet, scale 1:250,000.

Freeman, C.J., 2006, Executive summary report for the Hadukovich gold project, Delta River mining district, Alaska: Unpublished report for Canaco Resources Inc., 70 p. (posted on www.sedar.com, June 9, 2006).

Freeman, C.J., 2009, Geology and mineralization of the Hajdukovich gold project, Delta River mining district, Alaska: Unpublished report for Anglo- Alaska Gold Corp, 68 p. (as of Feb 10, 2011, on web at http://www.avalonalaska.com/Project_of_Month/HA-10EXE1-Form43.pdf)

Nokleberg, W.J., Aleinikoff, J.N., Lange, I.M., Silva, S.R., Miyaoka, R.T., Schwab, C.E., Zehner, R.E.,

Bond, G.C., Richter, D.H., Smith, T.E., and Stout, J.H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p., 1 sheet, scale 1:250,000.

Primary Reference: Freeman, 2009

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Unnamed (near Cony Mountain)

Site type: Occurrence

ARDF no.: MH375

Latitude: 63.29 **Quadrangle:** M B-4

Longitude: 145.4257

Location description and accuracy:

This occurrence is on a nunatak about 0.6 mile east-southeast of Cony Mountain. It is about 0.4 mile south of the center of section 3, T. 19 S., R. 12 E.

Commodities:

Main: Au, Cu, Ni, Pd, Pt

Other:

Ore minerals: Chalcopyrite, pentlandite, pyrrhotite, violarite

Gangue minerals:

Geologic description:

Nokleberg and others (1992 [MF]; 1992 [Open-File]) map the rocks in the area as undivided gabbro, diabase, and metagabbro on their regional 1:250,000-scale geologic map. Ragan and Hawkins (1966) and Bittenbender and others (2007), who examined the geology in more detail, identified a nearly horizontal thrust fault under the occurrence. The upper plate rocks consist of highly deformed, quartz-biotite schist cut by dikes and plugs of Triassic(?) gabbro, pyroxenite, and peridotite. About 300 feet away, the schist has been intruded by Cretaceous(?) granodiorite. The mafic and ultramafic rocks are strongly altered. Peridotite is serpentinized; clinopyroxene is replaced by hornblende, biotite, and chlorite; and plagioclase is sericitized. The rocks in the lower plate are relatively undeformed basalt and fine-grained gabbro. Attempts to date the rocks were unsuccessful.

This occurrence was first identified by Bittenbender and others (2007). Most of the gabbro and peridotite samples that they collected contained at least some chalcopyrite, pyrrhotite, and pentlandite altered to violarite. They collected 6 samples; all contained at least some nickel, copper, and precious metals. The best was a 7-foot sample that contained 3,710 parts per million (ppm) nickel, 4,740 ppm copper, 385 parts per billion (ppb) platinum, 827 ppm palladium, and 340 ppb gold.

Alteration:

The mafic and ultramafic rocks are strongly altered. The peridotite is serpentinized; clinopyroxene is replaced by hornblende, biotite, and chlorite; and plagioclase is sericitized.

Age of mineralization:

Unclear but may be related to Triassic(?) dikes and plugs of mafic and ultramafic rocks.

Generic deposit model:

Deposit model:

Nickel-copper-PGE-gold mineralization possibly related to Triassic? dikes and plugs of mafic and ultramafic rocks.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only surface sampling by the Bureau of Land Management from 2001 to 2003.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Ragan, D.M., and Hawkins, J.W., Jr., 1966, A polymetamorphic complex in the eastern Alaska Range: Geological Society of America Bulletin, v. 77, p. 597-604.

Primary Reference: Bittenbender and others, 2007

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (east of Coney Mountain)

Site type: Occurrence

ARDF no.: MH376

Latitude: 63.2966 **Quadrangle:** M B-4

Longitude: 145.4128

Location description and accuracy:

This occurrence is at an elevation of about 6,400 feet, about 1.0 mile east-northeast of Cony Mountain on a ridge at the head of the Gulkana Glacier. It is about 0.5 mile south of the center of section 3, T. 19 S., R. 12 E.

Commodities:

Main: Au, Cu, Ni, Pd, Pt

Other:

Ore minerals: Chalcopyrite, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

Nokleberg and others (1992 [MF]; 1992 [Open-File]) map the rocks in the area as undivided gabbro, diabase, and metagabbro on their regional 1:250,000-scale geologic map. Ragan and Hawkins (1966) and Bittenbender and others (2007), who examined the geology in more detail, identified a nearly horizontal thrust fault under the occurrence. The upper plate rocks consist of highly deformed, quartz-biotite schist cut by dikes and plugs of Triassic(?) gabbro, pyroxenite, and peridotite. About 300 feet away, the schist has been intruded by Cretaceous(?) granodiorite. The mafic and ultramafic rocks are strongly altered. Peridotite is serpentinized; clinopyroxene is replaced by hornblende, biotite, and chlorite; and plagioclase is sericitized. The rocks in the lower plate are relatively undeformed basalt and fine-grained gabbro.

Bittenbender and others (2007) collected several samples of copper stained peridotite from a small plug in the metamorphic rocks of the upper plate. They did not note any specific ore minerals but this occurrence is similar to ARDF site MH375 about a mile to the southwest, where chalcopyrite, pyrrhotite, and pentlandite are present in similar mafic and ultramafic rocks. A representative sample of peridotite from the southern portion of the occurrence contained 50 parts per billion (ppb) platinum, 56 ppb palladium, 12 ppb gold, 330 parts per million (ppm) copper, and 1,500 ppm nickel. A select sample of iron-stained rubble in the middle of the occurrence contained 409 ppb platinum, 414 ppb palladium, 17 ppb gold, 1,500 ppm copper and 1,880 ppm nickel.

Alteration:

Mineralized mafic and ultramafic rocks in a small plug are variably serpentinized.

Age of mineralization:

Probably related to Triassic(?) dikes and plugs of mafic and ultramafic rocks.

Generic deposit model:

Deposit model:

Disseminated copper-nickel-PGE mineralization in a plug of mafic and ultramafic rocks.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only surface sampling by the Bureau of Land Management in the early 2000s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Ragan, D.M., and Hawkins, J.W., Jr., 1966, A polymetamorphic complex in the eastern Alaska Range: Geological Society of America Bulletin, v. 77, p. 597-604.

Primary Reference: Bittenbender and others, 2007

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (east of Gakona Glacier)

Site type: Occurrence

ARDF no.: MH377

Latitude: 63.213 **Quadrangle:** M A-3

Longitude: 145.072

Location description and accuracy:

This site includes several outcrops of mineralized rock in the cirque of an unnamed glacier east of the Gakona Glacier. They are centered about 2.1 miles north-northeast of VABM 5206 'Ona' and about 0.2 mile north of the center of section 4, T. 20 S., R. 14 E.

Commodities:

Main: Au, Cu, Pd, Pt

Other: Co

Ore minerals: Chalcopyrite, magnetite, pyrrhotite

Gangue minerals:

Geologic description:

The rocks in the area consist of mafic and ultramafic intrusive rocks associated with volcanic rocks that are probably part of the Pennsylvanian to Permian, Slana Spur Formation (Rose, 1967; Nokleberg and others, 1992 [MF]; 1992 [Open-File]; 1992 [Open-File]; Bittenbender and others, 2007). The volcanic rocks are hornfelsed near the intrusive rocks. Cretaceous K/Ar dates from the mafic and ultramafic rocks probably reflect regional metamorphism and their protoliths may be Paleozoic.

Numerous stream-sediment samples collected by the U.S. Geological Survey and Bureau of Land Management that contained anomalous platinum-group elements led to the search for their source (O'Leary and others, 1982; Bittenbender and others, 2003). Bittenbender and others (2007) identified several outcrops, one up to 160 feet long, of pyroxenite and peridotite with persistent but minor chalcopyrite, pyrrhotite, and pyrite. Two, 20-foot samples contained 127 and 65 parts per billion (ppb) palladium, 52 and 36 ppb platinum, 18 and 15 ppb gold, and 824 and 1,005 parts per million (ppm) copper. A sample selected for its high sulfide content contained 144 ppb palladium, 104 ppb platinum, 34 ppb gold, 1,055 ppm copper, and 34 ppm nickel. They considered the mineralization to be too low grade to account for the anomalous PGE in the geochemical samples.

Alteration:

Hornfelsing of volcanic rocks adjacent to mafic and ultramafic intrusive rocks.

Age of mineralization:

Unclear whether the host rocks are Cretaceous or Paleozoic.

Generic deposit model:

Deposit model:

Disseminated chalcopyrite, pyrrhotite, and pyrite in mafic and ultramafic rocks.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only limited sampling by state and federal agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2003, Mineral investigations in the Delta River Mining District, east-central Alaska, 2001-2001: Bureau of Land Management-Alaska Open-File Report 91, 82 p.

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

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Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

O'Leary, R.M., Risoli, D.A., Curtin, G.C., Tripp, R.B., McDougal, C.M>, and Huston, D.L., 1982, Final analytical results of stream-sediments, glacial debris, and non-magnetic heavy-mineral concentrate samples from the Mt. Hayes quadrangle, Alaska: U.S. Geological Survey Open-File Report 82-325, 130 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1967, Geology of the upper Chistochina River area, Mount Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 28, 41 p., 2 maps, scale 1:40,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (in upper Miller Gulch)

Site type: Occurrences

ARDF no.: MH378

Latitude: 63.1765 **Quadrangle:** M A-2

Longitude: 144.8226

Location description and accuracy:

The dikes, sills, and plugs that are described in this record are scattered widely at the head of Miller Gulch. Their center is at an elevation of about 4,800 feet in Miller Gulch and about 0.5 mile south-southwest of the center of section 14, T. 20 S., R. 15 E.

Commodities:

Main: Au, Ir, Os, Pt

Other:

Ore minerals: Gold, osmiridium, tetraferroplatinum

Gangue minerals:

Geologic description:

Bittenbender and others (2007) summarized the occurrences of lode platinum group elements (PGE) and gold in the so-called 'dikes' in upper Miller Gulch. They are in Upper Jurassic to Cretaceous, black slatey argillite (Matteson, 1973; Summers, 1990; Nokleberg and others, 1992 [MF]; 1992 [Open-File]). The 'dikes' include dikes, sills, and plugs of gabbro, dunite, peridotite, hornblendite, and diorite that were intruded in several episodes. Matteson (1973) dated a mafic-ultramafic body nearby at the head of Quartz Creek (MH379) by K/Ar methods at a minimum age of 120-123 Ma.

Foley and Summers (1990) identified tetraferroplatinum, osmiridium, and native gold in the mafic and ultramafic rocks and in the argillite nearby. They believe that the platinum and at least part of the gold in the Miller Creek placer (MH296) that drains drains this area came from the mafic and ultramafic rocks. However, analyses of a considerable number of samples collected both by Foley and Summers (1990) and by Bittenbender and others (2007) failed to show significant amounts of the PGE or gold in these rocks in spite of the physical identification of PGE minerals and native gold in them. One reason may be their erratic distribution, i.e., the 'nugget' effect. In the samples collected by Bittenbender and others (1970), the maximum values in any of them was 7 parts per billion (ppb) gold, 0.2 part per million (ppm) silver, 479 ppm copper, 0.685 ppm mercury, 24 ppb palladium, and 19 ppb platinum.

Alteration:

Not noted.

Age of mineralization:

Associated with dikes, sills, and plugs that may be older than 120-123 Ma mafic-ultramafic rocks nearby but younger than the Upper Jurassic to Cretaceous argillite host rock.

Generic deposit model:

Deposit model:

PGE and gold mineralization in mafic to ultramafic dikes, sills, and plugs.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only sampling by state and federal agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Foley, J.Y., and Summers, C.A., 1990, Source and bedrock distribution of gold and platinum-group metals in the Slate Creek area, northern Chistochina Mining District, east-central, Alaska: U.S. Bureau of Mines Open-File report 14-90, 49 p., 1 sheet

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Matteson, C., 1973, Geology of the Slate Creek area, Mt Hayes (A-2) quadrangle, Alaska: Fairbanks, unpublished University of
Alaska thesis, 66 p.

Primary Reference: Bittenbender and others, 2007

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Picric Hill

Site type: Occurrence

ARDF no.: MH379

Latitude: 63.3179 **Quadrangle:** M B-4

Longitude: 145.8634

Location description and accuracy:

The Picric Hill occurrence is at an elevation of about 5,250 feet on a ridge between headwater tributaries of Ann Creek. It is about 2.1 miles north-northeast of the junction of the North and West Forks of Rainy Creek and about 0.6 mile north-northeast of the center of section 32, T. 18 S., R. 10 E.

Commodities:

Main: Au, Cu

Other:

Ore minerals: Chalcopyrite, magnetite, pyrite

Gangue minerals:

Geologic description:

This occurrence was first identified and sampled by Bittenbender and others (2007) in 2002. As of 2007 there is no indication of industry work on it.

The rocks in the area are mainly olivine-rich basalt (picrite) of probable Triassic age (Rose, 1965; Nokleberg and others, 1992 [MF]; 1992 [Open-File]; Bittenbender and others, 2007). The occurrence is in a band of interfingering skarn and sulfides that is exposed for 44 feet along strike and is 5-11 feet thick. The wall rock of the band is altered felsic intrusive rock. The band is highly fractured and locally brecciated. The skarn consists mainly of fine- to medium-grained massive garnet with minor epidote and actinolite. The sulfides are mainly pyrite with about a third chalcopyrite and some magnetite. The sulfides generally occur in the interstices of euhedral garnet . Bittenbender and Gensler (2003) collected three, 5 to 6 foot samples across the skarn. The highest gold value was only 37 parts per billion and the highest copper value was 1,205 parts per million (ppm). A select sample of float contained 2,750 ppm copper.

Alteration:

Mineralization in an altered band of felsic intrusive rocks.

Age of mineralization:

Source of skarn mineralization is probably the Triassic basalt (picrite) in the area.

Generic deposit model:

Deposit model:

Band of copper skarn associated with a basalt.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

This occurrence was first identified and sampled by Bittenbender and others (2007) in 2002. As of then, there was no indication of industry work on it.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

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Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Rose, A.W., 1965, Geology and mineral deposits of the Rainy Creek area, Mt. Hayes quadrangle, Alaska: Alaska Division of Mines and Minerals Geologic Report 14, 57 p., 1 sheet, scale 1:36,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Unnamed (south of Chisna Pass)

Site type: Prospect

ARDF no.: MH380

Latitude: 63.1504 **Quadrangle:** M A-2

Longitude: 144.8157

Location description and accuracy:

This site is south of Chisna Pass, about 1.1 mile south-southeast of the junction of Miller Gulch and Slate Creek. It is at an elevation of about 5,300 feet, about 0.2 mile southeast of the center of section 26, T. 16 N., R. 14 E.

Commodities:

Main: Ag, Cu

Other:

Ore minerals: Chalcopyrite

Gangue minerals:

Geologic description:

This record refers specifically to mineralization at this site as described by Bittenbender and others (2007). However, their description also covers several large claim groups and extensive work in the area that not only covers this site but several other nearby ARDF sites, MH300 and MH365. Those records may include data that applies to this site before it was separately recognized.

C.W. Monroe (as Northland Mines) prospected in the area from 1964 to at least 1973 and staked more than 142 lode claims that covered this site and several square miles south of Chisna Pass (Bittenbender and others, 2007). Paul Glavinovich staked at least 36 claims that probably covered this site and Resource Associates of Alaska (RAA) staked a large block of claims in the late 1970s and early 1980s. Their claims probably covered this site but the three holes they drilled were probably about 0.4 miles to the southeast at ARDF site MH365 . AMAX Exploration apparently was active in the area in about 1990 and Cominco Alaska Exploration explored in the early 90s. In 2010, Corvus Gold Inc. drilled three holes to the southeast in 2010 as described in ARDF record MH365 as part of an extensive exploration program. The work included surface sampling and mapping and geochemical and geophysical surveys on a large block of claims that undoubtedly covered this prospect.

As described by Bittenbender and others (2007) citing Nokleberg and others (1991; 1992 [MF]; 1992 [Open-File]), the rocks in the area are hypabyssal stocks, dikes, and sills of Permian andesite to rhyolite that intrude marine volcanic rocks, volcaniclastic sedimentary rocks, and thin limestones of the Pennsylvanian and Permian, Slana Spur Formation. The area is cut by a series of high angle faults. The mineralization is in a thin limestone that crops out over an area about 50 feet wide and 200 feet long; It has been replaced by a chalcopyrite-calcite-jasper-epidote-garnet skarn Select samples contained up to 50.5 parts per million silver and 6.43 percent copper. Bittenbender and others (2007) suggest that the mineralization is related to a 300.4 +/- Ma quartz monzonite intrusion to the northwest.

Alteration:

Mineralized skarn developed in limestone.

Age of mineralization:

Skarn thought to be related to a nearby 330.4 Ma, quartz-monzonite intrusion.

Generic deposit model:

Deposit model:

Silver-copper skarn.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

C.W. Monroe (as Northland Mines) prospected in the area from 1964 to at least 1973 and staked more than 142 lode claims that covered this site and several square miles south of Chisna Pass (Bittenbender and others, 2007). Paul Glavinovich staked at least 36 claims that probably covered this site and Resource Associates of Alaska (RAA) staked a large block of claims in the late 1970s and early 1980s. Their claims probably covered this site but the three holes they drilled were probably about 0.4 miles to the southeast at ARDF site MH365 . AMAX Exploration apparently was active in the area in about 1990 and Cominco Alaska Exploration explored in the early 90s. In 2010, Corvus Gold Inc. drilled three holes to the southeast in 2010 as described in ARDF record MH365 as part of an extensive exploration program. The work included surface sampling and mapping and geochemical and geophysical surveys on a large block of claims that undoubtedly covered this prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., Kurtak, J.M., and Deininger, James Jr., 2007, Mineral assessment of the Delta River Mining District area, east-central, Alaska: U.S. Bureau of Land Management, Alaska Technical Report 57, 675 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Nokleberg, W.J., Aleinikoff, J. N., Lange, I. M.; Silva, S. R., Miyaoka, R. T., Schwab, C. E., Zehner, R. E., Bond, G. C., Richter, D. H., Smith, T. E., and Stout, J. H., 1992, Preliminary geologic map of the Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Open-File Report 92-594, 39 p. 1 sheet, scale 1:250,000.

Nokleberg, W. J., Aleinikoff, J. N., Dutro, J. T., Lanphere, M. A., Silberling, N. J., Silva, S. R., Smith, T. E., and Turner, D. L., 1992, Map, tables, and summary of fossil and isotopic age data, Mount Hayes Quadrangle, eastern Alaska range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-D, 43 p., 1 sheet, scale 1:250,000.

Primary Reference: Bittenbender and others, 2007

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-05-13

Site name(s): Mars

Site type: Prospect

ARDF no.: MH381

Latitude: 63.2371 **Quadrangle:** M A-6

Longitude: 146.8297

Location description and accuracy:

The Mars Prospect is located within the Stellar Project in the northeastern portion of the Clearwater Mountains; 0.15 mile from the center of section 29, T. 19 S., R. 5 E., of the Fairbanks Meridian. This location is accurate to within about 100 feet.

Commodities:

Main: Au, Mo, Cu

Other: Ag, W

Ore minerals: Azurite, chalcopyrite, galena, gold, malachite, molybdenum, pyrite, sphalerite

Gangue minerals: Albite, carbonate, chlorite, epidote, garnet, quartz, sericite

Geologic description:

The Mars Prospect is located in the northeastern portion of the Clearwater Mountains, west of the Zackly deposit and on the west side of the West Fork of the Maclaren River. The deposit geology is described as skarn hosted in andesite, basalt, gabbro, and limestone (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014). The geology of the area is dominated by a major, terrain-bounding, low angle thrust fault where Cretaceous argillite from the Maclaren metamorphic belt is thrust over Late Triassic greenstone, limestone and argillite of the Clearwater Terrane. In the southeastern portion of the prospect area, another thrust fault juxtaposes the Clearwater Terrane atop basalt and andesites with interlayered limestones from the Amphitheater Group (Eden, 2013).

The Mars Prospect contains several mineral occurrences including the historical Copper Knob and Joy Creek occurrences. In the northern portion of the Mars Prospect, two occurrences record porphyry-type mineralization with disseminated pyrite and chalcopyrite in argillite and felsic intrusive rocks and mineralized quartz veins. The 'Mex' scheelite skarn occurrence, previously explored by Cominco, is also located in the Mars Prospect area (Eden, 2013).

In the center of the Mars Prospect are several poly-metallic occurrences in Late Triassic andesite-basalt in footwall of the major low-angle thrust fault. These occurrences include gold-bearing quartz-carbonate veins, galena and sphalerite in brecciated greenstone and abundant pyrite in greenstone with locally abundant chalcopyrite, azurite and malachite (Eden, 2013).

Other major occurrences include the historical Joy Creek and Copper Knob occurrences of the Clearwater Mountains claim group. The Joy Creek occurrence occurs in the complexly faulted rocks of the thrust footwall that include a Late Triassic greenstone, Triassic limestone and argillite and andesite of uncertain age. Mineralization is diverse and includes disseminated pyrite and chalcopyrite in an epidote-silica altered rock with local malachite staining, a gold-bearing copper skarn that occurs parallel to a quartz porphyry dike and gold-bearing altered sedimentary rocks (Eden, 2013).

The Copper Knob occurrence also occurs in conjunction with a thrust fault that juxtaposes metabasalt of the Nikolai greenstone against argillite slate and limestone of uncertain age intruded by Cretaceous or early Tertiary dikes. The area is complex with gold, silver, copper, molybdenum and tungsten anomalies in diverse mineralization types including copper-gold skarn, mineralized dikes and shear zones and quartz veins. One significant occurrence in the area is a strongly pyritized fault zone as much as 15 feet wide that

strikes west-northwest in Copper Creek and can be traced from 4700 feet to 5000 feet in elevation and for 500 feet on strike. Samples collected from this zone average 2.7 parts per million (ppm) gold (Eden, 2013).

The Mars Prospect was first visited by Millrock in 2010 following up on the large, orange color anomaly. The color anomaly is attributed to gossanous rocks, weathered carbonate rocks, and hornfelsed sediments. Copper, gold or both copper and gold were anomalous in many of the surface samples collected. The main Copper-gold geochemical anomaly is coincident with a strong circular magnetic anomaly, the center of which is composed of diorite with chalcopyrite veins. Significant geochemical results include a 1.2-kilometer soil traverse averaging 462 ppm in copper, a 950-meter soil traverse averaging 763 ppm copper and a 900-meter soil traverse averaging 891 ppm copper. In addition, a sample of altered diorite collected from the center of the magnetic anomaly returned 0.51 percent copper, 0.21 ppm gold and high grade rock samples of 7.4 percent copper and 1.79 ppm gold were collected from float and a gossanous gully, respectively (Eden, 2013).

This prospect consists of altered gabbro/diorite intruding Triassic volcanic and lesser sedimentary rocks, locally containing extensive gossan exposures. The altered zones commonly contain variable copper mineralization. Soil sampling across the prospect has defined a 420 ppm copper anomalous zone measuring approximately 950 meters by 1.7 kilometers. Rock samples of altered volcanic rock have returned assays as high as 7.4 percent copper. Anomalous gold-in-soil values are common within the area of 420 ppm copper anomaly including multiple samples assaying 0.100 ppm gold. Assays as high as 1.78 ppm gold have been returned from rock samples. The Mars prospect is bounded on the northwest by a post-mineral (?) thrust fault. Potential exists for the discovery of additional mineralization to the northwest below the fault contact (Eden, 2013).

The Mars Prospect is located in the northeastern portion of the Clearwater Mountains, west of the Zackley Prospect and on the west side of the West Fork of the Maclaren River. Mention of high grade copper lodes in the Clearwater Mountains dates back to 1918.

Kurtak et al. (1992) state that claims in the Mars area (formerly known as MEX) were first staked in 1974. In 1980, Mankomen Exploration Inc. staked several claims in the Mars area, which was followed by claim staking by Cominco American in 1981. The same year, Cominco and Mankomen formed a joint venture, which lasted until 1982. During the JV period, geochemical sampling and geological mapping conducted on the MEX claims, as well as, a ground magnetic survey, an electromagnetic (EM) survey, a very low frequency (VLF) electromagnetic survey (Kurtak et al., 1992) and limited hand trenching.

In 1983 the only work that was performed on the Mars Property was performed by Mankomen. Their work consisted of limited hand trenching, rock and stream sediment sampling, as well as, minor geologic mapping. Later in 1983, the MEX claims were leased to Anschutz Mining Corp. (Kurtak et al., 1992). Work performed by Anschutz in 1984 on the MEX claims consisted of trenching, although it is not known how much trenching was conducted. Anschutz Mining probably dropped the lease in 1985 as no Affidavit of Labor certificates could be found mentioning Anschutz Mining.

In 1988, Amax Exploration leased the MEX claims from Mankomen, but later turned them back to the owner (Kurtak et al., 1992).

In 1992, Noranda flew an aeromagnetic survey over the MEX claims and produced an interpretive total field magnetics map. The total area covered by the magnetics survey was approximately 6,000 acres. The survey revealed several large magnetic anomalies that were not followed-up on until 2012.

In 2010, Millrock staked claims covering the MEX area and gave the prospect area the name Mars. Millrock collected 27 soil and 5 rock samples within the Mars area. The results indicated a zone anomalous in copper, gold and molybdenum. In 2012, 26 rock and 54 soil samples were taken over a portion of the magnetic anomalies identified by Noranda (Hemlo Gold). The results showed a 2 mile long zone of anomalous copper-gold with an isolated zone of anomalous molybdenum. Some of the strongest geochemical anomalies are coincident with the stronger magnetic anomalies (Eden, 2013).

In 2012 and 2013, Millrock performed soil, stream sediments, and rock sampling, in addition to airborne electromagnetic geophysical survey and spectroscopy (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Alteration:

Disseminated pyrite and chalcopyrite in an epidote-silica altered rock with local malachite staining, a gold-bearing copper skarn that occurs parallel to a quartz porphyry dike and gold-bearing altered sedimentary rocks (Eden, 2013). Generally potassic, sericite, albite, chlorite, epidote, and garnet.

Age of mineralization:

Probably Late Cretaceous or early Tertiary, nearly synchronous with thrust faulting (Eden, 2013).

Generic deposit model:

Deposit model:

Porphyry Cu-Au? (Cox and Singer, 1986, model 20c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c?

Production Status: None

Site Status: Active

Workings/exploration:

The Mars Prospect is located in the northeastern portion of the Clearwater Mountains, west of the Zackley Prospect and on the west side of the West Fork of the Maclaren River. Mention of high grade copper lodes in the Clearwater Mountains dates back to 1918.

Kurtak et al. (1992) state that claims in the Mars area (formerly known as MEX) were first staked in 1974. In 1980, Mankomen Exploration Inc. staked several claims in the Mars area, which was followed by claim staking by Cominco American in 1981. The same year, Cominco and Mankomen formed a joint venture, which lasted until 1982. During the JV period, geochemical sampling and geological mapping conducted on the MEX claims, as well as, a ground magnetic survey, an electromagnetic (EM) survey, a very low frequency (VLF) electromagnetic survey (Kurtak et al., 1992) and limited hand trenching.

In 1983 the only work that was performed on the Mars Property was performed by Mankomen. Their work consisted of limited hand trenching, rock and stream sediment sampling, as well as, minor geologic mapping. Later in 1983, the MEX claims were leased to Anschutz Mining Corp. (Kurtak et al., 1992). Work performed by Anschutz in 1984 on the MEX claims consisted of trenching, although it is not known how much trenching was conducted. Anschutz Mining probably dropped the lease in 1985 as no Affidavit of Labor certificates could be found mentioning Anschutz Mining.

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In 2012 and 2013, Millrock performed soil, stream sediments, and rock sampling, in addition to airborne electromagnetic geophysical survey and spectroscopy (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Clautice, K.H., Smith, T.E., Pessel, G.H., and Solie, D.N., 1989, Geology and mineral occurrences, upper Clearwater Creek area, Mt. Hayes A-6 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Public-data File 89-18, 14 p., 2 sheets, scale 1:24,000.

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Eden, K., 2013, Stellar Property, Valdez Creek Mining District, South-Central Alaska. Technical Report (43-101) for Millrock Resources Inc.
www.sedar.com (posted on January 8, 2013).

Ellis, W.T., 1980, 1980 Alaska Range Project: Anaconda Copper Co., Anchorage, Alaska, 33 p.

Kurtak, J.M., Southworth, D.D., Balen, M.D., and Clautice, K.H., 1992, Mineral investigations in the Valdez Creek mining district, south-central Alaska: U.S. Bureau of Mines Open-File Report 1-92, 659 p., 2 plates, scale 1:250,000.

Millrock Resources Inc., 2014, Stellar: http://www.millrockresources.com/projects/stellar/ (as of April 29, 2014).

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Primary Reference: Eden, K., 2013

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-04-29

Site name(s): Moonwalk; North Moonwalk; South Moonwalk

Site type: Prospect

ARDF no.: MH382

Latitude: 63.3205 **Quadrangle:** M B-6

Longitude: 146.6592

Location description and accuracy:

The Moonwalk Prospect area is located between Cathedral Creek and the West Fork Maclaren River in the northern part of the Stellar Property; 0.5 mile south-southeast of the center of section 30, T. 18 S., R. 6 E., of the Fairbanks Meridian. This location is accurate to within about 100 feet.

Commodities:

Main: Au, Mo, Zn

Other: Bi, Sb

Ore minerals: Arsenopyrite, chalcopyrite, gold, molybdenum, pyrite, stibnite

Gangue minerals: Quartz

Geologic description:

The Moonwalk Prospect, also referred to as North Moonwalk and South Moonwalk, is a mesothermal gold prospect consisting of altered granodiorite intruding mainly black shale. The intrusive rock and surrounding sediments are commonly altered with local zones of stockwork quartz-sulfide veining. The Moonwalk ridge consists of a broad, granodiorite altered zone locally containing anomalous to ore grade gold values in rock and soil (Eden, 2013).

The Moonwalk Prospect area is in the northern part of the Stellar Property, situated on the southern flank of the Central Alaska Range south of the Denali fault. The rocks south of the Denali fault are part of two major terranes. The Maclaren terrane is bounded by the Denali fault on the north and the Broxsen Gulch thrust fault on the south, and consists of metamorphosed granodioritic plutons and batholiths that were emplaced in Jurassic-Cretaceous metasediments. South of the Broxson Gulch thrust fault the Wrangellia terrane contains Upper Paleozoic island arc volcanics and sediments overlain by Triassic rift related volcanics and sediments that are locally overlain by Jurassic and Tertiary sediments (Eden, 2013).

Millrock Resources Inc. conducted exploration work at the Moonwalk Prospect in 2010 and 2012 consisting of geochemical sampling and geological mapping. Nineteen soil samples within the granitic intrusion average 1.15 grams per tonne of gold with a high of 3.54 grams per tonne of gold. The granodiorite covers an exposed area of around 700 meters by 500 meters. Talus and outcrop rock chip samples were collected over the western and eastern portion of the granodiorite. Samples from the western area averaged 1.10 grams per tonne of gold over 140 meters, while the eastern area samples averaged 0.55 grams per tonne of gold over 85 meters. A grab sample in a quartz-sulfide vein within the granodiorite assayed 30.45 grams per tonne of gold. The Moonwalk Prospect is also highly anomalous in arsenic, bismuth, antimony and zinc. The mineralization at Moonwalk is indicative of an intrusion-related gold system. Mineralized samples at North Moonwalk also tend to be anomalous in bismuth, arsenic and antimony, common trace elements associated with 'Tombstone-style' gold deposits and prospects found within the Tintina gold belt of Alaska and the Yukon (Eden, 2013).

Millrock conducted an electromagnetic airborne survey during 2013 summer field season (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Alteration:

Stockwork gold quartz-vein mineralization with some sericite(Eden, 2013; P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Age of mineralization:

Cretaceous? (Millrock Resources Inc., 2014).

Generic deposit model:

Deposit model:

Intrusion-related gold.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Millrock Resources Inc. conducted exploration work at the Moonwalk Prospect in 2010 and 2012 consisting of geochemical sampling and geological mapping. Nineteen soil samples within the granitic intrusion average 1.15 grams per tonne of gold with a high of 3.54 grams per tonne of gold. The granodiorite covers an exposed area of around 700 meters by 500 meters. Talus and outcrop rock chip samples were collected over the western and eastern portion of the granodiorite. Samples from the western area averaged 1.10 grams per tonne of gold over 140 meters while the eastern area samples averaged 0.55 grams per tonne of gold over 85 meters. A grab sample in a quartz-sulfide vein within the granodiorite assayed 30.45 grams per tonne of gold. The Moonwalk Prospect is also highly anomalous in arsenic, bismuth, antimony and zinc. The mineralization at Moonwalk is indicative of an intrusion-related gold system. Mineralized samples at North Moonwalk also tend to be anomalous in bismuth, arsenic and antimony, common trace elements associated with 'Tombstone-style' gold deposits and prospects found within the Tintina gold belt of Alaska and the Yukon (Eden, 2013).

Millrock conducted an electromagnetic airborne survey during 2013 summer field season (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Eden, K., 2013, Stellar Property, Valdez Creek Mining District, South-Central Alaska. Technical Report (43-101) for Millrock Resources Inc.
www.sedar.com (posted on January 8, 2013).

Millrock Resources Inc., 2014, Stellar: http://www.millrockresources.com/projects/stellar/ (as of April 29, 2014).

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-

1996-C, 42 p., 1 sheet, scale 1:250,000.

Primary Reference: Eden, K., 2013

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-04-30

Site name(s): Gemini

Site type: Prospect

ARDF no.: MH383

Latitude: 63.2631 **Quadrangle:** M B-6

Longitude: 146.7012

Location description and accuracy:

The Gemini prospect is located on a northwest-aligned ridge about 2.0 miles east of the West Fork Maclaren River within the Stellar Project; 0.5 mile south-southeast of the center of section 13, T. 19 S., R. 5 E., of the Fairbanks Meridian. This location is accurate to within about 100 feet.

Commodities:

Main: Au, Cu

Other:

Ore minerals: Chalcopyrite, gold, pyrite, pyrrhotite

Gangue minerals: Albite, chlorite, epidote, garnet

Geologic description:

The Gemini prospect, part of the Stellar Project area, appears to be hosted primarily within Triassic volcanic rocks, specifically andesites and basalts. The mineralization is characterized by disseminated chalcopyrite and gold (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

This newly discovered prospect was defined in August of 2013, the result of a wide-spaced, property-wide soil sampling program. The Gemini 420 parts per million (ppm) copper-in-soil anomaly, while variable in outline, averages approximately 1.0 kilometer by 1.6 kilometers. Anomalous gold-in-soil results tend to occur coincident with elevated copper values with gold assays typically ranging from 0.150 – 0.250 ppm gold (Millrock Resources Inc., 2014).

Between 2011 and 2013 field seasons, Millrock conducted rock, soil, stream sediments sampling, and an airborne geophysical and spectrometry survey (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Alteration:

Disseminated chalcopyrite and gold with albite, chlorite, epidote, and garnet alteration minerals (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Age of mineralization:

Triassic or younger based on age of host rock.

Generic deposit model:

Deposit model:

Porphyry Cu-Au? (Cox and Singer, 1986, model 20c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c?

Production Status: None

Site Status: Active

Workings/exploration:

This newly discovered prospect was defined in August of 2013, the result of a wide-spaced, property-wide soil sampling program. The Gemini 420 parts per million (ppm) copper-in-soil anomaly, while variable in outline, averages approximately 1.0 kilometer by 1.6 kilometers. Anomalous gold-in-soil results tend to occur coincident with elevated copper values with gold assays typically ranging from 0.150 – 0.250 ppm gold (Millrock Resources Inc., 2014).

Between 2011 and 2013 field seasons, Millrock conducted rock, soil, stream sediments sampling, and an airborne geophysical and spectrometry survey (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Millrock Resources Inc., 2014, Stellar: http://www.millrockresources.com/projects/stellar/ (as of April 29, 2014).

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Primary Reference: Millrock Resources Inc., 2014

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-04-30

Site name(s): Jupiter

Site type: Prospect

ARDF no.: MH384

Latitude: 63.233 **Quadrangle:** M A-6

Longitude: 146.6921

Location description and accuracy:

The Jupiter prospect is located on a northwest-aligned ridge about 2.0 miles east of the West Fork Maclaren River within the Stellar Project; 0.5 mile southeast of the center of section 25, T. 19 S., R. 5 E., of the Fairbanks Meridian. This location is accurate to within about 100 feet.

Commodities:

Main: Au, Cu

Other:

Ore minerals:

Gangue minerals: Albite, chlorite, epidote, garnet

Geologic description:

The Jupiter prospect is hosted in altered Triassic volcanic rocks near a contact with dioritic intrusive rocks. The prospect, located approximately 1.8 kilometers (1.1 miles) north of the main Zackly skarn, is characterized by east- and northerly-trending,altered,copper/gold-bearing fracture/vein zones and disseminated chalcopyrite and gold hosted in andesites and basalts (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014; Millrock Resources Inc., 2014). Soil sampling has defined a 420 parts per million (ppm) copper anomaly measuring approximately 800 meters by 1.9 kilometers. Anomalous gold-in-soil values are commonly associated with elevated copper values with assays up to 0.330 ppm gold returned (Millrock Resources Inc., 2014).

Between 2011 and 2013 field seasons, Millrock conducted rock, soil, stream sediments sampling, and an airborne geophysical and spectrometry survey (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Alteration:

Age of mineralization:

Triassic or younger based on age of host rock.

Generic deposit model:

Deposit model:

Porphyry Cu? (Cox and Singer, 1986; model 17)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

17?

Production Status: None

Site Status: Active

Workings/exploration:

Between 2011 and 2013 field seasons, Millrock conducted rock, soil, stream sediments sampling, and an airborne geophysical and spectrometry survey (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Millrock Resources Inc., 2014, Stellar: http://www.millrockresources.com/projects/stellar/ (as of April 29, 2014).

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Primary Reference: Millrock Resources Inc., 2014

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-04-30

Site name(s): Bushwacker

Site type: Occurrence

ARDF no.: MH385

Latitude: 63.2452 **Quadrangle:** M A-6

Longitude: 146.676

Location description and accuracy:

The Bushwacker occurrence is located on the east bank of the West Fork Maclaren River within the Stellar Project; 0.3 mile north-northeast of the center of section 2, T. 20 S., R. 5 E., of the Fairbanks Meridian. This location is accurate to within about 100 feet.

Commodities:

Main: Mo, S, U

Other:

Ore minerals: Molybdenite

Gangue minerals:

Geologic description:

The Bushwacker occurrence is located within the Stellar Project areas. It has characteristics of a molybdenum porphyry with anomalies in molybdenum, sulfur and uranium (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Millrock collected four soil samples in 2013 in addition to airborne electromagnetic geophysical survey (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Alteration:

Age of mineralization:

Triassic or younger based on age of host rock?

Generic deposit model:

Deposit model:

Porphyry molybdenum? (Cox and Singer, 1986; model 21b)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

21b?

Production Status: None

Site Status: Active

Workings/exploration:

Millrock collected four soil samples in 2013 in addition to airborne electromagnetic geophysical survey

(P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Primary Reference: Millrock Resources Inc., 2014

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-04-30

Site name(s): Venus

Site type: Prospect

ARDF no.: MH386

Latitude: 63.2887 **Quadrangle:** M B-6

Longitude: 146.6413

Location description and accuracy:

The Venus prospect is located in between Maclaren Glacier and the West Fork Maclaren River within the Stellar Project; 0.4 mile north of the center of section 8, T. 19 S., R. 6 E., of the Fairbanks Meridian. This location is accurate to within about 100 feet.

Commodities:

Main: Cu

Other:

Ore minerals: Chalcopyrite

Gangue minerals: Chlorite, garnet

Geologic description:

Venus is a copper prospect, in the Stellar Project area, characterized by a copper soil anomaly hosted in hornfels and basalt (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014). The Stellar Project area straddles the Yukon-Tanana and Wrangellia terranes (Millrock Resources Inc., 2014).

From 2011 to 2013, Millrock Resources Inc. conducted soil and rock sampling. In 2013, airborne electromagnetic geophysical survey and spectrometry were flown (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Alteration:

Chlorite and garnet (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Age of mineralization:

Triassic or younger based on age of host rock (Nokleberg and others, 1991)?

Generic deposit model:

Deposit model:

Unknown.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

From 2011 to 2013, Millrock Resources Inc. conducted soil and rock sampling. In 2013, airborne electromagnetic geophysical survey and spectrometry were flown (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Millrock Resources Inc., 2014, Stellar: http://www.millrockresources.com/projects/stellar/ (as of April 29, 2014).

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996-C, 42 p., 1 sheet, scale 1:250,000.

Primary Reference: P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral commun., 2014

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-09

Site name(s): Fat Chance

Site type: Occurrence

ARDF no.: MH387

Latitude: 63.2508 **Quadrangle:** M B-6

Longitude: 146.8292

Location description and accuracy:

The Fat Chance occurrence is located 2.1 miles west of the West Fork Maclaren River within the Stellar Project; 0.2 mile south of the center of section 20, T. 20 S., R. 5 E., of the Fairbanks Meridian. This location is accurate to within about 100 feet.

Commodities:

Main: Mo

Other: Sb, W

Ore minerals: Molybdenite, pyrite, scheelite, stibnite

Gangue minerals: Sericite

Geologic description:

Fat Chance is a molybdenum occurrence, in the Stellar Project area, related to a feldspar porphyry intruding quartz monzonite (P. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014). The Stellar Project area straddles the Yukon-Tanana and Wrangellia terranes (Millrock Resources Inc., 2014).

From 2011 to 2013, Millrock Resources Inc. conducted soil and rock sampling. In 2013, airborne electromagnetic geophysical survey and spectrometry were flown (Philip. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Alteration:

Phyllic (Philip. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014).

Age of mineralization:

Triassic or younger based on age of host rock (Nokleberg and others, 1991)?

Generic deposit model:

Deposit model:

Porphyry molybdenum? (Cox and Singer, 1986; model 21b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

21b?

Production Status: None

Site Status: Active

Workings/exploration:

From 2011 to 2013, Millrock Resources Inc. conducted soil and rock sampling. In 2013, airborne electromagnetic geophysical survey and spectrometry were flown (Philip. St. George, Chief Exploration Officer, Millrock Resources Inc., oral communication, 2014). Twenty-two soils and five rocks were collected on the occurrence. Soils averaged 47 ppb Au, 175 ppm Cu and 25 ppm Mo with values up to 317 ppb Au, 586 ppm Cu and 275 ppm Mo. Rocks averaged 21 ppb Au, 302 ppm Cu and 15 ppm Mo with values up to 56 ppb Au, 659 ppm Cu and 44 ppm Mo.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Millrock Resources Inc., 2014, Stellar: http://www.millrockresources.com/projects/stellar/ (as of April 29, 2014).

Nokleberg, W.J., Lange, I.M., Roback, R.C., Yeend, Warren, and Silva, S.R., 1991, Map showing locations of metalliferous lode and placer mineral occurrences, mineral deposits, prospects, and mines, Mount Hayes quadrangle, eastern Alaska Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1996C, 42 p., 1 sheet, scale 1:250,000.

Primary Reference: P. St, George, Chief Exploration Officer, Millrock Resources Inc., oral commun., 2014

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Eureka Zone; Alpha Complex

Site type: Prospect

ARDF no.: MH388

Latitude: 63.2481 **Quadrangle:** M A-5

Longitude: 146.1786

Location description and accuracy:

The Eureka Zone is a prospect within the Alpha Complex, an ultramafic-mafic complex composed of a sill-dike body 18 kilometers long and up to 600 meters wide, elongated northwest-southeast (Stone, 2005). The coordinates in this record are located approximately at the center of the prospect, about 2.5 miles from where Eureka Creek meets Broxson Gulch. It is located about 0.7 mile northeast of the center of section 27, T. 19 S., R. 8 E., of the Fairbanks Meridian. The accuracy is unknown; the location was estimated using a map of Eureka Zone on Pure Nickel Inc.'s website (Pure Nickel, 2014). The location is accurate to within 1/4 mile.

Commodities:

Main: Ag, Au, Co, Cu, Ni, Pd, Pt

Other:

Ore minerals: Ni-Cu-PGE sulfides

Gangue minerals: Olivine, serpentine

Geologic description:

The Alpha complex lies within an area called the Eureka Zone (Findlay, 2013) or Eureka Complex (Stone, 2005). The Alpha Complex and Eureka Zone are part of Pure Nickel's MAN Project, designed for exploration of Nickel (Ni), Copper (Cu), and Platinum Group Element (PGE) mineralization in a series of mafic-ultramafic intrusive complexes that are part of the Wrangellia Terrane (Pure Nickel, 2011; Findlay, 2013).

The region is known for the Nikolai Greenstone, a Late Triassic meta-basalt; associated are cogenetic ultramafic-mafic intrusions. These ultramafic-mafic intrusions characteristically weather to an orange-brown color, are generally serpentinized in tectonized zones, and may contain chromiferous magnetite, chromite, and/or disseminated sulfides (Ellis, 2002).

The intrusion complex is a very elongate sill-dike body composed dominantly of massive dunite with thin, marginal gabbro-norite layers. The complex dips moderately to the north, is slightly oblique to the stratigraphy, intruding sedimentary rocks of the Slana River Formation. A discordant magnetic high joins the Eureka Zone with the Fish Lake Complex to the south, interpreted as a potential feeder dike at depth (Ellis, 2002).

The Eureka Complex is truncated by faults related to the Broxson Gulch Thrust and felsic intrusions. Wall rock contacts are generally strongly serpentinized. Copper-magnetite skarns formed in calcareous rocks in contact with the Eureka Complex (Ellis, 2002).

Ni-Cu-PGE mineralization in this prospect is characterized by disseminated sulfides in ultramafic rock at contact with gabbro-norite layers (Stone, 2005). Electron microprobe results indicated most of the nickel is in sulfides with only 0.14 percent contained in olivine and 0.04 percent contained in serpentine, indicating that most of the nickel is recoverable (Findlay, 2013).

Alteration:

Serpentinization (Stone, 2005).

Age of mineralization:

Triassic, about 230 Ma (Findlay, 2013).

Generic deposit model:

Deposit model:

Disseminated Ni-Cu-PGE in gabbro (Cox and Singer, 1986; model 5b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

5b

Production Status: None

Site Status: Active

Workings/exploration:

From 1991 to 1997, this area was explored by American Copper and Nickel Company (ACNC) working with Fort Knox Gold Resources, Inc. Their work included drilling, surface UTEM, and borehole and EM on three holes. From 1997 to 2003, the area was explored by Nevada Star Resource Corp (US), whose work included a geological mapping program in addition to an AEM survey over the northern and southern portion of the MAN Project area. From 2004 to 2005, the area was briefly explored by Anglo American Exploration (USA). Their work included geological mapping, prospecting, and a soil geochemical sampling survey (Pure Nickel Inc., 2014).

In 2005, Nevada Star Resources Corp., resumed work and completed a 35-kilometer TEM survey over four loop areas, 177-kilometer ground magnetometry, and 1057 soil samples over the general MAN Project area, including eight diamond drill holes in Alpha, which is in the central part of the property. Alpha is a prospect area within the MAN Project area (Pure Nickel Inc., 2014).

In 2007, Pure Nickel gained control of the leases, and it is now 100 percent owned by them, after a joint venture partnership with ITOCHU Corporation of Japan from 2008 to 2013. During this partnership, approximately 23.5 million US dollars were spent on exploration at the general MAN Project area (Pure Nickel Inc., 2014).

In 2011, Pure Nickel completed exploration work focused on the Alpha complex. One of the key objectives of the 2011 program was to evaluate the potential for 'reef' style Platinum Group Elements (PGE) mineralization in the Alpha complex. The possible presence of this type of mineralization was inferred from the occurrence of highly anomalous PGE values associated with a distinctive gabbro/pyroxenite sequence interpreted as discrete layers in the complex. Three holes targeting the potential 'reef' successfully intersected the correct lithological sequence, but assay results did not confirm the presence of economic concentrations of PGE (Findlay, 2013).

In 2012, Pure Nickel completed detailed mapping, and soil and IP surveys at the Alpha complex. Follow-up drilling tested the soil and IP anomalies (Findlay, 2013).

In 2013, Pure Nickel completed an exploration program that included an eight hole, 2,991-meter drill program primarily targeting the Eureka Zone in the central part of the Alpha mafic-ultramafic complex. The drill program successfully intersected the Eureka Zone, first recognized in 2012, in six of the seven holes that were targeted (Pure Nickel Inc., 2014).

The drill results confirm the presence of what is now interpreted as a continuous zone of magmatic sulfide mineralization containing elevated concentrations of nickel, copper, cobalt, gold, silver, platinum and palladium. Estimated true widths of intersection for 2013 drill holes cutting the Eureka Zone in the central Alpha segment range from 120 meters to 250 meters. Composite intersection grades across the mineralized zone in the drill holes range from 123 parts per billion (ppb) to 212 ppb gold + platinum + palladium, 0.05 to 0.16 percent copper, and 0.17 to 0.24 percent nickel. The mineralization also includes minor silver and cobalt. Higher grade mineralization over narrower widths is present in most of the holes (Pure Nickel Inc., 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

In 2007, Pure Nickel gained control of the leases, and it is now 100 percent owned by them, after a joint venture partnership with ITOCHU Corporation of Japan from 2008 to 2013. During this partnership, approximately US$23.5 million was spent on exploration at the general MAN Project area (Pure Nickel Inc., 2014).

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Ellis, W.T., 2002, Summary report for the Eureka Creek, Tangle Lakes Ni-Cu-PGE project - Delta River Mining District, Central Alaska Range: Unpublished report prepared for the Nevada Star Resources Corp. by Alaska Earth Sciences, Inc., 51 p. (Report held by Alaska Earth Sciences, Anchorage, Alaska).

Findlay, J., 2013, An Overview of Pure Nickel Inc.'s MAN and Salt Chuck Exploration Projects in Alaska, Pure Nickel Inc.: Alaska Miners Association, 2013 Annual Convention, Abstracts, p. 31.

Pure Nickel Inc., 2011, Pure Nickel MAN Alaska Exploration Update: http://www.purenickel.com/s/NewsReleases.asp?ReportID=497855 (News release on December 21, 2011, as of July 9, 2014).

Pure Nickel Inc., 2014, MAN Project overview: http://www.purenickel.com/s/MAN_Project.asp (as of July 9, 2014).

Stone, W.E., 2005, MAN Nickel-Copper-PGE Area 2 Project: 2005 Technical Report, Volume 1, Unpublished report prepared for the Nevada Star Resources Corp., 74 p. (Copy of report held by Alaska

Primary Reference: Pure Nickel Inc., 2014

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Beta Complex

Site type: Prospect

ARDF no.: MH389

Latitude: 63.1119 **Quadrangle:** M A-4

Longitude: 145.9709

Location description and accuracy:

The Beta Complex is an elongate ultramafic-mafic complex. The center is located about 3.0 miles north of the junction of Round Triangle Lake and Long Triangle Lake, about 3.0 miles west-southwest from VABM 5715, and about 0.2 mile northwest from the center of section 11, T. 21 S., R. 9 E., of the Fairbanks Meridian. The location accuracy is estimated to be within 1.5 miles of the center.

Commodities:

Main: Cu, Ni, Pd, PGE, Pt

Other:

Ore minerals:

Gangue minerals:

Geologic description:

The Beta Complex is a Nickel-Copper-Platinum Group Elements (Ni-Cu-PGE) prospect in a series of mafic-ultramafic intrusive complexes that are part of the Wrangellia Terrane (Pure Nickel, 2011; Findlay, 2013). It was formerly part of Pure Nickel Inc.'s MAN Project (Lisa Buchan, Corporate Secretary and Business Manager, Pure Nickel Inc., oral communication, 2014). The region is known for the Nikolai Greenstone; associated are ultramafic-mafic intrusions cogenetic with overlying Triassic Nikolai basalt. These intrusions characteristically weather to an orange-brown color, are generally serpentinized in tectonized zones, and may contain chromiferous magnetite, chromite, and/or disseminated sulfides (Ellis, 2002).

Alteration:

Age of mineralization:

Triassic, about 230 Ma (Findlay, 2013).

Generic deposit model:

Deposit model:

Disseminated Ni-Cu-PGE in gabbro (Cox and Singer, 1986; model 5b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

5b

Production Status: None

Site Status: Active?

Workings/exploration:

From 1991 to 1997, this area was explored by American Copper and Nickel Company (ACNC) working with Fort Knox Gold Resources, Inc. Their work included drilling, surface UTEM, and borehole and EM on three holes. From 1997 to 2003, the area was explored by Nevada Star Resource Corp (US), whose work included a geological mapping program in addition to an AEM survey over the northern and southern portion of the project area. From 2004 to 2005 the area was briefly explored by Anglo American Exploration (USA). Their work included geological mapping, prospecting, and a soil geochemical sampling survey (Pure Nickel Inc., 2014).

In 2005, Nevada Star Resources Corp., resumed work and completed a 35-kilometer TEM survey over a four loop area, 177-kilometer ground magnetometry, and 1057 soil samples over general MAN Project area (Pure Nickel Inc., 2014).

In 2007, Pure Nickel gained control of the leases, and it is now 100 percent owned by them, after a joint venture partnership with ITOCHU Corporation of Japan from 2008 to 2013. During this partnership, approximately 23.5 million US dollars were spent on exploration at the general MAN Project area (Pure Nickel Inc., 2014).

In 2008, the field program by Pure Nickel focused on diamond drilling, which targeted geophysical anomalies, including VTEM conductors, in the Beta Complex. The drilling intercepted wide zones of disseminated sulfides, including 0.50 meter grading 1.39 percent nickel and 1.27 percent copper (Pure Nickel Inc., 2008).

Pure Nickel's 2009 field program included four drill holes in the southern Beta Complex. Interpretation of 2D modeling of 2009 ZTEM data and previous 3D inversions of aeromagnetic data, as well as several widely spaced deep drill holes indicate thick ultramafic bodies with localized deep feeders (Pure Nickel Inc., 2009).

The 2010 exploration program executed by Pure Nickel on the Beta Complex included three drill holes in the southern Beta complex. Drill results highlights include 1.1 meters of 1.76 percent copper; 8 meters of 202.7 parts per billion (ppb) platinum + palladium; 11 meters of 150.6 ppb platinum + palladium; and 1.14 meters of 835.5 ppb platinum + palladium (Findlay, 2013).

Production notes:

None.

Reserves:

None.

Additional comments:

In 2007, Pure Nickel gained control of the leases, and it is now 100 percent owned by them, after a joint venture partnership with ITOCHU Corporation of Japan from 2008 to 2013. During this partnership, approximately US$23.5 million was spent on exploration at the general MAN Project area (Pure Nickel Inc., 2014).

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Ellis, W.T., 2002, Summary report for the Eureka Creek, Tangle Lakes Ni-Cu-PGE project - Delta River Mining District, Central Alaska Range: Unpublished report prepared for the Nevada Star Resources Corp. by Alaska Earth Sciences, Inc., 51 p. (Report held by Alaska Earth Sciences, Inc., Anchorage, AK).

Findlay, J., 2013, An Overview of Pure Nickel Inc.'s MAN and Salt Chuck Exploration Projects in Alaska, Pure Nickel Inc.: Alaska Miners Association, 2013 Annual Convention, Abstracts, p. 31.

Pure Nickel Inc., 2008, Pure Nickel Exploration Update: http://www.purenickel.com/s/NewsReleases.asp?ReportID=308816 (as of July 11, 2014).

Pure Nickel Inc., 2009, Pure Nickel MAN Exploration Update: http://www.purenickel.com/s/NewsReleases.asp?ReportID=378372 (as of July 11, 2014).

Pure Nickel Inc., 2011, Pure Nickel's Alaska Results Indicate Platinum Palladium Horizons: http://www.purenickel.com/s/NewsReleases.asp?ReportID=437071 (as of July 11, 2014).

Pure Nickel Inc., 2014, MAN Project overview: http://www.purenickel.com/s/MAN_Project.asp (as of July 9, 2014).

Stone, W.E., 2005, MAN Nickel-Copper-PGE Area 2 Project: 2005 Technical Report, Volume 1, Unpublished report prepared for the Nevada Star Resources Corp., 74 p. (Copy of report held by Alaska Earth Sciences, Anchorage, Alaska).

Primary Reference: Pure Nickel Inc., 2014

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Unnamed (Hulahula River)

Site type: Occurrence

ARDF no.: ML018

Latitude: 69.0657 **Quadrangle:** ML A-2

Longitude: 144.6652

Location description and accuracy:

The location is the ridge two miles northwest of the confluence of Itkillik Creek with the Hulahula River, and about three miles south of the airstrip. This location is part of a group of copper occurrences that occur within an area that extends five miles north and south and four miles east to west. The area is in the Mount Michelson A-2 Quadrangle. The site is referred to as USGS Location 41 reported in Brosgé and Reiser, 1976, and is in the NW¼ sec. 34, T. 4 S., R. 31 E., of the Umiat Meridian. Accuracy of the location is about 0.75 mile.

Commodities:

Main: Cu

Other: Ag, Co, Pb, Zn

Ore minerals: Chalcopyrite, malachite

Gangue minerals: Clay, hematite, sericite

Geologic description:

Regional potential for copper mineralization had been advanced by Brosgé and Reiser (1976), who suggested that the vicinity of the upper Hulahula River is favorable for copper mineralization due to widespread mafic volcanic rocks (Reiser and others, 1971) with a high intrinsic copper content, and multiple copper showings in the area. They reported a group of stream sediment samples were consistently anomalous along the upper 10 miles of the west-to-southwest flowing upper segment of the Hulahula River (Brosgé and Reiser, 1976). They believed this regional copper anomaly reflects widespread copper enrichment in mafic rock including sills.

At the USGS Location 41site, chalcopyrite was reported by Brosgé and Reiser (1976), to occur in sheared mafic volcanic rocks with individual minor malachite occurrences up to 40 feet across (Barker, 1983, and Brosgé, written commun., 1982). Samples indicate copper values are generally elevated in samples of sills. Several sites of minor malachite staining also occur in the area to the west and are associated with pyritic zones and limonite in fractured, bleached mafic volcanic rocks, and is locally associated with disseminated sulfide grains. (Note a copy of Brosgé's written communication is available upon request from Alaska Division of Geological and Geophysical Surveys Geologic Materials Center, Anchorage, Alaska, in the archive for project files of J.C. Barker, U.S. Bureau of Mines.)

Alteration:

Bleaching, sericite, pyrite, and limonite staining are common features, locally with hematite staining, silicification, quartz stockwork, and minor veining (Brosgé and Reiser, 1976, and Brosgé written commun., 1982).

Age of mineralization:

Mineral occurrences are hosted in lower Paleozoic mafic rocks and clastic rocks of the pre-Mississippian Neruokpuk basement (Reiser, and others, 1971).

Generic deposit model:

Deposit model:

The copper occurrences in mafic rocks here are similar to Besshi-type copper deposit model (Cox and Singer, 1986, model 24b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24b

Production Status: None

Site Status: Inactive

Workings/exploration:

The prospect area was selected for field examination and sampling by the U.S. Bureau of Mines in 1982 as part of Alaska-wide critical and strategic mineral investigations as reported in Barker, 1983. On the basis of the previous work by Reiser and other. 1971, the contact relationships were examined for evidence of alteration and mineralization. Copper mineralization was found restricted to a zone up to 15 ft wide within the mafic rocks; minor silicification, bleaching due to argillic alteration, and traces of copper minerals were present. Although summer at the time of the examination the area was partly snow-covered.

Production notes:

None.

Reserves:

None.

Additional comments:

The area was selected for study by the U.S. Bureau of Mines in 1982 as part of Alaska-wide critical and strategic mineral investigations. The region is closed to mineral development; site is located in the Arctic National Wildlife Range and presently classified as ‘Wilderness’.

References:

Barker, J.C., 1983, Cobalt and copper investigation of the Hulahula River Region: U.S. Bureau of Mines unpublished Field Report, 33 p., available through Alaska Division of Geological and Geophysical Surveys.

Brosgé, W.P., and Reiser, H.N, 1976, Preliminary geologic and mineral resource maps (excluding petroleum), Arctic National Wildlife Range, Alaska: U.S. Geological Survey Open-File Report 76-539, 4 p., 4 sheets, scale 1:500,000.

Reiser, H.N., Brosgé, W.P., Dutro, J.T., Jr., and Detterman, R.L., 1971, Preliminary geologic map, Mt. Michelson quadrangle, Alaska: U.S. Geological Survey Open-File Report 71-237, 2 sheets, scale 1:200,000.

Primary Reference: Barker (1983)

Reporter(s): J.C. Barker

Last report date: 2017-04-06

Site name(s): Unnamed (Hulahula River) USBM Location A

Site type: Occurrence

ARDF no.: ML019

Latitude: 69.0967 **Quadrangle:** ML A-2

Longitude: 144.6228

Location description and accuracy:

Location A in an unpublished report (Barker, 1983) is on the east cut-bank of the Hulahula River and east of the airstrip. This location is part of a group of copper occurrences found over an area that extends five miles north to south and four miles east to west.

The Hulahula River flows north to the Arctic Ocean and its headwaters drain the north flank of the Continental Divide. The occurrence site is referred to as Location A in Barker, 1983, is in the W½ sec. 15, T. 4 S., R. 31 E, of the Umiat Meridian. Accuracy of the location is about 0.75 mile.

Commodities:

Main: Cu

Other: Ag, Co, Pb, Zn

Ore minerals: Chalcopyrite, galena, malachite, sphalerite

Gangue minerals: Chlorite, clays, hematite, sericite

Geologic description:

Malachite and occasionally chalcopyrite blebs can be found in quartz-carbonate veins and as stratiform replacement in clastic sedimentary rocks of the pre-Mississippian Neruokpuk shale and phyllite that are interbedded with chert and mafic volcanic rocks. Location A is an area less than 1,000 feet across including bedrock exposures in the river bank. Clastic sedimentary rocks include sandstone, calcareous sandstone, dolostone, and argillite-phyllite rocks. Stratiform mineralization is concentrated in areas of rapid facies change over short distances. Two chip samples collected across outcropping, southwest-dipping black phyllite and shale at Location A in a river cut bank outcrop assayed 255 and 510 parts per million (ppm) copper. A small shale boulder on the river bar nearby was assayed and reported 2.6 percent copper with .07 percent cobalt, 0.17 percent nickel and 52 ppm silver. A narrow veinlet with trace galena and sphalerite in another nearby outcrop at Location A assayed 0.79 percent lead and 5.25 percent zinc. Another nearby cut bank site exhibits disseminated chalcopyrite occurring along thin southwest-dipping strata of calcareous shale up to 1.5 inches thick; a sample assayed 590 ppm copper with elevated cobalt (Barker, 1983).

Alteration:

Bleaching and iron staining are common features, locally with hematite staining and silicification, quartz stockwork, and minor veining (Barker, 1983).

Age of mineralization:

Mineral occurrences are hosted in pre-Mississippian clastic rocks of the Neruokpuk formation (Brosgé and Reiser, 1976).

Generic deposit model:

Deposit model:

Besshi-type copper (Cox and Singer, 1986, model 24b); sedimentary-hosted copper in shale and phyllite (Cox and Singer, 1986, model 30b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24b, 30b

Production Status: None

Site Status: Inactive

Workings/exploration:

Two chip samples collected across outcropping, southwest-dipping black phyllite and shale near Location A in a river cut bank assayed 255 and 510 parts per million (ppm) copper. A small shale boulder on the river bar nearby was assayed and reported 2.6 percent copper with 0.07 percent cobalt, 0.17 percent nickel and 52 ppm silver. A narrow veinlet with trace galena and sphalerite in another nearby outcrop at Location A assayed 0.79 percent lead and 5.25 percent zinc. Another nearby cut bank site exhibits disseminated chalcopyrite occurring along thin southwest-dipping strata of calcareous shale up to 1.5 inches thick; a sample assayed 590 ppm copper with elevated cobalt (Barker, 1983).

Production notes:

None.

Reserves:

None.

Additional comments:

The prospect area was selected for study by the U.S. Bureau of Mines in 1982 as part of on-going critical and strategic mineral investigations in Alaska. The area is now closed to mineral development; the site is located in the Arctic National Wildlife Range and classified as Wilderness.

Favorable regional potential for copper mineralization was advanced by Brosgé and Reiser in 1976, who suggested that the vicinity of the upper Hulahula River may contain significant copper mineralization due to widespread mafic volcanic rocks with high intrinsic copper content. Several copper showings are reported in the region. A group of stream sediment samples was consistently anomalous for copper along the upper segment of the Hulahula River (Brosgé and Reiser, 1976), who mapped widespread mafic sills in this region, which intrudes clastic rocks of the Neruokpuk formation (Reiser and others, 1971).

References:

Barker, J.C., 1983, Cobalt and copper investigation of the Hulahula River Region: U.S. Bureau of Mines unpublished Field Report, 33 p., available from Alaska Division of Geological and Geophysical Surveys Geologic Materials Center, Anchorage, Alaska.

Brosgé, W.P., and Reiser, H.N., 1976, Preliminary geologic and mineral resources maps (excluding petroleum), Arctic National Wildlife Range, Alaska. U.S. Geological Survey Open-File Report 76-539, 4 p., 4 sheets, scale 1:500,000.

Reiser, H.N., Brosgé, W.P., Dutro, J.T., Jr., and Detterman, R.L., 1971, Preliminary geologic map, Mt. Michelson Quadrangle, Alaska, U.S. Geological Survey Open-File Report 71-237, 2 sheets, scale 1:200,000.

Primary Reference: Barker (1983)

Reporter(s): J.C. Barker

Last report date: 2017-04-06

Site name(s): Unnamed (Hulahula River) USBM Location B

Site type: Occurrence

ARDF no.: ML020

Latitude: 69.0822 **Quadrangle:** ML A-2

Longitude: 144.5457

Location description and accuracy:

Location B is in rugged mountainous terrain about two miles east-southeast of the airstrip on the Hulahula River and Location A of Barker (1983). Hulahula River flows north to the Arctic Ocean and is headwaters drain the north flank of the Continental Divide. The occurrence site is referred to as Location B (Barker, 1983) situated above the 5000 foot contour level. The site is in the SW1/4, sec. 24, T. 4 S., R. 31 E., of the Umiat Meridian. Accuracy of the location is about 0.75 mile.

Commodities:

Main: Cu

Other: Ag, Co, Ni, Pb, Zn

Ore minerals: Chalcopyrite, malachite

Gangue minerals: Clays, limonite, hematite

Geologic description:

Location B is hosted in pre-Mississippian clastic rocks and mafic sills cutting a sequence of green and brown argillite (Reiser and others, 1971).

U.S. Bureau of Mines samples 19059-60 at Location B occur near the ridgetop and exhibit minor copper mineralization at the contact of green and brown argillite (Barker, 1983). Intermittent snow cover at the time of the examination precluded definitive contact relationships. It was uncertain if the green argillite(?) may have actually been a highly altered mafic rock. Samples 19059 and 19060 from a shear zone with spotty malachite assayed 405 and 1700 parts per million (ppm) copper, respectively. Elevated silver, cobalt, and nickel were also present. Thinly bedded, foliate dolostone that outcrops at sample 19104 near this location also contained finely disseminated sulfide grains that included trace to minor chalcopyrite; a sample assayed 334 ppm copper.

Favorability for regional copper potential has been advanced by Brosgé and Reiser (1976) who suggested that the vicinity of the upper Hulahula River is favorable for copper mineralization due to widespread mafic volcanic rocks with high intrinsic copper content; several copper showings were reported in the region. A group of stream sediment samples were also consistently anomalous along the upper 10 miles of the Hulahula River (Brosgé and Reiser, 1976).

Alteration:

Bleaching and iron staining are common features in the area, limonite in shear zone locally with hematite staining and silicification, minor quartz stockwork and veining. Pyritic quartz carbonate mineralized zone cuts the host rock (J.C. Barker, unpublished data).

Age of mineralization:

Mineral occurrences appear to be hosted in rocks of the pre-Mississippian clastic rocks and mafic sills of the Neruokpuk Formation (Brosgé and Reiser, 1976).

Generic deposit model:

Deposit model:

Besshi-type copper (Cox and Singer, 1986, model 24b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24b

Production Status: None

Site Status: Inactive

Workings/exploration:

U.S. Bureau of Mines samples 19059-60 at Location B occur near the ridgetop and exhibit minor copper mineralization at the contact of green and brown argillite (Barker, 1983). It was uncertain if the green argillite(?) may have been a highly altered mafic rock. Samples 19059 and 19060 from a shear zone with spotty malachite assayed 405 and 1700 parts per million (ppm) copper, respectively. Elevated silver, cobalt, and nickel were also present. Thinly bedded, foliate dolostone that outcrops at sample 19104 near this location also contained finely disseminated sulfide grains that included trace to minor chalcopyrite; a sample assayed 334 ppm copper.

Production notes:

None.

Reserves:

None.

Additional comments:

The prospect area was selected for study by the U.S. Bureau of Mines in 1982 as part of on-going critical and strategic mineral investigations in Alaska. No further work was performed. The area is now closed to mineral development; the site is located in the Arctic National Wildlife Range and classified as Wilderness.

References:

Barker, J.C., 1983, Cobalt and copper investigation of the Hulahula River Region: U.S. Bureau of Mines Unpublished Field Report, 33 p., available from Alaska Division of Geological and Geophysical Surveys Geologic Materials Center, Anchorage, Alaska.

Brosgé, W.P., and Reiser, H.N., 1976, Preliminary geologic and mineral resources maps, Arctic National Wildlife Range, Alaska. U.S. Geological Survey Open File Report 76-539, 4 p., 4 sheets, scale 1:500,000.

Reiser, H.N., Brosgé, W.P., Dutro, J.T., Jr., and Detterman, R.L., 1971, Preliminary Geologic Map, Mt. Michelson Quadrangle, Alaska, U.S. Geological Survey Open-File Report 71-237, 2 sheets, scale 1:200,000.

Primary Reference: Barker (1983)

Reporter(s): J.C. Barker

Last report date:

Site name(s): Unnamed (Hulahula River) USBM Location C

Site type: Occurrence

ARDF no.: ML021

Latitude: 69.0447 **Quadrangle:** ML A-1

Longitude: 144.5915

Location description and accuracy:

The location given is near the confluence of the Hulahula River and Itkillik Creek. This location is part of a group of copper occurrences found over an area five miles north-south and four miles east-west.

Hulahula River flows north to the Arctic Ocean and its headwaters drain the north flank of the Continental Divide. The occurrence site is referred to as U.S. Bureau of Mines Location C (Barker, 1983) and is in the NW¼, sec. 5, T. 5 S., R. 32 E., of the Umiat Meridian. Accuracy of the location is about 0.75 mile.

Commodities:

Main: Cu

Other: Ag, Co, Pb, Zn

Ore minerals: Chalcopyrite

Gangue minerals: Clays, hematite, pyrite, quartz, sericite

Geologic description:

Favorability for regional copper mineralization has been advanced by Brosgé and Reiser in 1976, who suggested that the vicinity of the upper Hulahula River is favorable for copper mineralization due to widespread mafic volcanic rocks with high intrinsic copper content; several copper showings were reported in the region. A group of stream sediment samples were consistently anomalous along the upper 10 miles of the upper segment of the Hulahula River (Brosgé and Reiser, 1976), which is underlain by widespread mafic rocks (Reiser, 1971) that may have acted as a source for copper remobilized into favorable nearby rocks or structural traps.

At Location C strata bound style mineralized copper occurrences occur in the Kekiktuk Conglomerate. Conglomerate boulders with quartz stockwork and infrequently with chalcopyrite occur in the lower Itkillik Creek at Location C. A chip sample assayed 1.86 percent copper. A second sample of another group boulders assayed 0.135 percent copper. Both contained elevated silver. The bedrock source was not found; however Brosgé and Reiser (1976) also reported chalcopyrite in brecciated and schistose quartzite, chert, and quartz pebble conglomerate and sandstone of the Kekiktuk Conglomerate at their location 42 (69.0150 N, 144.6657 W), and at their location 43 (69.0347 N, 144.5242 W) chalcopyrite occurs in conglomerate and phyllite that is interbedded with chert and mafic volcanic rocks.

Alteration:

Bleaching and iron staining are common features, locally with hematite staining and silicification, quartz stockwork and minor veining (Barker,1983).

Age of mineralization:

Mineral occurrences are hosted in rocks of the Mississippian clastic rocks of the Kekiktuk Conglomerate (Brosgé and Reiser, 1976).

Generic deposit model:

Deposit model:

Besshi-type copper (Cox and Singer, 1986, model 24b); sedimentary-hosted copper (Cox and Singer, 1986, model 30b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24b, 30b

Production Status: None

Site Status: Inactive

Workings/exploration:

At Location C strata bound style mineralized copper occurrences occur in the Kekiktuk Conglomerate. Conglomerate boulders with quartz stockwork and infrequently with chalcopyrite occur in the lower Itkillik Creek at Location C. A chip sample assayed 1.86 percent copper. A second sample of another group boulders assayed 0.135 percent copper. Both contained elevated silver. The bedrock source was not found; however Brosgé and Reiser (1976) also reported chalcopyrite in brecciated and schistose quartzite, chert, and quartz pebble conglomerate and sandstone of the Kekiktuk Conglomerate at their location 42 (69.0150 N, 144.6657 W), and at their location 43 (69.0347 N, 144.5242 W) chalcopyrite occurs in conglomerate and phyllite that is interbedded with chert and mafic volcanic rocks.

Production notes:

None.

Reserves:

None.

Additional comments:

The prospect area was selected for study by the U.S. Bureau of Mines in 1982 as part of on-going critical and strategic mineral investigations in Alaska. No further work was performed. Closed to mineral development, site is located in the Arctic National Wildlife Range and classified as Wilderness.

References:

Barker, J.C., 1983, Cobalt and Copper Investigation of the Hulahula River Region: U.S. Bureau of Mines Unpublished Field Report, 33 p., available from Alaska Division of Geological and Geophysical Surveys Geologic Materials Center, Anchorage, Alaska.

Brosgé, W.P., and Reiser, H.N., 1976, Preliminary geologic and mineral resources maps, Arctic National Wildlife Range, Alaska: U.S. Geological Survey Open-File Report 76-539, 4 p., 4 sheets, scale 1:500,000.

Reiser, H.N., Brosgé, W.P., Dutro, J.T., Jr., and Detterman, R.L., 1971, Preliminary Geologic Map, Mt. Michelson Quadrangle, Alaska, U.S. Geological Survey Open-File Report 71-237, 2 sheets, scale 1:200,000.

Primary Reference: Barker (1983)

Reporter(s): J.C. Barker

Last report date: 2017-04-06

Site name(s): Utopia Creek

Site type: Mine

ARDF no.: MZ006

Latitude: 65.9822 **Quadrangle:** MZ D-2

Longitude: 153.7379

Location description and accuracy:

The Utopia Creek placer mine follows the channel of Utopia Creek for about 3 miles upstream from its junction with the Indian River. The coordinates are at about the midpoint of the mined portion of the creek, which is shown on the 1:63,360-scale topographic map. The mined area is centered about 0.6 mile northeast of the center of section 26, T. 7 N., R. 24 E. and R. 25 E. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Galena, gold, sphalerite, tetrahedrite

Gangue minerals:

Geologic description:

The rocks in the Utopia Creek area consist of Cretaceous andesite and basalt interlayered with chert, cherty tuff, conglomerate, and coquinoidal limestone (Patton and others, 1977). The Indian Mountain granodiorite pluton crops out approximately 2 miles northwest of the placer workings, and podlike intrusions of fine-grained, pyritiferous, silicified, felsic rock occur along an east-northeast-trending fault about 1.5 miles south of the workings. The gradient of upper Utopia Creek is about 200 feet per mile; the gradient at the mouth is about 75 feet per mile. Unlike other gold-bearing streams in the area, Utopia Creek does not drain the Indian Mountain granodiorite intrusion (Miller and Ferrians, 1968).

Bedrock in Utopia Creek is slightly metamorphosed andesite cut by fine-grained felsic rock (Miller and Ferrians, 1968). Boulders of massive barite are in the tailings of an abandoned placer mine near the head of Utopia Creek, and some of those boulders contain tetrahedrite, sphalerite, and galena (Miller and Ferrians, 1968). That mineralization is described in record ARDF MZ005.

Gold was discovered in Utopia Creek in about 1906 (Cobb, 1975) and mining was reported as early as 1915. J.Q. Hackett, R.B. Norris, and C.B. Frank prospected and did a little mining on Utopia Creek in 1929 (Wimmler, 1929). L. McGee and a crew of 12 men began prospecting on Utopia Creek in 1936 (Smith, 1938). Overburden was stripped and a bedrock drain dug in 1937 by about a 20-man crew employed by McGee (Smith, 1939 [B 910A]). Large-scale mining was started in 1938 (Smith, 1939 [B 917-A]). McGee ran the operation and for several years employed approximately 30 men. At the time, Utopia Creek was the largest placer operation in the district (Smith, 1941). In 1939, McGee divided the property into two segments. The upstream section was mined by hydraulic methods when water was available. The pay streak in that portion of the creek was on the south side of the drainage. Heavy machinery and draglines were used on the downstream portion, where gravels were as much as 25 feet thick (Smith, 1941). Large-scale mining continued until 1952 (Cobb, 1973). U.S. Geological Survey topographic maps of the Melozitna quadrangle show workings along approximately 3.5 miles of Utopia Creek; the upper tailings continuing along a draw on the south side of the creek. The remains of a 40-foot long washing plant lie in a heavily vegetated area along the lower creek (Kurtak and others, 2002). The configuration of the tailings piles indicates that mining concentrated on deposits in the modern stream channel. The average grade of the placer, which started at 0.032 ounce of gold per cubic yard, was down to 0.003 ounce per cubic yard by the last year of production

(Kurtak and others, 2002). The fineness of a placer gold sample from Utopia Creek was 849 (Metz and Hawkins, 1981).
At least 8,850 ounces of gold were mined on Utopia Creek (Cobb and Miller, 1981).

Alteration:

Age of mineralization:
Quaternary.

Generic deposit model:
Placer deposits (Garnett and Bassett, 2005)

Deposit model:
Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: Yes; medium

Site Status: Probably inactive

Workings/exploration:
Gold was discovered in Utopia Creek around 1906 (Cobb, 1975; Eberlein and others, 1977) and mining was reported as early as 1915. J.Q. Hackett, R.B. Norris, and C.B. Frank prospected and did a little mining on Utopia Creek in 1929 (Wimmler, 1929). L. McGee and a crew of 12 men began prospecting on Utopia Creek in 1936 (Smith, 1938). Overburden was stripped and a bedrock drain dug in 1937 by about a 20-man crew employed by McGee (Smith, 1939 [B 910A]). Large-scale mining was started in 1938 (Smith, 1939 [B 917-A]). McGee ran the operation and for several years employed approximately 30 men. At the time, Utopia Creek was the largest placer operation in the district (Smith, 1941). In 1939, McGee divided the property into two segments. The upstream section was mined by hydraulic methods when water was available. The paystreak in that portion of the creek was on the south side of the drainage. Heavy machinery and draglines were used on the downstream portion, where gravels were as much as 25 feet thick (Smith, 1941). Large-scale mining continued until 1952, when interest apparently waned (Cobb, 1973). U.S. Geological Survey topographic maps of the Melozitna quadrangle show workings along approximately 3.5 miles of Utopia Creek, with the upper tailings continuing along a draw on the south side of the creek. The remains of a 40-foot long placer wash plant lie in a heavily vegetated area along the lower creek (Kurtak and others, 2002). The configuration of the tailings piles indicates that mining concentrated on deposits in the modern stream channel.

Production notes:
Utopia Creek was probably the largest gold producer in the Koyukuk district (Smith, 1941) but there is no detailed record of production. Cobb and Miller (1981) estimate that about 8,850 ounces of gold were mined on Utopia Creek but it may have been more than 10,000 ounces. Kurtak and others (2002) reported that 8,854 ounces of gold were recovered from 1939 to 1950, but the records are incomplete and there was substantial production before 1939.

Reserves:
None.

Additional comments:
This site is the Utopia Creek, U.S. BLM MILS location 0020470011.

References:

Cobb, E.H., 1973, Placer deposits of Alaska: U.S. Geological Survey Bulletin 1374, 213 p.

Cobb, E.H., 1975, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in five quadrangles in west central Alaska (Hughes, Kotzebue, Melozitna, Selawik, Shungnak): U.S. Geological Survey Open-File Report 75-627, 58 p.

Cobb, E.H., and Miller, T.P., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in the Hughes, Kotzebue, Melozitna, Selawik and Shungnak quadrangles, west-central Alaska; Supplement to Open-File Report 75-627; Part B, Lists of references to January 1, 1981: U.S. Geological Survey Open-File Report 81-847-B, 14 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Metz, P.A., and Hawkins, D.B., 1981, A summary of gold fineness values from Alaska placer deposits: University of Alaska, Fairbanks, Mineral Industry Research Laboratory Report No. 45, 56 p.

Miller, T.P., and Ferrians, O.J., Jr., 1968, Suggested areas for prospecting in the central Koyukuk River region, Alaska: U.S. Geological Survey Circular 570, 12 p.

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Primary Reference: Kurtak and others, 2002

Reporter(s): G.E. Graham, D.J. Szumigala (ADGGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): City; Golden Range

Site type: Prospect

ARDF no.: NB110

Latitude: 62.866

Quadrangle: NB D-6

Longitude: 143.9511

Location description and accuracy:

The City prospect is about 10.8 miles north of Slana. It is about 1.3 mile west-northwest of VABM 6677 'Ahtell' and about 0.5 mile west-northwest of the center of section 32, T. 3 S., R. 8 E., Copper River Meridian. The location is accurate to within 30 feet of the center of the prospect (C. Brown, Alaska Exploration Manager, Corvus Gold, written commun., 2014).

Commodities:

Main: Ag, Au

Other: As

Ore minerals: Arsenopyrite, gold, pyrite

Gangue minerals: Carbonate minerals, quartz, sericite

Geologic description:

The rocks in the area of the City prospect are diorite and quartz diorite of the Permian to Pennsylvania Ahtell pluton (Richter, 1966; Richter and others, 1975; Wilson and others, 1998; Corvus Gold Inc., 2012). The rocks are cut by extensive dike swarms and faults. The mineralization is on the northeast side of a regional-scale northwest-striking fault.

The City prospect may have been sampled in 1980 when WGM Inc. on behalf of the Ahtna Native Corporation searched for the source of geochemical anomalies in gold that outlined a northwest-trending area several miles long that WGM had identified in 1979 (WGM Inc., 1979, 1980). In 1980, they collected several rock samples at scattered locations along the trend that contained up to 3,260 parts per billion (ppb) gold.

In 2010, Corvus Gold Inc. revisited the area, outlined an area of mineralization 2 by 9 kilometers in size, and called it the Golden Range target. They collected more than 300 rock and soil samples in the area. The 151 rock samples averaged 0.6 gram of gold per tonne; 29 of the 151 had more than 0.10 gram of gold per tonne, and the best had 50.4 grams of gold per tonne.

By 2011, Corvus had identified at least 5 prospects in the Golden Range target area that they had sampled and drilled (Corvus Gold, Inc., 2012). One is the City prospect where they drilled 3 holes. Notable intercepts were 0.7 metes that averaged 6.21 grams of gold per tonne and 6.68 grams of silver per tonne, and 2.8 meters that averaged 1.57 grams of gold per tonne and 0.38 gram of silver per tonne. Details of the mineralization are unavailable but it is probably similar to that at the nearby Notch prospect (GU045) where arsenopyrite-quartz veins are in a thick mineralized zone marked by sericitic and quartz-carbonate alteration (Meyers and others, 2011).

Alteration:

Extensive silica-carbonate alteration of diorite and quartz diorite? In addition, quartz, sericite, and pyrite (W.T. Ellis, Vice President, Alaska Earth Sciences, Inc., written communication, 2014).

Age of mineralization:

Younger than the Permian to Pennsylvanian host rocks.

Generic deposit model:

Deposit model:
Polymetallic vein? (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
22c?

Production Status: None

Site Status: Active

Workings/exploration:
The City prospect may have been sampled in 1980 when WGM Inc. on behalf of the Ahtna Native Corporation searched for the source of geochemical anomalies in gold that outlined a northwest-trending area several miles long that WGM had identified in 1979 (WGM Inc., 1979, 1980). In 1980, they collected several rock samples at scattered locations along the trend that contained up to 3,260 parts per billion (ppb) gold. In 2010, Corvus Gold Inc. revisited the area, outlined an area of mineralization 2 by 9 kilometers in size, and called it the Golden Range target. They collected more than 300 rock and soil samples in the area. By 2011, Corvus had identified at least 5 prospects in the Golden Range target area that they had sampled and drilled (Corvus Gold, Inc., 2012). One is the City prospect where they drilled 3 holes.

Production notes:
None.

Reserves:
None.

Additional comments:
The 04/01/2012 version of this record incorrectly listed the ARDF number as GU050 for Gulkana quadrangle while the quadrangle abbreviation should be NB as it is located in the Nabesna quadrangle.

References:

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Primary Reference: Corvus Gold Inc., 2012

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-08-24

Site name(s): Round Top; Roundtop

Site type: Prospect

ARDF no.: NL011

Latitude: 64.1703 **Quadrangle:** NL A-4

Longitude: 157.5334

Location description and accuracy:

The Round Top prospect is about 1.4 miles southwest of VABM 1954 'Round Top' in the Kaiyuh Mountains. It is on an east-west trending ridge at the headwaters of Minnesota Creek near the center of section 20, T. 15 S., R. 7 E., of the Kateel River Meridian. The location is between the drill collars RT-3 and RT-7 drilled by Anaconda Minerals Company in 1981. The location is accurate to 100 meters.

Commodities:

Main: Ag, Cu, Mo

Other: Pb, W, Zn

Ore minerals: Argentojarosite, beudantite, chalcocite, chalcopyrite, covellite, galena, jarosite, molybdenite, native Cu, pyrite, pyrrhotite, scheelite, sphalerite

Gangue minerals: Quartz

Geologic description:

Outcrop in the prospect area is scarce and the geology is largely defined by rubble. The country rocks in the area of the Round Top prospect are Paleozoic to Proterozoic(?) pelitic schist and quartzite of greenschist- and amphibolite-grade, locally accompanied by blueschist-grade (Patton and others, 2009). Lesser amounts of carbonate rocks and metavolcanic rocks are also present (Gemuts and others, 1983). All rocks have undergone multiple periods of deformation and generally trend northeast. The country rocks are intruded by a large intrusive complex that trends northwest, parallel to a major regional fault about 0.6 mile southwest of the prospect. The intrusive complex can be divided into a western lode and an eastern lobe that together cover an area of about 0.8 square mile.

Harris (1985) identified six types of porphyritic intrusive rocks and an intrusive microbreccia in the complex. The two oldest porphyries, which are quartz monzonite, appear to be the parent lithology for the microbreccia and are associated with the mineralization. They are crosscut by later porphyritic intrusive rocks. A K/Ar date on a potassium-feldspar phenocryst from the oldest intrusive gave an age of 74 +/- 2.8 Ma. The microbreccia is composed of lithic fragments that are cemented and replaced by biotite, potassium feldspar, and quartz, or by chlorite and quartz, with lesser amounts of chalcedonic quartz and montmorillonite, calcite and actinolite. The biotite-potassium feldspar-quartz replacement indicates potassic alteration and suggests that the microbreccia formed during copper mineralization. Gradational contacts between the microbreccia and the older quartz monzonite porphyry indicate that the microbreccia formed from it. The second-oldest porphyry, which is also quartz monzonite, is in sharp contact with the microbreccia; textural evidence suggests that the microbreccia was emplaced in pulses along shear zones, possibly coincident with explosive degassing during cooling of the intrusive rocks.

The wall rocks of the intrusive complex are mainly fine- to medium-grained pelitic schist. Near the intrusive, the calcareous rocks have locally been altered to calc-silicate hornfels. Two small outcrops of light-green metavolcanic rocks (possibly meta-andesite) are known (Harris, 1985).

The early potassic and propylitic alteration encloses an approximately 330-foot-diameter zone of stockwork quartz veins. Potassic alteration extends west for about 3,600 feet, and gradually grades into propylitic alteration. The propylitic alteration consists of chlorite, epidote, calcite, actinolite,

montmorillonite, and chalcedonic quartz. The later sericite-quartz-pyrite alteration is fracture controlled and pervasive throughout the intrusive complex (Harris, 1985).

Mineralization at Round Top occurs as: 1) veins containing molybdenite, chalcopyrite, pyrite, and pyrrhotite; 2) gossan containing argentojarosite, jarosite, and beudantite; 3) a supergene zone beneath the gossan containing chalcocite, covellite, native copper, and chalcopyrite; and 4) calc-silicate wall rocks near the intrusive that contain pyrite, chalcopyrite, and sphalerite (Harris, 1985).

Quartz veins in the stockwork zone make up to 90 percent of the rock. Older, smaller 'A'- type veins with potassium-feldspar margins locally contain molybdenite, pyrite, and chalcopyrite. Younger, larger, 'B'- type veins usually contain molybdenite in their cores or along selvages. Sericite, anhydrite, and andalusite occur along some vein margins (Harris, 1985).

Molybdenite occurs primarily in an elliptical area of quartz veins that encloses an intensely veined stockwork zone at the eastern lobe of the intrusive. Chalcopyrite mineralization also occurs in this zone, and in potassically-altered microbreccia. The dominant sulfide in this zone is pyrite with traces of pyrrhotite. Chalcopyrite content decreases outward from the zone of intense stockwork veins and there is a concentric zone of tungsten mineralization as scheelite in quartz veins (Ellis and Roberts, 2014); lead, zinc, and silver increase at the western boundary of the intrusive complex. Within the schist, iron enrichment is marked by iron sulfides in calc-silicate hornfels.

A zone of supergene enrichment underlies the oxide (gossan) zone, which typically extends to a depth of 300 to 400 feet. The supergene zone contains chalcocite, sparse covellite and native copper, as well as pyrite and chalcopyrite. Within the oxide zone, goethite, hematite, jarosite, and limonite are common in a kaolinite-sericite-quartz assemblage that is leached of all sulfides (Harris, 1985).

Alteration:

Alteration consists of early potassic and propylitic alteration in the microbreccia and earlier porphyritic intrusions, and later sericite-quartz-pyrite alteration throughout the intrusive complex. The deposit also has undergone supergene enrichment, and calcareous schist near the intrusive complex have undergone calc-silicate hornfelsing and iron metasomatism (Harris, 1985).

Age of mineralization:

A K/Ar date on potassium feldspar from the oldest porphyry at Round Top is 74 +/- 2.8 Ma. Mineralization is likely younger than this (Harris, 1985).

Generic deposit model:

Deposit model:

Porphyry Cu-Mo (Cox and Singer, 1986; model 21a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

21a

Production Status: None

Site Status: Active

Workings/exploration:

The Round Top porphyry prospect was discovered in 1980 during a reconnaissance exploration program by Anaconda Minerals Company (Anaconda) (Harris, 1985). Between 1980 to 1983 Anaconda completed geologic mapping, geochemical sampling, drilling, and geophysical surveys including MaxMin (small loop frequencey domain electromagnetics) survey, ground magnetics, electromagnetics (EM), gravity, and induced polarization surveys, and airborne magnetic regional survey (Ellis and Roberts, 2014).

The geochemical sampling in 1981 resulted in 874 soil samples and 730 rock samples being collected over the Round Top prospect. Results showed concentric zoning with molybdenum in the center grading outward through tungsten, to copper-lead and finally lead-silver-tin-copper. The molybdenum center anomaly coincides with the occurrence of quartz vein stockwork within quartz monzonite porphyry. The outer lead-

silver halo is associated with a contact between the intrusive quartz monzonite porphyry and the schist (Ellis and Roberts, 2014).

Anaconda drilled at the Round Top prospect in 1981. They drilled 1,668.4 meters in seven drill holes. Highlights from the drilling include: hole RT-7 with 0.48 percent copper over 18.6 meters in a zone of supergene chalcocite enrichment, and 5 other mineralized zones that contained 0.36 to 1.10 percent copper; hole RT-3 had 5 intercepts with thicknesses between 26.3 to 62.7 meters that contained from 0.22 to 0.72 percent copper and up to 0.07 percent molybdenum; hole RT-2 intersected three zones of copper-silver mineralization that contained 0.98 to 1.8 percent copper and 4.5 to 23.0 grams per tonne silver (Ellis and Roberts, 2014; Western Alaska Copper and Gold, 2015).

Western Alaska Copper and Gold completed a complex resistivity induced polarization (CR-IP) survey on the Round Top prospect in 2010. Data was collected from 29 stations along two survey lines for a total of 5.4 line kilometers (Ellis and Roberts, 2014).

In 2012 Western Alaska Copper and Gold completed a soil geochemistry program collecting samples on a 500 by 100 meter grid covering the Round Top prospect, TG (NL028), and TG North (NL027) in order to determine the extent of the Round Top geochemical signature. They collected over 1,050 soil samples. The molybdenum results confirmed the concentric anomaly discovered by Anaconda in 1981. The copper soil anomaly is slightly west of the molybdenum anomaly and covers a 2.5 by 2.5 kilometer area. Western Alaska Copper and Gold also completed an airborne magnetic and radiometric survey in 2012 (Ellis and Roberts, 2014).

In 2016, Western Alaska Copper & Gold conducted exploration drilling at their Roundtop property in western Alaska, a combined porphyry copper-molybdenum, skarn, and lead-zinc-silver carbonate-replacement deposit. The 6-hole, 1,461-meter-total-length drill program tested historical drilling by Anaconda, as well as soil-geochemical anomalies and geophysical targets. Western Alaska discovered secondary chalcocite beneath the East Lobe Porphyry, including 39 meters of 0.50 percent copper within a 75-m interval of 0.31 percent copper. Chalcocite was found at depths of greater than 330 meters (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

In the 2015 record update, Tim's Gossan or TG was separated into a separate record (ARDF number NL028).

References:

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Western Alaska Copper and Gold, 2015, Round Top Project Geology: http://www.westernalaskacopperandgold.com/round-top-geology.html (as of July 29, 2015).

Primary Reference: Harris, 1985

Reporter(s): C.E. Cameron (Northern Associates Inc.); D.J. Grybeck (Contractor, USGS); N.V. King (Alaska Earth Sciences); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Honker

Site type: Prospect

ARDF no.: NL018

Latitude: 64.1272 **Quadrangle:** NL A-4

Longitude: 157.9818

Location description and accuracy:

The Honker prospect is about 4.2 miles southwest of the summit of Khotol Mountain (VABM 2844) in the Kaiyuh Mountains. It is in the southwest quarter of section 1, T. 16 S., R. 4 E., of the Kateel River Meridian. The prospect location is at the top of hill 1810 and centered on the Main Vein which trends north-northeast for approximately 600 meters.

Commodities:

Main: Ag, Au

Other: As, Bi, Cu, Pb, Sb, W

Ore minerals: Arsenopyrite, bismuth, bismuthinite, chalcocite, chalcopyrite, electrum, galena, gold, malachite, marcasite, pyrite, pyrrhotite, scheelite, scorodite, selenides, stibnite, sulfosalts, tellurides

Gangue minerals: Quartz

Geologic description:

The country rocks at the Honker prospect consist of Paleozoic to Proterozoic (?) schists of mostly greenschist facies and include chlorite schist, quartz-chlorite-muscovite schist, variably hornfelsed, banded, light and dark gray metasedimentary rocks, and minor graphitic schist rubble (Flanigan, 1998; Patton and others, 2009). Medium-grained granodiorite float also occurs at the prospect. The metamorphic rocks generally strike east-west and dip 20 to 40 degrees south. High-temperature contact metamorphism is indicated by the presence of andalusite crystals and garnet porphyroblasts. The metasedimentary rocks are very resistant and cap the top of hill 1810. Hornfelsing and silicification of these rocks are probably due to the intrusion of the nearby Early Cretaceous Khotol Mountain pluton (Patton and others, 2009). A schistose quartzite unit overlies the metasedimentary rocks (Flanigan, 1998).

The Honker prospect consists mainly of two subparallel, gold- and silver-bearing quartz-arsenopyrite veins that trend N 20 E to N 25 E. It also includes gossan; banded and massive sulfides in calcareous chlorite schist; and disseminations, blebs, and clots of sulfides in hornfelsed sedimentary rocks (Flanigan, 1998). These principal veins are brecciated and oxidized. The larger vein (Main Vein or Honker East) may be as long as 950 meters, has a true thickness (identified by drilling) of 1-5 meters, and a vertical extent of 150 meters. The smaller vein (West Vein or Honker West) is up to 3 meters thick and is traceable at the surface intermittently along strike for up to 300 meters (Flanigan, 1998).

Large, resistant, boulders up to 0.5 meters in diameter of dark reddish-brown, massive, ropy and siliceous, vuggy gossan are more prominent than boxwork gossan and fracture-veined limonitic material. Gossan at the Honker prospect is not as abundant as at Waterpump Creek (NL020) or Illinois Creek (NL023), but is also due to the oxidation of sulfides (Flanigan, 1998). The most abundant vein material at Honker is milky-white or pale green quartz and scorodite, and siliceous breccia that locally contains limonite. Disseminated arsenopyrite and traces of malachite are present locally. The arsenopyrite is generally euhedral and coated with chalcocite (Flanigan, 1998). Brecciated material is matrix supported and composed of rounded and angular fragments of schist, quartz, arsenopyrite, and minor gossan, cemented by quartz, scorodite, iron oxide, and small amounts of arsenopyrite. Additional sulfides occur as disseminated grains, blebs, and pods in the metasedimentary rocks, generally without gold (Flanigan, 1998). Electron microprobe analysis and

polished section petrography also identified gold and silver tellurides, selenides, and sulfosalt minerals, chalcopyrite, marcasite, bismuth-bismuthinite solid solution, stibnite, galena, electrum, and native gold (Flanigan, 1998).

Drill holes intersected three narrow zones of banded and massive pyrrhotite and pyrite, with traces of chalcopyrite, arsenopyrite, and scheelite. These zones appear to be conformable with the quartz-chlorite-muscovite schist. Sparse, disseminated, very-fine-grained arsenopyrite and pyrite occur between the intercepts (Flanigan, 1998).

Mineralized rock samples from the Honker prospect average 0.13 ounce per ton (oz/t) gold and 0.17 oz/t silver. Copper ranges up to 5400 parts per million (ppm), lead up to 935 ppm, and several samples contained anomalous tungsten (25-270 ppm). The mineralization includes little or no zinc, manganese, antimony, or mercury, but arsenic values range higher than 5 percent in the richest drill hole intercepts. Samples of drill core assay up to 1.12 oz/t gold and 2.33 oz/t silver, and average 0.13 oz/t gold and 0.27 oz/t silver. The banded and massive sulfide intercepts assay up to 0.078 oz/t gold and 0.08 oz/t silver (Flanigan, 1998).

Arsenopyrite thermometry indicates that ore mineralization temperatures at the Honker prospect were between 300 and 350 degrees Celsius (Flanigan, 1998). These temperatures and the fact that the veins cut the schistosity of the host rocks make it unlikely that metamorphism is responsible for mineralization (Ellis, 2013; Flanigan, 1998).

K-Ar and Ar/Ar dating of sericite near the ore and white mica from the Khotol pluton demonstrate that mineralization and Khotol plutonism were coeval at about 113 Ma (Flanigan, 1998). The presence of anomalous Sb, Sn, and native Bi suggests that mineralization at Honker was related to magmatic fluids derived from the pluton, and the distribution of Au, Ag, As, and Bi among the Honker, Waterpump Creek (NL020), and the Illinois Creek (NL023) deposits indicates zoning peripheral to it (Flanigan, 1998).

Alteration:

Metasedimentary rocks are hornfelsed and silicified. Locally, the schist is altered to clay and iron-stained. Oxidation of sulfides has produced gossan (Flanigan, 1998).

Age of mineralization:

K-Ar and Ar/Ar dating of sericite near the ore and white mica from the Khotol pluton demonstrate that mineralization and Khotol plutonism were coeval at about 113 Ma (Flanigan, 1998).

Generic deposit model:

Deposit model:

Plutonic-related, epigenetic lode Au-Ag; Polymetallic veins? (Cox and Singer, 1986, model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active

Workings/exploration:

The Honker vein system was discovered in 1981 by Anaconda Mining Company (Anaconda) during a regional exploration program. In 1982, Anaconda conducted follow-up geological mapping, ground magnetometer, induced polarization (IP), and electromagnetic (EM) surveys, geochemical sampling, and tested the Main Vein with 10 diamond drill holes totaling 1001.2 meters (Ellis, 2013). Anaconda collected 103 rock chip samples and 31 soil samples. Rock samples containing vein material averaged 8.58 grams per tonne (g/t) silver and wall rock samples averaged 0.97 g/t silver. Gold values were as high as 39 g/t. Both the Main Vein and the West Vein did not yield a geophysical response where the veins and associated gossans are exposed at the surface. However, the geophysical surveys produced magnetic and EM anomalies to the south of the outcrop area on hill 1810, and along strike of both veins. Anaconda interpreted the anomalies to the south of the outcrop areas to result from an increase in pyrrhotite and clay gouge along

the veins (Ellis, 2013). Drilling highlights from the 10 drill holes include 4.8 meters at 0.211 ounce/ton (oz/t) gold and 0.42 oz/t silver, 4.9 meters at 0.11 oz/t gold and 0.21 oz/t silver, and 2.0 meters at 0.11 oz/t gold and 0.9 oz/ silver. Also in 1982, Anaconda collected two bulk samples from float material (160 and 72.7 pounds) along the Main Vein for metallurgical testing. The two bulk samples averaged 29.14 g/t gold (0.85 oz/t) and 29.48 g/t silver (0.86 oz/t) (Ellis, 2013).

Exploration on Honker ceased until 2009 when Western Alaska Copper and Gold retraced the veins, located the Anaconda drill collars and took 25 samples of vein material. In 2010 J & G Gold LLC did geologic mapping and sampling under an option with Western Alaska Copper and Gold. Channel samples were taken at 8 to 10 meter intervals along the veins. The highest gold value from the samples was 86.9 parts per million (ppm) (Ellis, 2013). In 2012 Western Alaska Copper and Gold completed an airborne magnetic and radiometric survey.

In 2014 Western Alaska Copper and Gold completed a trenching program at the Main Vein and West Vein to collect multiple samples of mineralization. These metallurgical samples were evaluated for gravity and leaching extraction methods for gold (Western Alaska Copper and Gold, 2015).

Production notes:

None.

Reserves:

Inferred resources for the Honker prospect are estimated to be greater than 250,000 ounces of gold in ore averaging 1.0 ounce of gold per ton (Flanigan, 1998).

Additional comments:

References:

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Patton, W.W. Jr., Wilson, F.H., Labay, K.A., and Shew, Nora, 2009, Geologic map of the Yukon-Koyukuk Basin, Alaska: U.S. Geological Survey Scientific Investigations Map 2909, scale 1:500,000, 2 sheets and pamphlet. http://pubs.usgs.gov/sim/2909/

Western Alaska Copper and Gold, 2015, Honker Gold Project: http://www.westernalaskacopperandgold.com/honker-gold.html (as of July 29, 2015).

Primary Reference: Flanigan, 1998

Reporter(s): C.E. Cameron (Northern Associates Inc.); N.V. King (Alaska Earth Sciences)

Last report date: 2016-03-15

Site name(s): Silver Chalice; Kaiyah

Site type: Prospect

ARDF no.: NL024

Latitude: 64.0829 **Quadrangle:** NL A-6

Longitude: 158.771

Location description and accuracy:

The Silver Chalice prospect is about 1 mile west of the Yukon River, and 3 miles east of Poison Creek. The coordinates are for the approximate center of the prospect near VABM Kaiyah in section 24, T. 16 S., R. 1 W. The location is accurate.

Commodities:

Main: Ag, Au

Other: As, Bi, Hg

Ore minerals:

Gangue minerals: Quartz

Geologic description:

The rocks in the area of the Kaiyah prospect consist of Cretaceous deltaic sandstone, shale, and conglomerate adjacent to the Poison Creek caldera. The caldera is expressed topographically as a curvilinear fault contact between the volcanic rocks inside the caldera and Koyukuk sedimentary rocks around it. Landsat and magnetic data suggest that the caldera system may be over 20 kilometers in diameter. The Tertiary volcanic rocks include intermediate to felsic ash flow tuff, massive basaltic andesite, and a small area of siliceous sinter (North Star Exploration, Inc., 2001; Patton and others, 2009).

Gold and silver are anomalous in surface samples of silicified sedimentary rocks east of the caldera rim in an area of radial faulting. The silicified rocks are cut by chalcedonic quartz veinlets, vuggy drusy coatings, and blue-gray quartz veinlets. In addition to the silicification, the host rocks locally are argillized (clay altered). Core holes drilled in 2000 intersected extensive zones of polyphase quartz veining, advanced argillic alteration, polymetallic sulfides, and mineralized dikes. The drill holes were targeted at two east-west-trending vein systems, the Main and South veins, which are approximately 250 feet apart (Avalon Development newsletter, Jan., 2001).

Bundtzen and Miller (1997) first reported gold in epithermal quartz veins at the prospect in 1997. Subsequent fieldwork by North Star Exploration Inc. in 1999 resulted in the definition of more widespread mineralization. In 250 rock samples, gold averages 110 parts per billion (ppb) and silver averages 20 parts per million (ppm). Samples contain up to 0.4 ppm gold and up to 13.6 ounces of silver. Samples also contain anomalous values of arsenic, bismuth, and mercury (North Star Exploration, Inc., 2001).

Next Gen Metals Inc. (2009) acquired the property in late 2009. As described by them, the quartz veins are associated with northeast structures that radiate from the margin of the caldera. The veins are in an outer zone of propylitic alteration and an inner zone of weak to moderate argillic alteration; there also is weak silicification adjacent to the veins. Rock samples from surface rubble contain up to 10 grams of gold per tonne and 462 grams of silver per tonne; the gold:silver ratio is about 40:1. The main Silver Chalice vein is up to 25 feet thick as cut in two drill holes; the South vein is 27 feet thick as cut in one hole. Fluid inclusion work suggests an epithermal origin.

Alteration:

Silicification, propylitic and argillic alteration.

Age of mineralization:
The veins cut Tertiary volcanic rocks.

Generic deposit model:

Deposit model:
Epithermal Au-Ag (Cox and Singer, 1986; model 25c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
25c

Production Status: None

Site Status: Active

Workings/exploration:
During 1999 and 2000, North Star Exploration Ltd. explored the Kaiyah prospect with geologic mapping, geophysics, and Landsat image analysis. In 2000, 2,776 feet of core drilling were completed. Next Gen Metals Inc. acquired the property in late 2009 and plans extensive work in 2010.

Production notes:
None.

Reserves:
None.

Additional comments:
This prospect is on Doyon, Ltd. selected land.

References:

Bundtzen, T.K., and Miller, M.L., 1997, Precious metals associated with Late Cretaceous-early Tertiary igneous rocks of southwestern Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 242-286.

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Patton, W.W., Wilson , F.H., Labay, K.A., and Shew, Nora, 2009, Geologic map of the Yukon-Koyukuk Basin, Alaska: U.S. Geological Survey Scientific Investigations Map 2909, 2 plates, scale 1:500,000, and 26 p. text.

Primary Reference: Next Gen Metals Inc., 2009

Reporter(s): C.E. Cameron (Northern Associates Inc.); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): TG North

Site type: Prospect

ARDF no.: NL027

Latitude: 64.1933 **Quadrangle:** NL A-4

Longitude: 157.5927

Location description and accuracy:

The TG North prospect is about 3.1 miles west-northwest of VABM 1954 'Round Top', and about 0.3 mile north of the center of section 13, T. 15 S., R. 7 E. The location is accurate.

Commodities:

Main: Ag, Au, Pb, Zn

Other:

Ore minerals:

Gangue minerals: Quartz

Geologic description:

The TG North prospect was discovered in 1980 by Anaconda Minerals as part of a regional exploration program that also found the nearby and better defined Round Top and Tim's Greisen prospects (NL011). They drilled four shallow 'Winkie' holes in late 1984, and covered it with geophysical and geochemical surveys. The prospect was being explored by the Western Alaska Copper and Gold Company in 2012 in conjunction with their work at the Round Top prospect.

As described by Western Alaska Copper and Gold (2012), the mineralization consists of gossan and vuggy, quartzite breccia along a north-trending linear. The host rock is brittle quartzite. Samples of from a prospect pit contained up to 5.7 percent lead and 1,203 grams of silver per tonne. Drill core shows evidence of many crosscutting fractures, replacement textures, and silicification. Western Alaska Copper and Gold suggests that the deposit may be Bonanza-style epigenetic silver-gold-lead-zinc mineralization in structurally controlled veins, breccia and replacement deposits.

Alteration:

Silicification; abundant gossan.

Age of mineralization:

Possibly related to the nearby Round Top prospect (NL011) which is probably Late Cretaceous or Early Tertiary based on a 74 Ma K/Ar date.

Generic deposit model:

Deposit model:

Bonanza-style epigenetic silver-gold-lead-zinc mineralization in structurally controlled veins, breccia and replacement deposits.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The TG North prospect was discovered in 1980 by Anaconda Minerals as part of a regional exploration program that also found the nearby and better defined Round Top and Tim's Greisen prospects (NL011). They drilled four shallow 'Winkie' holes in late 1984, and covered the the prospect by geophysical and geochemical surveys. The prospect was being explored by the Western Alaska Copper and Gold Company in 2012.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Flanigan, B., 1998, Genesis and mineralization of ore deposits in the Illinois Creek region, west central Alaska: University of Alaska, Fairbanks, M.Sc. thesis, 125 p., 2 plates.

Harris, T.D., 1985, Geology of the Round Top porphyry copper-molybdenum deposit, west-central Alaska: Boulder, University of Colorado, M.Sc. thesis, 202 p.

Western Alaska Copper and Gold, Co., 2012, 2012 Round Top/TG North project: http://www.westernalaskacopperandgold.com/reports/Round%20Top%20Prospectus%2011-1-2011e%20.pdf Project: (as of March 18, 2012).

Primary Reference: Western Alaska Copper and Gold Co., 2012

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Tim's Gossan; TG

Site type: Prospect

ARDF no.: NL028

Latitude: 64.1724 **Quadrangle:** NL A-4

Longitude: 157.5841

Location description and accuracy:

Tim's Gossan prospect is 2.8 miles west of VABM 1954 'Round Top' in a saddle between hill 1730 and 1560 on an east-west trending ridge in the Kaiyuh Mountains. The prospect drains into the headwaters of California Creek and Minnesota Creek in the southeast corner of section 24, T. 15 S., R. 6 E., of the Kateel River Meridian. The location of the site is where the rubble crop of mineralized gossan is found.

Commodities:

Main: Ag, Pb, Zn

Other: As, Au, Cu, Sn

Ore minerals:

Gangue minerals: Quartz

Geologic description:

Outcrop in the prospect area is scarce and the geology is largely defined by rubble. The country rocks in the area of Tim's Gossan prospect are Paleozoic to Proterozoic(?) pelitic schist and quartzite of greenschist- and amphibolite-grade, locally accompanied by blueschist-grade (Patton and others, 2009). Lesser amounts of carbonate rocks and metavolcanic rocks are also present (Gemuts and others, 1983). All rocks have undergone multiple periods of deformation and generally trend northeast. The country rocks are intruded by a large intrusive complex that trends northwest, parallel to a major regional fault about 0.6 mile east of the prospect (Harris, 1985).

Tim's Gossan is interpreted by Harris (1985) to be part of the Round Top system (Flanigan, 1998). The gossan is hosted in locally brecciated quartz-chlorite-muscovite schist. The brecciated schist is mildly bleached, iron-stained, and altered to clay. The gossan is black or gray, massive, and extends over an approximately 250 by 820 foot area. Sooty, amorphous, yellow, black or gray, and red-orange supergene oxides fill 0.6- to 1.2-cubic-inch voids in the gossan. The gossan is composed of a thick, dark, iron and manganese coating on small, foliated siliceous structures (Flanigan, 1998). Work carried out between 1980 and 1983 defined silver-lead-zinc replacement style mineralization in chloritic limestone and dolomite dipping 40 to 50 degrees northeast into a northwest trending fault zone (Ellis and Roberts, 2014).

Tim's Gossan prospect contains high levels of lead, zinc, silver, and manganese and anomalous values of tin and arsenic. Drilling at Tim's Gossan in 1983 intersected graphite-siderite gouge zones containing high levels of zinc, lead, and silver (Ellis and Roberts, 2014).

Alteration:

The brecciated schist is mildly bleached, iron-stained, and altered to clay (Flanigan, 1998). Mineralization in chloritic limestone and dolomite is also observed (Ellis and Roberts, 2014).

Age of mineralization:

A K/Ar date on potassium feldspar from the oldest porphyry at the nearby Round Top prospect (NL011) is 74 +/- 2.8 Ma. Mineralization is likely younger than this (Harris, 1985).

Generic deposit model:

Deposit model:
Zn-Pb Skarn? or Polymetallic veins? (Cox and Singer, 1986; model 18c or 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
18c? or 22c?

Production Status: None

Site Status: Active

Workings/exploration:

Tim's Gossan was first discovered in 1980 during a regional reconnaissance program completed by Anaconda Minerals Company (Anaconda). In 1982 and 1983 Anaconda completed soil sampling at Tim's Gossan and nearby Round Top (NL011), a MaxMin (small loop frequency domain electromagnetics) survey, and a few shallow drill holes (Ellis and Roberts, 2014). The surface gossan and corresponding geochemical anomaly is 30 to 110 meters wide by 800 meters long. Surface gossan samples contain values up to 4.52 percent lead, 0.84 percent zinc, 211 grams per tonne (g/t) silver, 1700 parts per million (ppm) tin, 415 parts per billion (ppb) gold, 1255 ppm copper, and more than 1000 ppm arsenic (Flanigan, 1998; Western Alaska Copper and Gold, 2015). Anaconda drilled 7 shallow holes at Tim's Greisen in 1982 that totaled 400 meters. Four of the shallow drill holes explored the surface anomaly and intercepted gossan zones of 5.9 meters, 7.8 meters and 3.75 meters in width (Western Alaska Copper and Gold, 2015).

In 2012 Western Alaska Copper and Gold completed a soil geochemistry program collecting samples on a 500 by 100 meter grid covering Tim's Gossan, Round Top (NL011), and TG North (NL027) in order to determine the extent of the Round Top geochemical signature. They collected over 1,050 soil samples. Silver and lead were the most anomalous metals in soil samples over Tim's Gossan. Western Alaska Copper and Gold also completed an airborne magnetic and radiometric survey in 2012 over Tim's Gossan (Ellis and Roberts, 2014).

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

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Gemuts, I., Puchner, C.C., and Steefel, C.I., 1983, Regional geology and tectonic history of western Alaska, western Alaska geology and potential: Alaska Geological Society Symposium, Anchorage, Alaska, Feb. 16-18, 1982, p. 57-85.

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Western Alaska Copper and Gold, 2015, Round Top Project Geology: http://www.westernalaskacopperandgold.com/round-top-geology.html (as of July 29, 2015).

Primary Reference: Ellis and Roberts, 2014

Reporter(s): N.V. King (Alaska Earth Sciences)

Last report date: 2016-03-15

Site name(s): Divide

Site type: Prospect

ARDF no.: NM058

Latitude: 64.8451 **Quadrangle:** N D-1

Longitude: 165.2954

Location description and accuracy:

The Divide prospect is northwest of the junction of the Nome River and Divide Creek (NM049). It is bounded on the west by Quartz Creek (NM111) and Boer Creek; on the south by Divide Creek (NM057), and on the west by the Campion Ditch. The prospect area extends north for nearly 1 mile and is more than one-half mile wide. The coordinates are approximately at the center of this large mineralized area that extends north across a low hill (locally called Boer Mountain). The prospect is in the upper part of section 35 and in the center of section 26, T. 7 S., R. 33 W. The location is accurate. Stevens (2010) provides numerous detailed maps of the prospect.

Commodities:

Main: Au

Other: As, Fe, Pb, Sb, Zn

Ore minerals: Arsenopyrite, galena, gold, jamesonite, pyrite, pyrrhotite, sphalerite, stibnite

Gangue minerals: Albite, ankerite, quartz

Geologic description:

Work on the Divide prospect began in the 1990s (Chris Gierymski, Cominco American, written communication, December 1995; Stevens, 2010). In 1994, David and Daniel Lajack sampled the southeast flank of Boer Mountain (the hill between Boer Creek and the Nome River) on a 2,000- by 2,500 foot grid Seventeen of 57 soil samples contained 100 parts per billion (ppb) or more of gold; the highest was 370 ppb gold. In 1995, Cominco expanded the grid to a 1 mile by 1.5 mile area elongated to the north; they collected almost 700 soil samples, and ran VLF and ground magnetics. A series of 21 trenches with a total length of 5,822 feet. was also dug at that time. About 1,000 samples were collected from the trenches.

At least two major northeast-trending vein zones were found as a result of Cominco's exploration. Trench 1 trends east; it starts about 1,300 feet east of Quartz Creek approximately on the section line between sections 26 and 35 on the southeast flank of Boer Mountain. Several 1- to 3-foot-wide gold-bearing quartz veins that strike northeast and dip nearly vertically were mapped and sampled near trench 1. The channel samples along a 50-foot interval in trench 1 assayed 0.663 ounce of gold per ton. The trench was partly frozen; strong 'muck' anomalies were found along the trench in three sections that aggregated 250 feet in length. Trench D-12 cut approximately the same zone as trench 1, and it was also well mineralized. Trenches D-10 and D-11 were cut nearly on the divide between Quartz Creek and Boer Creek; these trenches also exposed quartz veins that strike northeast and dip steeply to gently. Trench 10 exposed a section 8-feet long that contained 0.047 ounce of gold per ton; trench D-11 exposed 55 feet with 0.437 ounce of gold per ton; 40 feet contained 0.044 ounce of gold per ton; it included an interval of 20 feet long hat contained 0.080 ounce of gold per ton. Trench D-9, north of trenches 10 and 11 and on trend with upper Boer Creek, had a 70-foot interval with 0.024 ounce of gold per ton; it included a section 20 feet long with 0.067 ounce of gold per ton.

The prospect was drilled by Cominco American in 1996 (written communication, August 22, 1996; Stevens, 2010). In general, the drill results were not as good as the trench results. Five holes were drilled at the head of the divide between Quartz Creek and Boer Creek. The best drill hole, D-6, intersected 28 feet

with 0.011 ounce of gold per ton. Three holes were drilled southeast of Boer Mountain; hole Div-9 intersected 10 feet with 0.235 ounce of gold per ton. About 2,000 feet east of Boer Mountain, hole Div-3 had 37 feet with 0.055 ounce of gold per ton,; it included 24.7 feet with 0.091 ounce of gold per ton.

In 2002, Rio Fortuna Exploration Corp. drilled 18 holes that totaled 1,357 meters (Stevens, 2010). Lajack Minerals explored the property from 2003 to 2006 and drilled 9 holes that totaled 273 meters.

In 2007, Millrock Resources Inc. and their partner Alix Resources Corp. (2008) drilled 5 holes and cut intervals with significant gold values in each (Stevens,2010). The intervals vary from 0.30 to 8.99 meters thick and contain 1.0 to 10.0 grams of gold per ton.

In 2008, Millrock drilled 22 holes that totaled 2,656 meters and dug 1244 meters of trenches (Stevens, 2010). Some notable intercepts in the drilling were 15.24 meters with 0.09 ounce of gold per ton, 1.52 meters with 0.29 ounces of gold per ton, 10.67 meters with 0.035 ounce of gold per ton, and 6.10 meters with 0.04 ounce of gold per ton. On Dec. 2, 2009, Millrock terminated their agreement with Alix.

In summary, a total of 68 holes totaling 5,848 meters have been drilled on the Divide prospect to 2010 and 45 trenches have been dug that total 3,018 meters (Stevens, 2010).

The gold-bearing quartz veins occur along joints and fractures (Stevens, 2010). The veins have albite and local silicified selvages; larger veins have several feet of selvage with iron-bearing carbonate (ankerite). In general, pyritization appears to be a favorable indication of nearby gold mineralization. In decreasing order of abundance, the ore minerals in the veins are pyrite, arsenopyrite, pyrrhotite, galena, stibnite, sphalerite, and jamesonite.

The host rocks at the Divide prospect are metasedimentary rocks of retrograde greenschist or lower amphibolite facies; these include graphitic and calcareous schist; blue-gray, gray, and black marble; and black quartz schist and quartzite (Hummel, 1962). Strata west and northwest of Quartz Gulch, including most of the canyon of Boer Creek, are less graphitic. Projection of bedrock geology from the west suggests that some of these metamorphic rocks could be biotite-bearing (Sainsbury, Hummel, and Hudson, 1972; Bundzten and others, 1994). The schistose rocks are mostly phyllonite with slip schistosity approximately parallel to lithologic contacts and original bedding. The schistosity strikes northeast to east-northeast and dips about 30 degrees southeast.

The metamorphic rocks are probably part of the Nome Group, derived from Proterozoic to early Paleozoic protoliths (Till and Dumoulin, 1994). The Nome Group underwent regional blueschist facies metamorphism in the Late Jurassic or Early Cretaceous (Sainsbury, Coleman and Kachadoorian, 1970; Forbes and others, 1984; Thurston, 1985; Armstrong and others, 1986; Hannula and McWilliams, 1995). The blueschist facies rocks were recrystallized to greenschist facies or higher metamorphic grades in conjunction with regional extension, crustal melting, and magmatism in the mid-Cretaceous (Hudson and Arth, 1983; Miller and Hudson, 1991; Miller and others, 1992; Dumitru and others, 1995; Hannula and others, 1995; Hudson, 1994; Amato and others, 1994; Amato and Wright, 1997, 1998). Lode gold mineralization on Seward Peninsula is mostly related to the higher temperature metamorphism in the mid-Cretaceous (Apodoca, 1994; Ford, 1993, Ford and Snee, 1996; Goldfarb and others, 1997).

Alteration:

Local silicification and pervasive introduction of pyrite and ankerite near vein systems.

Age of mineralization:

Mid-Cretaceous; the veins postdate regional metamorphism and are probably similar in age to other lode gold deposits of Seward Peninsula.

Generic deposit model:

Deposit model:

Low sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

Work on the Divide prospect began in the 1990s after its discovery by David and Daniel Lajack (Stevens, 2010). Cominco American dug 21 trenches that totaled 1,775 meters and drilled 14 holes that totaled 1,000 meters in 1996. In 2002, Rio Fortuna Exploration Corp. drilled 18 holes that totaled 1,357 meters (Stevens, 2010). Lajack Minerals explored the property from 2003 to 2006 and drilled 9 holes that totaled 273 meters. In 2007, Millrock Resources Inc. and their partner Alix Resources Corp. (2008) drilled 5 holes. In 2008, Millrock drilled 22 holes that totaled 2,656 meters and dug 1,744 meters of trenches (Stevens, 2010). On Dec. 2, 2009, Millrock terminated their agreement with Alix. In summary, a total of 68 holes totaling 5,848 meters have been drilled on the Divide prospect to 2010 and 45 trenches have been dug that total 3,018 meters (Stevens, 2010).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Primary Reference: Millrock, 2008

Reporter(s): C.C. Hawley and Travis L. Hudson (Hawley Resources Group); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Bulk Gold

Site type: Prospect

ARDF no.: NM071

Latitude: 64.7912 **Quadrangle:** N D-1

Longitude: 165.2874

Location description and accuracy:

The Bulk Gold prospect of Altar Resources consists of a large block of State claims in the upper valley of Dorothy Creek. The coordinates are near the center of the block of claims; the widespread mineralization include much of sections 13 and 14, parts of section 15, and much of sections 23 and 24, T. 8 S., R. 33 W., Kateel River Meridian. The claims include the old Hed and Strand mine (NM070). The location is accurate.

Commodities:

Main: Au, Sb

Other: As, Bi

Ore minerals: Arsenopyrite, gold, stibnite

Gangue minerals: Calcite, quartz

Geologic description:

The Bulk Gold prospect was first identified in 1992 by Altar Resources by following up stream sediment samples anomalous in gold, arsenic, and antimony (Andover Ventures, 2006, Nome Drill Program; 2007, Gold Results; 2008, Bulk Gold). Between 1993 and 2003, Altar, variously with Teck Exploration and Consolidated Aston collected over 400 soil samples over the deposit and about 50 rock-chip samples. They drilled 8 shallow holes in the deposit. The most encouraging intercepts were 0.78 gram of gold per ton over 45 feet and 25 feet that averaged 0.9 gram of gold per ton. A sample in the saddle at the head of Dahl Creek contained 1.65 grams of gold per tonne, and 9,510 parts per million (ppm) arsenic. This saddle area was trenched and drilled in 1998. Four pits were dug at 300-foot intervals across the saddle. Bedrock samples from these pits contained 575 to 1,210 parts per billion (ppb) gold and 3,960 to 10,000 ppm arsenic. Andover Ventures is now (2008) the 100% owner.

In late 2006, Andover (2006, Nome Drill Program; 2007, Gold Results; 2008, Bulk Gold) drilled 8 shallow holes that totaled 285.7 meters. The most significant intercepts were 6.2 meters that that averaged 0.20 gram of gold per ton, 5.7 meters that averages 1.20 gram of gold per ton, and 6.7 meters that averaged 0.51 gram of gold per ton.

The property now being explored by Andover Resources (2008) has 4 types of mineralization on the property: 1) discordant, high-angle, high-grade stibnite-arsenopyrite-gold quartz veins (such as at the Hed and Strand mine (NM070)); 2) stratiform, possibly strata-bound disseminated gold mineralization at marble-schist contacts, 3) disseminated gold and arsenopyrite in metamorphosed felsic intrusive rocks, and 4) low-angle, high-grade gold-quartz veins. In 2001, Altar identified a 1400-foot-long geochemical anomaly, the 'Dripping Gold Zone', associated with marble and mineralized schist; soil samples contained as high as 5.1 grams of gold per ton and more than 10,000 ppm arsenic. One float sample of altered arsenopyrite-bearing intrusive rock contained 4.5 grams of gold per ton; another contained 1.5 gram of gold per ton, more than 200 ppm silver, and 338 ppm bismuth. There are also several other notable geochemical anomalies; the Dorothy Creek gold-arsenic anomaly which is about 3,000 feet long and the Discovery Hole gold-arsenic-antimony anomaly which is 1,600 feet long and 200 to 400 feet wide.

The Bulk Gold prospect is underlain mainly by massive marble and feldspathic epidote-bearing schist.

The epidote-bearing schist may be part of a regional mafic metavolcanic assemblage that has an Ordovician protolith (Till and Dumoulin, 1994). Hummel (1962 [MF 248]) mapped an approximately east-west, high-angle fault in Dahl Creek; the fault is upthrown on the south side. Earlier authors, including Mertie (1918 [B 662-I, p. 425-449]) and Cathcart (1922) noted a nearby metamorphosed granite body as possibly related to the mineralization at the Hed & [and] Strand mine, and Hummel (1962 [MF 248]) and Bundtzen and others (1994) mapped granitic orthogneisses in the area.

The metamorphic rocks in this area are part of the Nome Group derived from Proterozoic to early Paleozoic protoliths (Till and Dumoulin, 1994). The Nome Group rocks underwent regional blueschist facies metamorphism in the Late Jurassic or Early Cretaceous (Sainsbury, Coleman, and Kachadoorian, 1970; Forbes and others, 1984; Thurston, 1985; Armstrong and others, 1986; Hannula and McWilliams, 1995). The blueschist facies rocks were recrystallized to greenschist facies or higher metamorphic grades in conjunction with regional extension, crustal melting, and magmatism in the mid-Cretaceous (Hudson and Arth, 1983; Miller and Hudson, 1991; Miller and others, 1992; Dumitru and others, 1995; Hannula and others, 1995; Hudson, 1994; Amato and others, 1994; Amato and Wright, 1997, 1998). Lode gold mineralization on Seward Peninsula is mostly related to the higher temperature metamorphism in the mid-Cretaceous (Apodoca, 1994; Ford, 1993 [thesis]; Ford and Snee, 1996; Goldfarb and others, 1997).

Alteration:

Quartz veining and apparently some disseminated pyrite and arsenopyrite in nearby schist.

Age of mineralization:

Lode gold mineralization on Seward Peninsula is mostly related to higher temperature metamorphism in the mid-Cretaceous.

Generic deposit model:

Deposit model:

Disseminated gold and stratabound gold in metamorphic rocks, and in gold-arsenopyrite-stibnite quartz veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The Bulk Gold prospect was first identified in 1992 by Altar Resources by following up stream-sediment anomalies in gold, arsenic, and antimony (Andover Ventures, 2006, Nome Drill Program; 2007, Gold Results; 2008, Bulk Gold) . Between 1993 and 2003, Altar variously with Teck Exploration and Consolidated Aston collected over 400 soil samples over the deposit and about 50 rock-chip samples. They drilled 8 shallow holes and dug 4 pits across a prominent area of mineralization. In late 2006, Andover Ventures (2006, Nome Drill Program; 2007, Gold Results) drilled 8 shallow holes that totaled 285.7 meters. In 2001, Altar identified a 1400-foot geochemical anomaly, the 'Dripping Gold Zone'. There are several other strong geochemically anomalous zones the Dorothy Creek gold-arsenic anomaly which is about 3,000 feet long, and the Discovery Hole gold-arsenic-antimony anomaly, which is 1,600 feet long and 200 to 400 feet wide.

Production notes:

None.

Reserves:

None.

Additional comments:

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Primary Reference: This report

Reporter(s): C.C. Hawley and Travis L. Hudson (Hawley Resource Group); D.J. Grybeck (Port Ludlow, WA); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Bulk Gold (East)

Site type:

ARDF no.: NM072

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

As originally described in ARDF, the Bulk Gold deposit was artificially separated into east and west portions with separate ARDF records. As drilling and exploration continued, it became apparent that there is single Bulk Gold deposit that is now in ARDF as Site NM071 The information that was originally in this record has been integrated into NM071. The number for this record is preserved only for accounting purposes.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-03-05

Site name(s): Nelson

Site type: Prospect

ARDF no.: NM090

Latitude: 64.7622 **Quadrangle:** N D-1

Longitude: 165.3888

Location description and accuracy:

The Nelson prospect is in Steep Creek, a tributary of Gold Bottom Creek, at an elevation of about 800 feet. It is about 0.5 mile southeast of the center of section 29, T. 8 S., R. 33 W. The location is accurate.

Commodities:

Main: Pb, Zn

Other:

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals: Calcite

Geologic description:

The Nelson prospect contains sphalerite, galena, and pyrite in veinlets subparallel to layering in marble and in stockwork-like fracture zones; it includes a galena vein 2 inches thick (Mertie, 1918; Cathcart, 1922). When the prospect was visited by Cathcart in 1920, mineralization was exposed along 6 feet of an open cut near a contact of marble and mica schist; the schist had a strike of N15W and a dip of 18 degrees west. The marble was bleached in the mineralized zone. An adit, reportedly 55-feet long (Mertie, 1918), was caved and inaccessible to Cathcart (1922). The prospect was visited in 1995 by C.C. Hawley (personal communication) but the exposures were badly sloughed and the nature of the mineralization could not be observed. The Nelson prospect is in the main marble mass of Mount Distin and includes thin, mica schist layers (Hummel, 1962 [MF 248]; Bundtzen and others, 1994). Layering in the marble and the schist generally dips north and the prospect is about one-half mile south of the east-trending axis of the Mount Distin syncline of Hummel (1962).

Till and others (2011) map the host rocks as part of the Devonian-Ordovician Nome Group that consists of mixed marble, graphitic metasiliceous rock, and schist. The rocks were subject to blueschist facies metamorphism, then retrograded to greenschist-facies in the Jurassic and early Cretaceous.

Although earlier workers have classified this deposit as a lead-zinc replacement in marble, Slack and others (2011) classify this and several other prospect in the Nome Group (Aurora, NM140; Wheeler North, SO142, and Christophosen, NM141) as a sedimentary exhalative (Sedex) deposit. Whole-rock analyses of the schist interbedded with the marble indicates that they were originally clastic sedimentary rocks and they see no sign of volcanic protolithic rocks. Sulfur-isotope analysis of the sulfides also indicate a marine origin for the sulfur, as does isotopic analysis of barite in certain of these deposits.

Alteration:

Marble is bleached at the prospect.

Age of mineralization:

Deposited syngenetically in a marine environment during the Devonian; metamorphosed in the Jurassic or early Cretaceous.

Generic deposit model:

Deposit model:

Sedimentary exhalative (SEDEX) lead-zinc-silver-fluorite deposit (Cox and Singer, 1986, model 31a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

31a

Production Status: Undetermined

Site Status: Undetermined

Workings/exploration:

Developments included a 55-foot adit, an open cut, and several pits; all are badly sloughed. There apparently has been little work on the prospect since before 1920. Covered by at least one geochemical survey by the USGS and examined by several companies over the years.

Production notes:

None.

Reserves:

None.

Additional comments:

The Nelson prospect is on Bering Straits Native Corporation selected lands.

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Primary Reference: Slack and others, 2011

Reporter(s): C.C. Hawley and Travis L. Hudson; D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Aurora

Site type: Prospect

ARDF no.: NM140

Latitude: 64.7158 **Quadrangle:** N C-2

Longitude: 165.5909

Location description and accuracy:

The Aurora prospect is at the head of Aurora Creek, an eastern tributary to the Cripple River, at an elevation of about 1,060 feet. The mineralization trends south-southeast in a zone that extends for about a mile to a similar prospect, the Christophosen (NM141). The Aurora prospect is about 0.6 mile north-northwest of the center of section 13, T. 9 S., R. 34 W. The location is accurate.

Commodities:

Main: Au, Ba, F, Zn

Other: Ag, Cu, Pb, Sb

Ore minerals: Arsenopyrite, barite, chalcopyrite, fluorite, galena, gold?, pyrite, sphalerite, stibnite?, tennantite?

Gangue minerals: Ankerite, dolomite, quartz

Geologic description:

The Aurora zinc-lead prospect was discovered in 1966 by a geochemical survey (Herreid, 1968). Resource Associates of Alaska then found a train of boulders trending north-northwest of disseminated to semi-massive sulfides, mainly sphalerite. Herreid (1970) defined a soil anomaly at least 7,000 feet long that extends to a similar prospect, the Christophosen (NM141). In 1976 and 1977, Cominco explored the deposit and drilled 22 holes. The drilling cut an interval more than 100 feet thick that contained 5 percent zinc but they considered the mineralization to be too thin and low grade to be of further interest. From 1990 to 1993, Kennecott Exploration Company explored the deposit with new soil surveys; they also dug a series of trenches and did some drilling. They proposed that the early mineralization was syngenetic and related to rhyolitic volcanism; the deposit was then remobilized during Cretaceous regional metamorphism when gold was introduced along northeast-striking faults.

The massive sulfides are mainly light orange to brown sphalerite; local barite zones contain disseminated pyrite. There is some arsenopyrite and chalcopyrite. Antimony and arsenic are persistent trace elements in drill samples and the higher-grade samples contain about 0.1 ounce of gold per ton.

Bundtzen and others (1984) identified three rock units that host the mineralization: 1) white, zircon-rich muscovite-quartz schist, 2) feldspar-rich porphyroblastic schist, and 3) tourmaline-bearing muscovite-quartz-feldspar schist. Ankerite and dolomite are common and locally abundant; purple fluorite occurs in knots in the schist. Locally barite is prominent in layers and lenses. Based on whole-rock analyses, they proposed that the white muscovite-quartz schist is a metarhyolite and that the deposit is a volcanogenic massive-sulfide deposit.

Slack and others (2011) reject a volcanogenic massive sulfide origin for the deposit and Till and others (2011) map the host rocks as part of the Devonian Nome Complex that consists of pelitic, calcareous, and graphitic schist. Their work suggests that the protolith of the metamorphic rocks are sedimentary and they see no evidence of volcanic rocks in the area. They base their conclusion on: 1) sulfur isotope analyses of the sulfides that indicate a marine origin for the sulfur, 2) isotopic analysis of the barite that indicate that the probable source of the sulfur is Devonian and Mississippi sea water, and 3) their whole-rock analyses of the host rocks of the mineralization that they interpret as originally being clastic sedimentary rocks. They propose a sedimentary-exhalative (SEDEX) origin for the deposit during rifting of the continental margin in

Devonian-Missisippian(?) time. The rocks subsequently were subject to blueschist-grade metamorphism, then retrograded to greenschist-grade metamorphic rocks in the Jurassic and early Cretaceous.

Alteration:

Remobilization of metallic minerals and carbonates during Cretaceous metamorphism.

Age of mineralization:

Massive sulfides were syngenetic in early Paleozoic (Devonian?) sedimentary and/or marine volcanic rocks with remobilization during mid-Cretaceous deformation and metamorphism. Mineralization along crosscutting structures is probably mid-Cretaceous or younger.

Generic deposit model:

Deposit model:

Metamorphosed Kuroko-type volcanogenic massive sulfide (Cox and Singer, 1986; model 28a) or sedimentary exhalative (SEDEX) deposit (Cox and Singer, 1986, model 31a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 31a

Production Status: None

Site Status: Undetermined

Workings/exploration:

Soil surveys were done by the Alaska Division of Geological and Geophysical Surveys in the late 1960s. Some work by Resource Associates of Alaska in the early 1970s. Cominco explored the deposit in 1976 and 1977 and drilled 22 holes. Kennecott Exploration explored the deposit with soil surveys and trenching from 1990 to 1993 and drilled some holes.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bundtzen, T.K., Reger, R.D., Laird, G.M., Pinney, D.S., Clautice, K.H., Liss, S.A., and Cruse, G.R., 1994, Progress report on the geology and mineral resources of the Nome mining district: Alaska Division of Geological and Geophysical Surveys, Public Data-File 94-39, 21 p., 2 sheets, scale 1:63,360.

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Till, A.B., Dumoulin, J.A.,, Werdon, M.B., and Bleick, H.A., 2011, Bedrock geologic map of the Seward Peninsula, Alaska, and accompanying conodont data: U.S. Geological Scientific Investigations Map 3131, 31 p. pamphlet, 2 sheets, scale 1:500,000.

Primary Reference: Bundtzen and others, 1994; Slack and others, 2011

Reporter(s): C.C. Hawley and Travis L. Hudson; D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Christophosen

Site type: Prospect

ARDF no.: NM141

Latitude: 64.6988 **Quadrangle:** N C-2

Longitude: 165.5815

Location description and accuracy:
The Christophosen prospect is on the ridge between the headwaters of Oregon Creek and Penny River, just downslope and east of elevation 1620. It is about 0.4 mile north of the center of section 24, T. 9 S., R. 34 W. The location is accurate.

Commodities:

Main: Zn

Other: Ag, Au, Pb, Sb

Ore minerals: Chalcopyrite, galena, pyrite, sphalerite, stibnite

Gangue minerals: Ankerite, dolomite, quartz

Geologic description:
The Christophosen prospect was discovered before 1916. When Mertie (1918) visited the prospect in 1916, he found one caved shaft and reported sphalerite and pyrite with quartz. The locality was visited by Herreid (1968), who reported dolomite with sparsely disseminated galena, chalcopyrite, and sphalerite in an old prospect area. Approximately 500 feet south-southeast of the Christophosen pits, a rubble crop of sphalerite-bearing schist is present that is similar to mineralization found about a mile to the north at the Aurora Creek prospect (NM140). The Christophosen prospect apparently lies stratigraphically above a graphitic quartz schist, as does the Aurora deposit. The zinc content of soils near the rubble crop exceeds 2,000 ppm; the soil also is strongly anomalous in lead and silver. The rubble crop is contained within a broader, north-northwest trending soil anomaly about 1,200 feet long and 400 feet wide notable for samples samples that contain 1,000 ppm or more zinc. A lens of fine-grained cherty rock, possibly an exhalite layer, with disseminated galena, sphalerite, and stibnite appears to be stratigraphically above the sphalerite-bearing schist (Cindy Buxton and C.C. Hawley, written communication 1992). Bundtzen and others (1994) interpret the rocks in the area as a tightly folded complex of felsic metavolcanic schist and mixed chloritic, calcareous, and felsic schist . Till and others (2011) map the host rocks as part of the Devonian Nome Complex that consists of pelitic, calcareous, and graphitic schist and see no evidence of volcanic rocks in the area (Slack and others, 2011).
More detailed work at the Aurora prospect (NM140) about 1.2 miles to the north-northwest indicates that this prospect is part of a north-northwest trending belt of zinc-barite mineralization that has been variously interpreted as a metamorphosed, volcanogenic massive sulfide deposit (Bundtzen and others, 1994) or a Devonian sedimentary exhalative (SEDEX) deposit, metamorphosed in the Cretaceous (Slack and others, 2011). Subsequently, the rocks in the area were subject to blueschist facies metamorphism, then retrograded to greenschist-facies metamorphic rocks in the Jurassic and early Cretaceous.

Alteration:
Not noted.

Age of mineralization:
Either a syngenetic deposit or a volcanogenic massive-sulfide deposit in early Paleozoic (Devonian?)

sedimentary and marine volcanic rocks.

Generic deposit model:

Deposit model:

Metamorphosed Kuroko-type volcanogenic massive sulfide (Cox and Singer, 1986; model 28a) or sedimentary exhalative (SEDEX) deposit. (Cox and Singer, 1986, model 31a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 31a

Production Status: None

Site Status: Undetermined

Workings/exploration:

Several prospect pits are present; a shallow shaft was caved by 1916. Surface examination and sampling by Kennecott Exploration Company in 1991 and 1992.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bundtzen, T.K., Reger, R.D., Laird, G.M., Pinney, D.S., Clautice, K.H., Liss, S.A., and Cruse, G.R., 1994, Progress report on the geology and mineral resources of the Nome mining district: Alaska Division of Geological and Geophysical Surveys, Public Data-File 94-39, 21 p., 2 sheets, scale 1:63,360.

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Primary Reference: Bundtzen and others, 1994; Slack and others, 2011

Reporter(s): C.C. Hawley and Travis L. Hudson; D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Arctic Creek (lower)

Site type: Mine

ARDF no.: NM155

Latitude: 64.6095 **Quadrangle:** N C-2

Longitude: 165.7957

Location description and accuracy:

Arctic Creek is an east tributary of lower Cripple River. The mouth of Arctic Creek is about 5 miles upstream from the mouth of Cripple River on Norton Sound. Two segments of the creek have been mined, probably producing gold derived in part from two different sources. Lower Arctic Creek is defined as the part of Arctic Creek below the mouth of Bluff Creek (NM154), an east tributary. This lower part of Arctic Creek was mined by a floating bucket line dredge. The location is the approximate midpoint of the dredge tailings. Information for this mine was summarized by Cobb (1978) but his map location (Cobb, 1972) is on upper Arctic Creek (NM153).

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

From 1914 to at least 1922, an alluvial placer gold deposit was mined for at least a half mile along lower Arctic Creek by a floating bucket line dredge, starting about a mile above its mouth. The placer in lower Arctic Creek appears to have gold sources other than those that supplied gold to the upper part of Arctic Creek (NM153). These sources include Bluff Creek (NM154) and the wall rocks of a discordant quartz-ankerite vein exposed in the bluffs opposite the mouth of Bluff Creek (NM157). The lower part of a south-flowing tributary to Arctic Creek about a half mile below Bluff Creek has also been placer mined and is included here.

Arctic Creek is subparallel to the projection of a strong north-northeast fault mapped by Bundtzen and others (1994) as the Aurora fault. This fault is the control of the nearby vein mineralization (NM157). The rocks along Arctic Creek near Bluff Creek are in part pyritic, graphitic, quartz schist, but most of the country rock is calcareous mica schist.

Also see the record for 'Second Beach' near the mouth of the Cripple River (NM178) for recent prospecting and mining activities in the area that is based from a camp maintained by the Gold Prospectors of America (Gold Prospectors Association of America, 2010). At least some of their activities was on Arctic Creek.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Alluvial placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

A bucket line dredge operated on the lower part of Arctic Creek from 1914 until at least 1922 (Eakin, 1915; Harrington, 1921; Brooks, 1922; Brooks and Capps, 1924) There was probably some hand and small-scale mining along the creek during this period or later. Also see the record for 'Second Beach' (NM178) for recent prospecting and mining activities in the area that is based on a camp maintained by the Gold Prospectors of America (Gold Prospectors Association of America, 2010). At least some of their activities was on Arctic Creek.

Production notes:

There are no systematic records of early mining on Arctic Creek. However, since 1986, The Gold Prospectors Association of America has run a camp each summer near the mouth of the Cripple River; some of their prospecting and mining activity has been on Arctic Creek and at least some gold has been produced each year.

Reserves:

None.

Additional comments:

References:

Brooks, A.H., 1922, The Alaska mining industry in 1920: U.S. Geological Survey Bulletin 722-A, p. 1-74.

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Primary Reference: Cobb, 1978; Gold Prospectors Association of America, 2010

Reporter(s): C.C. Hawley and Travis L. Hudson (Hawley Resource Group, Inc.); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Cripple River

Site type: Mine

ARDF no.: NM156

Latitude: 64.6136 **Quadrangle:** N C-2

Longitude: 165.8536

Location description and accuracy:

Cripple River was reported to be auriferous from its headwaters to its mouth on Norton Sound by Collier and others (1908, plate X). The location given is the approximate midpoint of patented claims along a section of the river that extends from above Stella Creek (NM151) to its mouth on Norton Sound.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Collier and others (1908) reported that Cripple River was auriferous from its head to its mouth on Norton Sound. This was partly confirmed in the upper part of Cripple River during 1989-1990 reconnaissance exploration by Kennecott Exploration Company (written communication, 1992). Panned concentrates containing greater than 10,000 parts per billion (ppb) gold were found in gravels of Cripple River above Aurora Creek. Gold was also panned both above and below Gold Run, a north headwater tributary. A panned concentrate at the mouth of Oregon Creek contained greater than 10,000 ppb gold. Both Cleveland Creek (NM150) and Stella Creek (NM151) were mined just above their confluence with Cripple River. A large right-limit (north side) bench of Cripple River was reported to be rich enough to hydraulic mine (NM152), but water losses in two ditches apparently precluded the mining of the bench deposit. Cripple River is almost continuously covered by patented mining claims from a point about 1 mile above Stella Creek (NM151) downstream to its mouth. There is little information on the distribution of gold along Cripple River itself.

Also see the record for 'Second Beach' (NM178) for recent prospecting and mining activities in the area that is based from a camp maintained by the Gold Prospectors of America (Gold Prospectors Association of America, 2010). At least some of their activity was on lower Cripple River.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Gold placer (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

There was some mining on Cripple River and in tributaries before WW I (Brooks, 1904; Brooks, 1905; Collier and others, 1908; Smith, 1912; Chapin, 1914). Also see the record for 'Second Beach' (NM178) for recent prospecting and mining activities in the area run from a camp maintained by the Gold Prospectors of America (Gold Prospectors Association of America, 2010. At least some of their activities was on lower Cripple River.

Production notes:

There are no systematic records of early mining on the Cripple River. However, since 1986, The Gold Prospectors Association of America (2010) has run a camp each summer near the mouth of the Cripple River; some of their prospecting and mining activity has been on the Cripple River and at least some gold has been produced each year since then.

Reserves:

None.

Additional comments:

References:

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Chapin, Theodore, 1914, Placer mining on Seward Peninsula: U.S. Geological Survey Bulletin 592-L, p. 385-395.

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Alaska, Report on investigations in 1911: U.S. Geological Survey Bulletin 520-M, p. 339-344.

Primary Reference: Collier and others, 1908; Gold Prospectors Association of America, 2010

Reporter(s): C.C. Hawley and Travis L. Hudson (Hawley Resource Group. Inc.); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Second Beach (near the mouth of Cripple River)

Site type: Mine

ARDF no.: NM178

Latitude: 64.5431 **Quadrangle:** N C-2

Longitude: 165.785

Location description and accuracy:

Somewhat arbitrarily, this site is located about 1,500 feet upstream from the mouth of the Cripple River where Sainsbury and others (1972) reported a placer mine on the so-called Second Beach. However, see the Geologic Description below for more recent and widespread placer mining along the lower Cripple River. The Sainsbury location is about 0.5 mile south of the center of section 12, T. 11 S., R. 36 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

A placer mine near the mouth of Cripple River was reported by Sainsbury and others (1972). The location is on the west side of Cripple River, about 1,500 feet upstream from the mouth. It is inferred to be on a westward extension of the so-called Second Beach that was mined at many places on the coastal plain to the east. Second Beach deposits were originally marked by a moss-covered gravel escarpment about 35 feet above modern sea level. The beach contains quartz sand deposits that contain driftwood, fragments of walrus tusks, and marine shells (Collier and others, 1908; Moffitt, 1906, 1907). There was more garnet in Second Beach deposits than in those of Third Beach. Second Beach commonly is buried by a few feet of material that is usually frozen. The raised beach deposit is essentially at the landward limit of the Pelukian marine transgression mapped by Bundtzen and others (1994).

In 1985, Global Outdoors, Inc. purchased 2,300 acres near the mouth of the Cripple River and in 1986 began building a large camp just east of the mouth of the river. Since then, the Gold Prospectors Association of America has brought large parties to the camp each summer to prospect, mine, and fish in the area (Gold Prospectors Association of America, 2009, is the home page for considerably more information on their camp and a chronology of their activities over the years). The activities includes placer mining along the beach at the mouth of the Cripple River and prospecting and mining at several other sites in the area, for instance on lower Arctic Creek (NM155) and probably elsewhere up the Cripple River (NM156). Some uncertain amount of gold has undoubtedly been produced each summer since the mid-1980s. during their activities.

Alteration:

Age of mineralization:

Late Pleistocene.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Beach and stream, gold placers.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Old surface workings and dumps from drift mining prior to 1985 are widespread in the general area. Since 1986, there has been considerable mining and prospecting in the area from a camp run by the Gold Prospectors Association of America at the mouth of the Cripple River.

Production notes:

There was probably some gold production from the lower Cripple River prior to 1986 but the amount and the production history is uncertain. Since 1986, the Gold Prospectors Association of America has brought parties to their camp at the mouth of the Cripple River and some gold has undoubtedly been produced each year from beach and stream placers in the area.

Reserves:

There are probably no defined reserves but at least small amounts of gold can be panned along the beach and in streams in the area.

Additional comments:

References:

Bundtzen, T.K., Reger, R.D., Laird, G.M., Pinney, D.S., Clautice, K.H., Liss, S.A., and Cruse, G.R., 1994, Progress report on the geology and mineral resources of the Nome mining district: Alaska Division of Geological and Geophysical Surveys, Public Data-File 94-39, 21 p., 2 sheets, scale 1:63,360.

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Primary Reference: Sainsbury and others, 1972; Gold Prospectors Association of America, 2010

Reporter(s): C.C. Hawley and Travis L. Hudson (Hawley Resource Group, Inc.); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Rock Creek (lode); Nugent

Site type: Prospect

ARDF no.: NM207

Latitude: 64.6148 **Quadrangle:** N C-1

Longitude: 165.4181

Location description and accuracy:

The Rock Creek lode prospect extends for a strike distance of at least 1,000 feet in the Rock Creek valley above the confluence of Rock Creek and Sophie Gulch (NM208). The coordinates are at about the midpoint of the deposit, about 1.4 miles southwest of Mount Brynetson. The location is just inside the south-central border of section 14, T. 10 S., R. 34 W., of the Kateel River Meridian, and it is accurate to within 500 feet. It is included in locality 43 of Cobb (1972 [MF 463], 1978 [OFR 78-93]).

Commodities:

Main: Au

Other: Ag, Pb, Sb, W, Zn

Ore minerals: Arsenopyrite, boulangerite, galena, gold, hematite, limonite, pyrite, scheelite, stibnite, sphalerite

Gangue minerals: Albite, ankerite, calcite, quartz

Geologic description:

Gold-bearing, northeast-striking quartz veins in schist were known on Rock Creek by 1903 (Collier and others, 1908). Sheeted veins were later described, massive veins were locally worked, and some residual placer gold and scheelite were produced from weathered sheeted vein complexes (Moffit, 1913, p. 75-76; Mertie, 1918 [B 662-I, p. 436]; Cathcart, 1922). Lodes in the Rock Creek area were principal examples of disseminated lode gold deposits identified in a regional mineral assessment during the 1970s (Hudson and others, 1977; Hudson and DeYoung, 1978). This deposit is the most extensively explored gold lode in the Nome mining district. Significant exploration to better define the gold grades, including extensive trenching and drilling, has taken place episodically through from the 1980s to the present (2007) since its relocation by geologist R. V. Bailey of Denver in the early 1980s.

As of early 2006, NovaGold Resources Inc. (2006, Projects) is developing the property and carrying out an aggressive infill drilling program which began in 2003. The 2003 drilling totaled 8,000 m and increased total drilling on the project to 18,960 meters in 217 drill holes. Intensive infill drilling continued in 2004 when 82 core and rotary drill holes totaling 20,000 feet (5,900 meters) were completed. The infill drilling results are incorporated in a feasibility study that was started in late 2003. A positive feasibility study could lead to production from a 500 meter by 1,500 meter by 100 meter open pit by 2007. The proposed mine which would produce 5,000 to 7,000 tons per day is expected to produce about 100,000 ounces of gold per year. NovaGold is also evaluating the feasibility of processing ore from the nearby Saddle deposit (NM223) and the more distant Big Hurrah deposit (SO023) if a mill is built at Rock Creek. As of March 28, 2007, NovaGold Resources Inc. (2007, Reserve) reported the resources at Rock Creek as 9.6 million tonnes of measured and indicated reserves with an average grade of 1.31 grams of gold per ton.

The most typical and highest grade part of the Rock Creek lode consists of a sheeted vein complex. The veins strike northeast and generally dip at a high angle to the northwest. They generally range from 1 inch to 6 inches thick, although some veins are more than 1 foot thick. Vein spacing is locally about one per foot. Cathcart (1922, p. 246) described a sheeted zone near the mouth of Sophie Gulch (NM208), where 23 quartz veins from 1 inch to 8 inches thick are in a zone 28 feet wide. In general, sheeted veins are well exposed in mechanical and hydraulic cuts in a 1,000-foot-long interval north of Sophie Gulch (NM208). Although good

mineralization was found in some drill holes south of the Sophie Gulch fault, such as in Placer Dome RR-8-088, this fault appears to cut off or displace the best mineralization. The quartz and quartz-calcite veins of the sheeted set are composed mainly of white quartz with some internal crustification, but they are not banded. Albite tends to occur on the selvages and in adjacent wall rocks. Cathcart (1922) and others have reported muscovite in the veins. Sulfides tend to be relatively abundant close to the selvage, but are disseminated throughout the quartz. They consist mainly of pyrite, galena, stibnite, and sphalerite. Arsenopyrite is present but is more abundant in schist than in the veins. Lead sulfosalts such as boulangerite occur locally. Limonite tends to form on weathered veins, hematite on weathered arsenopyrite zones. The deposit is relatively long compared to its apparent thickness. Sheeted veins and most of the gold appear to lie above a marble-rich stratum which is at a depth of about 250 to 300 feet. Individual quartz stringers pinch and swell and may end abruptly at a slip plane parallel to schistosity.

The main Rock Creek deposit grades into several other deposits. Opposite the mouth of Sophie Gulch, sheeted veins 2 to 3 feet apart are in quartz-mica schist, but there are extensive arsenic- and albite-rich zones in the schist. Well-developed, fold-controlled quartz-albite zones were exposed in Kennecott trench RCT-94-8. The trench and adjacent hill slopes display arsenic-rich lodes of northwest strike. This area has locally been called Arsenic Hill. The Reinisch hydraulic pit (NM213) is in this area. A distinct vein called the Albion (NM211) was exposed by mine workings in upper Rock Creek; it probably is partly coincident with sheeted veins typical of the main Rock Creek deposit. The deposit at the Walsh Cut (NM214) resembles that at the Reinisch.

Most of the country rocks exposed at the prospect belong to the chlorite-rich metaturbidite schist and marble unit of Bundtzen and others (1994) or to the lower part of the 'mixed unit' of Till and others (1986). Graphitic mica schist and graphitic quartz schist are common; the graphitic quartz schist is locally a good marker unit. Schistosity generally strikes northeast and dips are low to moderate southeast. Quartz veins of the sheeted set are close to orthogonal to the schistosity. The schist appears to be a phyllonite. Although schistosity appears to be close to concordant with lithology, it is penetrative. Some coarse-grained units have incipient augen structure and are believed to have been sheared during a period of metamorphism that could be contemporaneous with early mineralization. Locally, schist is strongly mineralized with arsenopyrite and albite concordant to schistosity. Bedrock in the area probably is of early Paleozoic protolith age (Hummel, 1962 [MF 247]; Sainsbury, Hummel, and Hudson, 1972 [OFR 72-326]; Till and Dumoulin, 1994; Bundtzen and others, 1994).

Detailed mapping for Kennecott Exploration Company identified a strong northeast-striking fault that appears to cut off the Sophie Gulch fault. The fault, called the Arsenic Hill fault, is exposed in Placer Dome trench RRT-87-1 and in Kennecott Exploration Company trench RCT-94-8. The fault appears to localize complexly sheared graphitic quartz veins and may have both pre- and post-mineral history. It is subparallel and en echelon to the Albion (NM211) and proposed Calle (NM212) vein-fault structures.

Apodaca (1994) studied fluid inclusions and other detailed aspects of the vein geology at Rock Creek. Her work indicates that Rock Creek formed from low-salinity fluids relatively rich in carbon dioxide, methane, and nitrogen, with some hydrogen sulfide. Fluid inclusions indicate an estimated temperature of formation in the range of 225 to 275 degrees Centigrade. The Rock Creek deposit is probably similar in age (109 Ma) to the gold-quartz deposits at Bluff (Ford and Snee, 1996).

Alteration:

Early alteration consists of locally extensive albitization and sulfidization (introduction of arsenopyrite; late alteration consists of minor sericitization and albitization along with introduction of sheeted veins; and local development of ankerite.

Age of mineralization:

Mid-Cretaceous. The country rocks are part of the Nome Group derived from Proterozoic to lower Paleozoic protoliths (Till and Dumoulin, 1994). The Nome Group underwent regional blueschist facies metamorphism in the Late Jurassic or Early Cretaceous (Sainsbury and others, 1970 [P 750-C]; Forbes and others, 1984; Thurston, 1985; Armstrong and others, 1986; Hannula and McWilliams, 1995). The blueschist facies rocks were recrystallized to greenschist or higher metamorphic grades in conjunction with regional extension, crustal melting, and magmatism in the mid-Cretaceous (Hudson and Arth, 1983; Miller and Hudson, 1991; Miller and others, 1992; Dumitru and others, 1995; Hannula and others, 1995; Hudson, 1994; Amato and others, 1994; Amato and Wright, 1997, 1998). Lode gold mineralization on Seward

Peninsula is mostly related to the higher temperature metamorphism in the mid-Cretaceous (Apodoca, 1994; Ford, 1993 [thesis]; Ford and Snee, 1996; Goldfarb and others, 1997).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Undetermined

Site Status: Active

Workings/exploration:

Gold-bearing, northeast-striking quartz veins in schist were known on Rock Creek by 1903 (Collier and others, 1908). Sheeted veins were later described, massive veins were locally worked, and some residual placer gold and scheelite were produced from weathered sheeted vein complexes (Moffit, 1913, p. 75-76; Mertie, 1918 [B 662-I, p. 436]; Cathcart, 1922). Lode prospects in the Rock Creek area were principal examples of disseminated lode gold deposits identified in a regional mineral assessment during the 1970s (Hudson and others, 1977; Hudson and DeYoung, 1978). This deposit is the most extensively explored gold lode in the Nome mining district. Significant exploration has taken place episodically from the early 1980s to the present (2007) including extensive trenching and drilling has taken place episodically since the 1980s when the property was relocated by R.V. Bailey to the present (2007).

Bailey reopened trenches in the hydraulic cuts north of Sophie Gulch and exposed and sampled the sheeted veins. His work brought Placer Dome into the project in 1987 to 1989. Placer Dome drilled dozens of holes on regular, northwest-aligned fences approximately 200 feet apart for nearly 2,000 feet northeast from the mouth of Sophie Gulch. Both core and RC holes were drilled, and essentially all were steeply inclined to the southwest, perpendicular to the strike of the sheeted veins.

Some of this drilling was difficult. The water table is close to the surface and some holes had artesian flow. The program was sufficient to outline a geologic resource, but it was considered subeconomic by Placer Dome. An extensive soil geochemical survey was completed in the area by BHP in 1989, and the property was optioned by Newmont Mining Company in 1992. Some new drill holes, including holes to confirm Placer Dome tests, were drilled by Newmont. The property was further explored in 1994 and 1995 by Kennecott Exploration Company, who drilled a few holes along the northwest fences. The holes were inclined to the northwest so that they would be nearly at right angles to bedrock schistosity in lower Rock Creek. Both Placer Dome and Newmont carried out preliminary metallurgical work; it appears that about 70 percent of the gold is present as free gold; the balance is in auriferous sulfides, principally pyrite and arsenopyrite. Exploration continued in 2000 by NovaGold Resources. In 1999, they announced that better recovery and analytic techniques suggested higher average grades for the deposit, perhaps about 3 grams of gold per metric tonne.

As of early 2006, NovaGold Resources, Inc. (2006, Projects) is developing the property and is carrying out an aggressive infill drilling program which began in 2003. The 2003 drilling totaled 8,000 m and increased total drilling on the project to 18,960 meters in 217 drill holes. Intensive infill drilling continued in 2004 when 82 core and rotary drill holes totaling 20,000 feet (5,900 meters) were completed. The infill drilling results are incorporated in a feasibility study that was started in late 2003. A positive feasibility study could lead to production from a 500 meter by 1,500 meter by 100 meter open pit by 2007. Processing of 5,000 to 7,000 tons per day is expected to produce about 100,000 ounces of gold per year. NovaGold is also evaluating the feasibility of processing ore from the nearby Saddle deposit (NM223) and the more distant Big Hurrah deposit (SO023) if a mill is built at Rock Creek.

Production notes:

None.

Reserves:

As of March 28, 2007, NovaGold Resources Inc. (2007, Reserve) reported the resources at Rock Creek as 9.6 million tonnes of measured and indicated reserves with an average grade of 1.31 grams of gold per ton.

Additional comments:

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Amato, J.M., and Wright, J.E., 1997, Potassic mafic magmatism in the Kigluaik gneiss dome, northern Alaska--A geochemical study of arc magmatism in an extensional tectonic setting: Journal of Geophysical Research, v. B102, no. 4, p. 8065-8084.

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Primary Reference: This report

Reporter(s): C.C. Hawley (Hawley Resources Group, Inc.) and Travis L. Hudson (Applied Geology, Inc.)

Last report date: 2005-10-10

Site name(s): Saddle; New Era; Big Four

Site type: Prospects

ARDF no.: NM223

Latitude: 64.5905 **Quadrangle:** N C-1

Longitude: 165.3897

Location description and accuracy:

This site represents several closely related lode deposits in the headwaters of Snow Gulch, especially above the split of the gulch into two headward forks. The map location is on the Saddle deposit developed above the north fork of Snow Gulch, at an elevation of 450 feet in the SW1/4 section 25, T. 10 S., R. 10 W., Kateel River Meridian. These deposits are included in locality 46 of Cobb (1972 and 1978), and locality 1 of Hummel (1962).

Commodities:

Main: Au

Other: Ag, Sb, W

Ore minerals: Arsenopyrite, galena, gold, pyrite, scheelite, stibnite

Gangue minerals: Albite, calcite, quartz

Geologic description:

The Saddle deposit is of sheeted vein type; it trends northeasterly from near the west portal of the Miocene Ditch tunnel nearly to the top of hill 691. Other gold-bearing veins were developed in the south fork of upper Snow Gulch. One prospect in this group appears to lie on the Bernice No. 1 lode of John Leedy (U.S. Mineral Survey No. 775); the New Era tunnel is also in this vicinity. Another related vein zone possibly exists on the divide between Snow Gulch and Anvil Creek, nearly in line with the trend of Snow Gulch.

Prospecting dating back to at least 1899 has identified several gold lodes near the head of Snow Gulch. The older prospects, such as New Era and Big Four, are difficult to identify, but they can be approximately located. These vein and stratabound mineral occurrences are abundant in upper Snow Gulch and appear to be the main source of placer gold in Snow Gulch.

A prospector named John Leedy located claims on the east side of Snow Gulch and on Bonanza Hill from July 1899 until 1908; his claims were patented in 1908 (U.S. Mineral Survey No. 775). A stamp mill was moved into this area and various tunnels and workings were driven, including the New Era tunnel, reported to be more than 300 feet long. The tunnel was driven on a lode that strikes northeast and dips 40 northwest (Chapin, 1914, p. 400-401). The gold is in pyrite and arsenopyrite. The sulfides are disseminated in schist that is cut by quartz, minor albite, and locally calcite veinlets.

The New Era tunnel which was caved when visited by Chapin, appears to be near Placer Dome trenches ST-88-06, -08 and -010. These trenches expose zones containing more than 0.1 ounce of gold per ton. Mertie (1918, p. 433-434) examined this area in 1916. He repeated Chapin's description of the New Era tunnel, but was able to examine the Big Four shaft. He reported that this shaft was on the east side of Snow Gulch at an elevation of about 500 feet. Quartz stringers in a 60-foot-wide zone in marble strike about N 65 E and contain crystalline gold in vugs in quartz. This area was also described by Cathcart (1922, p. 243-244).

The Saddle deposit, mainly explored between 1986 and 1995, appears to start west of the portal of the Miocene Ditch tunnel and to continue northeasterly for about 1,300 feet. This deposit has been explored by shallow trenches and drill holes. It is irregular but is as much as 200 feet wide. The Saddle deposit is less consistently mineralized than the Rock Creek sheeted zone (NM207), but a small body of material

averaging about 0.05 ounce of gold per ton has been identified, and probably more could be developed. Other trenching and shallow drilling suggest that gold-bearing veins are also present in a west-southwest-trending zone west of the portal of Miocene tunnel. The apparent strike length of the zone is about 1,200 feet. This zone probably includes the New Era deposit.

An isolated deposit, about 1,200 feet northeast of Saddle, was found by Newmont in 1992, and a deposit at the ridge between Snow Gulch and Anvil Creek was intersected in three Placer Dome trenches (ST-88-3, -4, and -5). The deposit in these trenches can be projected about 300 feet on strike.

Bedrock in the area is schist and some marble, probably of early Paleozoic protolith age (Hummel, 1962; Sainsbury, Hummel, and Hudson, 1972; Till and Dumoulin, 1994; Bundtzen and others, 1994). Strata exposed in upper Snow Gulch and continuing southward on Bonanza Hill are chloritic mica schist, marble and occasional graphitic units. In general they belong to the chlorite-rich metaturbidite schist and marble unit of Bundtzen and others (1994).

As of 2007, NovaGold Resources, Inc. (2007, Nome) is exploring the Saddle deposit and they initiated new infill drilling in 2005. The new drilling is being done to define a resource that could be mined and trucked to the proposed Rock Creek (NM207) mill. As of March 28, 2007 NovaGold Resources Inc. (2007, Reserve) lists the the reserves at the Saddle prospect as 3.6 million tonnes of material with a grade of 2.3 ounces of gold per ton.

Alteration:

Albitization, silicification, and sulfidization of schist.

Age of mineralization:

Mid-Cretaceous; veins cross cut regionally metamorphosed schist; see NM207.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins (Cox and Singer, 1986; model 36a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Undetermined

Site Status: Active?

Workings/exploration:

Lode prospects were located in this area as early as 1899; there was considerable lode prospecting activity until World War I. n the mid-1980', R.V. Bailey discovered the Saddle deposit and began a trenching program that identified a sheeted vein complex. This exploration was followed by an extensive trenching program and some drilling by Placer Dome in 1987 and 1988, by soil geochemistry and some drilling by BHP in 1990, by detailed mapping and some drilling by Newmont Mining Company in 1992, and by additional drilling by Kennecott Exploration Company in 1994-5.

As of 2006, NovaGold Resources, Inc. (2007, Nome) is exploring the Saddle deposit and they initiated new infill drilling in 2005. The new drilling is to define a resource that could be mined and trucked to the proposed Rock Creek (NM207) mill.

Production notes:

None.

Reserves:

As of March 28, 2007 NovaGold Resources Inc. (2007, Reserve) lists the the reserves at the Saddle prospect as 3.6 million tonnes of material with a grade of 2.3 ounces of gold per ton.

Additional comments:

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NovaGold Resources, Inc., 2007 (Nome): http://www.novagold.net/s/NomeProjects.asp (as of April, 2007).

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Primary Reference: This report

Reporter(s): C.C. Hawley (Hawley Resources Group, Inc.) and Travis L. Hudson (Applied Geology, Inc.)

Last report date: 2005-10-12

Site name(s): Nome placer field

Site type: Mines

ARDF no.: NM251

Latitude: 64.5439 **Quadrangle:** N C-1

Longitude: 165.4026

Location description and accuracy:

This extensive placer gold deposit that has been mined intensively since before WWI occupies large parts of sections 11, 12, 13, and 14, T. 11 S., R. 34 W., of the Kateel River Meridian. The coordinates are immediately north of the Nome-Teller road in the SE1/4SE1/4 section 11. The site is accurately located (Bundtzen and others, 1994, sheet 1). It is approximately the same as locality 138 of Cobb (1972 [MF 463]). In his description of location 138, Cobb lists Center, Flat, Holyoke, Lake, Saturday, Wonder, and Little Creek claims and two operating companies: Hammon Consolidated Gold Fields and U.S. Smelting and Refining Company. The field was also extensively mined by the Pioneer Mining Company in the early days of the district. For convenience in this record, this composite placer deposit is hereafter referred to as the Nome placer field.

Commodities:

Main: Au

Other: Ag, W

Ore minerals: Arsenopyrite, gold, hematite, ilmenite, magnetite, pyrite, scheelite

Gangue minerals: Garnet

Geologic description:

The Nome placer field formed where the rich Anvil Creek alluvial placer (NM236) was reworked by marine processes where it flowed out onto a coastal plain. An ancestral Anvil Creek channel flowed southeasterly, turned south near modern Center Creek (not named on the 1970 revision of the topographic map but probably is the drainage near the northeast runway of the Nome airport), and eventually merged with Submarine Beach (NM285 and NM286). The field spreads out along the Third Beach (NM258). It is very wide southwest of Third Beach through the area of buried auriferous abrasion platforms seaward of Third Beach. The deposit includes a large part of the richest portion of Third Beach between Little Creek to the west and Dry Creek to the east (Moffit, 1906, p. 134; Moffit, 1907, p. 134-144; Collier and others, 1908, p. 34, 162-163). The general location of the deposit as it was recognized in 1906 can be inferred from patterns of gold distribution shown by Collier and others (1908, plate X).

The deposit is mainly developed on schist bedrock, but higher level gold concentrations occur in fan and delta-like deposits formed at times when an ancient Anvil drainage flowed into the ocean. The rather complex relations were summarized by Metcalfe and Tuck, 1942, p. 37): 'At the foothill edge of the coastal plain is an indistinguishable zone of intermixed stream and marine deposits... In this area, gold is found throughout the overburden, in horizons, in small stream channels, and as disseminations. Marine and stream gravel is often intermixed. When the shoreline was close to the hills, Anvil, Cooper, and Dry Creeks emptied gold-bearing detritus directly into the sea. In part this material formed an alluvial fan deposit and, when deposited directly into the sea, a delta... Under such conditions, gold distribution is very erratic. Further from the foothills the gold occurs in more regular horizons.'

Placer gold at Nome is very close to 900 fine; Anvil Creek averages 897 and varies from 894 to 905 (Metcalfe and Tuck, 1942, p. 41). Garnet was relatively abundant near Third Beach; sulfides, principally pyrite and arsenopyrite, locally occurred in concentrates seaward of Third Beach. In general, minerals in the

concentrates are magnetite, ilmenite, scheelite, garnet, pyrite, and arsenopyrite. Based on testing done by Fairbanks Exploration Company in 1939, after stripping all available free gold with mercury, the sulfides appear to contain about 0.25 to 0.75 ounce of gold per ton. Metcalfe and Tuck (1942) strongly suggest that some of the gold, and therefore sulfides, could have come from marine erosion of the bedrock surface itself.

The field was first worked by drifting by the Pioneer Mining Company, especially between 1904 and 1910. The average value of an almost continuous drift mine 3,000 feet in length was $4.51 or 0.22 ounce of gold per bedrock foot. Some of the ground contained an ounce of gold to the bedrock foot (Metcalfe and Tuck, 1942, figure 1). The area was mined hydraulically by the Pioneer Company from 1910 to 1922 and then by Hammon and Fairbanks Exploration companies from 1923 until 1934. During the period from 1904 until 1934, about $8,000,000 in gold (about 387,000 ounces of gold) was recovered from the area. The field furnished a significant amount of production of the Nome district (Bundtzen and others, 1994). The deposit was subsequently dredged until 1965. It was last mined as an open pit in 1994.

NovaGold Resources, Inc. (2007, Nome) has owned most of the ground that comprises this site since 1999 and is evaluating the placer gold potential of the Nome coastal plain. They developed a computer database of the approximately 8,000 holes drilled by the the Alaska Gold Company and its corporate predecessors over the long life of this major placer district. In addition, NovaGold and Kennecott Exploration have drilled new holes. The objective is to define mineable reserves that could be produced either by open pit methods or perhaps by rehabilitated dredges that were once operated by Alaska Gold in the area. As of March 28, 2007, an updated resource estimate was produced for NovaGold (2007, Reserve) by the Norwest Corporation. The property contains a measured and indicated resource of 1.6 million ounces of gold and an inferred resource of 300,000 ounces of gold. The gold is in a 194-million-tonne resource of sand and gravel which is valuable in its own right.

Alteration:

Age of mineralization:

Pliocene (?) and Quaternary; sea-level fluctuations are very important in the history of this deposit.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Alluvial placer Au (Cox and Singer, 1986, model 39a); deltaic deposits, buried strand line beach deposits, and offshore abrasion placers seaward from ancient beaches.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; large

Site Status: Active

Workings/exploration:

A buried alluvial gold deposit was discovered in the canyon of Anvil Creek in 1898 by Lindblom, Brynteson, and Lindeberg, who later formed Pioneer Mining Company. The men also located placer claims on the coastal plain along an ancient buried channel of Anvil Creek that lies between Little and Dry Creeks. These claims covered important parts of the Nome placer field deposit. Extensive underground mining of this deposit occurred between 1904 and 1910. In late 1904, the Third Beach deposit (NM258) was discovered. In the Nome placer field area, the upland limit of the Third Beach deposit was sharp and against a bedrock escarpment. The beach deposits contributed to the richness of the ancient Anvil Creek channel, and related abrasion deposits were mined seaward from Third Beach. The deposit as finally mined includes the ancestral Anvil Creek channel, Third Beach, and abrasion and transient or remnant beaches on the abrasion platform offshore from Third Beach. After drifting, the deposit was mined by surface hydraulic methods, generally with hydraulic elevators, from 1910 to 1934; it was then dredged until 1965. Final

production from the area, in the 1980s until 1994, was by open-pit operations that trucked ore to central washing plants. This gold field which was mined nearly continuously for nearly a century was the most important, spatially continuous placer operation in the Nome mining district.

NovaGold Resources, Inc. has owned most of the ground that comprises this site since 1999 and is evaluating the the placer gold potential of the Nome coastal plain (NovaGold Resources Inc., 2007, Nome). They developed a computer database of the some 8,000 holes drilled by the the Alaska Gold Company and its corporate predecessors over the long life of this major placer district. In addition, NovaGold and Kennecott Exploration have drilled new holes. The objective is to define mineable reserves that could be produced either by open pit methods or perhaps by rehabilitated dredges that were once operated by Alaska Gold in the area.

Production notes:

Production by dredges and surface workings of about $8,000,000 in gold (about 387,000 ounces) from 1904 to 1934 and extensive production after WW II.

Reserves:

The property contains a measured and indicated resource of 1.6 million ounces of gold and an inferred resource of 300,000 ounces of gold (NovaGold Resources, Inc., 2007, Reserve). The gold is in a 194 million tonne resource of sand and gravel which is valuable in its own right.

Additional comments:

References:

Bundtzen, T.K., Reger, R.D., Laird, G.M., Pinney, D.S., Clautice, K.H., Liss, S.A., and Cruse, G.R., 1994, Progress report on the geology and mineral resources of the Nome mining district: Alaska Division of Geological and Geophysical Surveys, Public Data-File 94-39, 21 p., 2 sheets, scale 1:63,360.

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NovaGold Resources, Inc., 2007 (Nome): http://www.novagold.net/s/NomeProjects.asp (as of April, 2007).

NovaGold Resources Inc., 2007 (Reserve): (http://www.novagold.net/i/pdf/NGReserve_ResourceTable.pdf (March, 2007).

Primary Reference: Metcalfe and Tuck, 1942

Reporter(s): C.C. Hawley (Hawley Resource Group, Inc.) and Travis L. Hudson (Applied Geology, Inc.); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-10

Site name(s): Ganes Creek

Site type:

ARDF no.: OP018

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

The mouth of Ganes Creek is about 5 miles southeast of the town of Ophir. Most of Ganes Creek has been mined to the mouth of Spalding Creek, about 13 miles upstream. About half of the creek is in the Ophir quadrangle and half in the Iditarod quadrangle. Much of the information that is available on the placers on Ganes Creek cannot be assigned to a quadrangle and most of the mining took place in the Iditarod quadrangle. The information that was previously in this record has been integrated into a single record (ID022) sited on Ganes Creek in the Iditarod quadrangle near the mouth of Six Gulch where the Discovery claim was located.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Porphyry Knob

Site type: Prospect

ARDF no.: OP031

Latitude: 63.5394 **Quadrangle:** OP C-1

Longitude: 156.0254

Location description and accuracy:

The Porphyry Knob prospect is on a prominent 1,800-foot hill, informally called Porphyry Knob, near the divide between Cripple Creek and Colorado Creek. It is about 0.4 mile west of the center of section 32, T. 22 S., R. 15 E., Kateel River Meridian. The location is accurate.

Commodities:

Main: Ag, Au

Other:

Ore minerals: Arsenopyrite, chalcopyrite, gold, pyrite, stibnite

Gangue minerals: Quartz

Geologic description:

The rocks in the vicinity of the Porphyry Knob prospect consist of highly altered, intermediate to mafic, volcanic, volcaniclastic, and flow-layered rocks interbedded with black shale, graywacke, and minor conglomerate of the Cretaceous Kuskokwim Group (McGinnis and others, 1997). In the Colorado Creek area, high-angle, northeast-trending faults are cut by later, northwest-trending faults.

The rocks at the Porphyry Knob prospect consist of a gently-dipping sequence of intermediate to mafic volcanic, volcaniclastic, and marine sedimentary rocks. What is usually called dacite porphyry is an important hostrock, but petrographic work by Placer Dome Exploration demonstrates that the light-colored, porphyritic rocks characteristic of this prospect are in fact mostly altered andesite and basalt despite their leucocratic appearance in hand specimen (McGinnis and others, 1997). The altered volcanic rocks contain abundant disseminated pyrite and arsenopyrite and are cut by quartz and limonite veins up to 2 centimeters thick. The dacite porphyry contains veins and veinlets of quartz + adularia + pyrite +/- apatite +/- ankerite +/- calcite. The andesite contains veins and veinlets of quartz +/- albite + ankerite +/- calcite + pyrite + arsenopyrite (McGinnis and others, 1997). Fine native gold can be panned from soil on the southeast margin of the prospect area (Avalon Development, 1998).

Placer Dome Exploration drilled ten core holes in 1997. The most significant intercept averaged 1.9 grams of gold per ton over 19.2 meters; this included an intercept 2 meters long with 7.5 grams of gold per tonne (McGinnis and others, 1997). The most abundant sulfides in the core are arsenopyrite, chalcopyrite, pyrite, and stibnite (Duncan, 1999). The gold:silver ratio at Porphyry Knob is generally low and ranges from 1:1 to 1:10 (Duncan, 1999). The prospect is marked by soil samples that contained up to 3,610 parts per billion gold, anomalous amounts of arsenic, antimony, and mercury, and minor bismuth (Avalon Development, 1998).

The igneous rocks display intense levels of phyllic, silicic, and carbonate alteration. The sedimentary rocks exhibit local sericitic, silicic, carbonate, hornfels, and skarn alteration (Avalon Development, 1998; Duncan, 1999).

The Porphyry Knob prospect may be part of a gold-bearing, quartz-adularia- type epithermal system (Avalon Development, 1998; Duncan, 1999; Dashevsky, 2000). Also see the Moose Jaw (OP032), and Eldorado Creek (OP033) prospects.

In 2009, TintinaGold Resources Inc. drilled 4 holes on Porphyry Knob (TintinaGold, 2010; Chutas and

others, 2009). At the surface, the rocks on the knob are mainly rhyodacite quartz porphyry surrounded by siltstone and andesite. The sedimentary and volcanic rocks were also intersected at depth in the drill holes and gold veins were intersected in both the porphyry and its host rock. A 111-meter interval in one hole contained 0.64 gram of gold per tonne; this included a 2.3-meter interval that contained 8.28 grams of gold per tonne and a 2-meter interval that contained 6.38 grams of gold per tonne. Another hole nearby intersected 98.4 meters that contained 0.54 grams of gold per tonne; this included 22 meters with 1.01 grams of gold per tonne.

There are six types of veins, at least two of which are gold bearing. The gold-quartz veins are associated with various suites of arsenic, antimony, and mercury minerals. In addition to the veins, the drilling cut significant intercepts of disseminated sulfide mineralization with bulk-tonnage potential. Several styles of alteration were noted in the porphyry, including pervasive sericitization, clay alteration, carbonate alteration, and a later clay-oxide alteration. Pervasive oxidation persists to at least 225 feet below the surface.

Alteration:

The igneous rocks display intense levels of phyllic, silicic, and carbonate alteration. The sedimentary rocks exhibit local sericitic, silicic, carbonate, hornfels, and skarn alteration (Avalon Development, 1998; Duncan, 1999).

Age of mineralization:

Cretaceous or younger. Mineralized sills intrude Cretaceous sedimentary rocks of the Kuskokwim Group.

Generic deposit model:

Deposit model:

Epithermal gold (quartz-adularia) (Cox and Singer, 1986; model 25b, 25c?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

25b, 25c?

Production Status: None

Site Status: Active

Workings/exploration:

Gold mineralization was identified on Porphyry Knob by S. Nerod during the 1970s at the Nerod trench in the southern part of the prospect area. In 1994, 1995, and 1996, Ron Rosander, the claim owner, contracted James Barker to evaluate lode sources of placer gold in the Colorado Creek area. Barker collected 254 soil samples, 93 rock samples, and 12 samples of placer gold for scanning-electron microscope and trace element analysis. Barker also conducted geologic mapping and a ground-based magnetometer survey. In 1996, the Alaska Division of Geological and Geophysical Surveys conducted geologic mapping in the Cripple Creek Mountains, and Placer Dome Exploration flew an east-west-oriented aeromagnetic survey over the Cripple Creek Mountains (Avalon Development, 1998).

Placer Dome Exploration drilled 10 core holes totaling 1,372 meters in the Porphyry Knob prospect during 1997, soil sampled over a large grid, and conducted geologic mapping, trenching, and road construction (McGinnis, 1997). Nova Gold explored the Porphyry Knob prospect in 1998 and conducted further geologic mapping, rock sampling, and soil sampling (Avalon Development, 1998). During 1999, Northern Associates, Inc., was contracted by Poisedon Minerals, Ltd. to conduct further soil sampling in the Colorado Creek area, including Porphyry Knob. In 2009, TintinaGold drilled 4 holes on Porphyry Knob and another 8 nearby in the upper basin of Colorado Creek.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Avalon Development Corp., 1998, Colorado Creek project, Ophir and Medfra quadrangles, southwest Alaska: Avalon Development Corp. report prepared for NovaGold Resources Inc., 9 p.

Chutas, Nathan, Alter, Doyle, and Stroup, Caleb, 2009, TintinaGold Resources Inc. - 2009 exploration at Colorado Creek: Abstracts, Alaska Miners Association 2009 Annual Convention, p. 25 (posted on the Internet at www.alaskaminers.org/abstracts2009.pdf).

Dashevsky, S.S., 2000, Colorado Creek project (Au) Innoko district, Alaska: Unpublished report for Rosander Mining Company, 7 p.

Duncan, R.G., 1999, Colorado Creek project, Alaska, interim report: Unpublished report for Poseidon Minerals Ltd., 22 p.

McGinnis, M.F., McCoy, M.E., Nerup, M.R., and Barnett, D., 1997, Colorado Creek project Alaska, 1997 summary report: Placer Dome Exploration Inc. unpublished report, 37 p.

TintinaGold Resources Inc., 2010, Colorado Creek: http://mantramining.com/Colorado_Creek_Project.aspx?m_id=6364 (as of February 1, 2010)

Primary Reference: TintinaGold Resources, 2010

Reporter(s): C.E. Cameron (Northern Associates, Inc.); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Eldorado Basin; Moose Jaw Mountain

Site type: Prospect

ARDF no.: OP034

Latitude: 63.5366 **Quadrangle:** OP C-1

Longitude: 156.006

Location description and accuracy:

The Eldorado Basin prospect is in the headwaters of Eldorado Creek, which flows into Colorado Creek. The center of the activity is at an elevation of about 1,800 feet along the creek but the several exploration efforts cover an area of about a half square mile in the central part of section 32, T. 22 S., R. 15 E. The location is accurate.

Commodities:

Main: Au

Other: As, Cu, Sb

Ore minerals: Arsenopyrite, chalcopyrite, pyrite, pyrrhotite, scorodite, stibnite

Gangue minerals: Actinolite, epidote, quartz

Geologic description:

The rocks in the vicinity of Eldorado Creek consist of intermediate to mafic volcanic and volcaniclastic rocks, and Cretaceous, Kuskokwim Group black shale, limestone, graywacke, and conglomerate; the strata are intruded by Cripple Mountain monzonite (McGinnis and others, 1997; Avalon Development Corp., 1998; Duncan, 1999). The headwaters of Eldorado Creek contain limonite-stained, gossanous breccia (Avalon Development Corp., 1998).

The Eldorado Basin prospect is on a mineralized zone that trends northeast across the headwaters of Eldorado Creek for about 2,200 meters. This zone extends northeast into the Medfra quadrangle and end at Colorado Creek, northeast of the summit of Moose Jaw Mountain. At the Eldorado Basin prospect, the mineralized zone contains scattered, thin veins of quartz and stibnite, arsenopyrite, and quartz, and locally of actinolite, chalcopyrite, or epidote. Soil samples collected in the vicinity contain up to 674 parts per million (ppm) copper, 2,250 parts per billion (ppb) gold, 2,818 ppm arsenic, 945 ppm antimony, and 12 ppm bismuth (Avalon Development Corp., 1998).

The northeast extension of this zone is defined by soil samples on Moose Jaw Mountain. Two mineralized areas have been identified: a NW-SE-trending, 400-meter by 50-meter area; and an adjacent area 1400 meters long by 200 to 400 meters wide. The 1400-meter-long area is open to the south (Duncan, 1999). Soil samples from these areas contained up to 515 ppb gold, 2,770 ppm arsenic, 2,942 ppm antimony, and 9 ppm bismuth (Avalon Development, 1998). Hypabyssal, porphyritic rocks at the top of Moose Jaw Mountain are cut by veins less than 5 centimeters thick of crystalline quartz, stibnite, arsenopyrite, and scorodite (Avalon Development, 1998).

Exploration in the Eldorado Basin includes geologic mapping and sampling by Barker during 1994, 1995, and 1996; soil sampling, rock sampling, and geologic mapping by NovaGold during 1998; and mobile-metallic-ion (MMI) sampling by Poseidon Minerals Ltd. in 1999 (Barker, 1996; Avalon Development Corp., 1998; Duncan, 1999). Also see OP002 and OP031-033 for similar mineralization nearby.

In 2009, TintinaGold Resources Inc. (TintinaGold, 2009; Chutas and others, 2009) drilled 9 holes in the upper basin of Colorado Creek in the general vicinity of the zones of mineralization and anomalies that had previously been identified. The holes were mostly drilled through colluvium along the creek but some were in quartz monzonite, hornfels, rhyodacite quartz porphyry, andesite, and siltstone. Significant pyrrhotite-

rich replacement mineralization was cut in the hornfels as were quartz-carbonate veins in the hornfels, diorite, and andesite dikes. The quartz-carbonate veins included pyrrhotite, chalcopyrite, pyrite, and arsenopyrite. Broad propylitic alteration as well as chlorite, sericite, and carbonate alteration were noted.

Alteration:

Broad propylitic alteration as well as chlorite, sericite, and carbonate alteration.

Age of mineralization:

Cretaceous or younger based on the age of the Kuskokwim Group rocks in which much of the mineralization occurs.

Generic deposit model:

Deposit model:

Epithermal Au? (Cox and Singer, 1986; model 25b, 25c?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

25b, 25c?

Production Status: None

Site Status: Active

Workings/exploration:

During 1994, 1995, and 1996, Ron Rosander contracted geologist James Barker to evaluate the lode sources of placer gold in the Colorado Creek area. Barker collected 254 soil samples, 93 rock samples, and 12 samples of placer gold for scanning-electron microscope and trace element analysis. Geologic mapping and a ground-based magnetometer survey were also carried out (Barker, 1996; McGinnis and others, 1997). In 1996, the Alaska Division of Geological and Geophysical Surveys conducted geologic mapping in the Cripple Creek Mountains and Placer Dome Exploration flew an east-west-oriented aeromagnetic survey over the Cripple Creek Mountains. Nova Gold conducted geologic mapping, rock sampling, and soil sampling during the summer of 1998 (Avalon Development, 1998). During 1999, Poseidon Minerals, Ltd. carried out soil sampling in the Colorado Creek area, and used mobile-metallic-ion (MMI) analyses (Duncan, 1999). In 2009, TintinaGold Resources Inc. drilled 8 holes along Colorado Creek.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Avalon Development Corp., 1998, Colorado Creek project, Ophir and Medfra quadrangles, southwest Alaska: Avalon Development Corp. report prepared for NovaGold Resources Inc., 9 p.

Barker, J.C., 1996, Geologic evaluation of the Colorado Creek prospect area, Alaska: Summary report prepared for Placer Dome Exploration, San Francisco, Calif., 73 p.

Chutas, Nathan, Alter, Doyle, and Stroup, Caleb, 2009, TintinaGold Resources Inc. - 2009 exploration at Colorado Creek: Abstracts, Alaska Miners Association 2009 Annual Convention, p. 25 (posted on the Internet at www.alaskaminers.org/abstracts2009.pdf).

Dashevsky, S.S., 2000, Colorado Creek project (Au) Innoko district, Alaska: Unpublished report for Rosander Mining Company, 7 p.

Duncan, R.G., 1999, Colorado Creek project, Alaska, interim report: Unpublished report for Poseidon Minerals Ltd., 22 p.

McGinnis, M.F., McCoy, M.E., Nerup, M.R., and Barnett, D., 1997, Colorado Creek project Alaska, 1997 summary report: Placer Dome Exploration Inc. unpublished report, 37 p.

TintinaGold Resources Inc., 2010, Colorado Creek: http://mantramining.com/Colorado_Creek_Project.aspx?m_id=6364 (as of February 1, 2010)

Primary Reference: Duncan, 1999; TintinaGold Resources Inc., 2009

Reporter(s): C.E. Cameron (Northern Associates, Inc.; D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Unnamed (near mouth of Port Camden)

Site type: Prospect

ARDF no.: PE001

Latitude: 56.80657 **Quadrangle:** PE D-6

Longitude: 133.9509

Location description and accuracy:

This prospect consists of a number of radioactiive occurrences on northeastern Kuiu Island that consist of outcrops of Tertiary sandstone along the shoreline at the end of the peninsula that juts out between the mouth of Kadake Bay and the north end of Port Camden. These are commonly referred to as the Port Camden prospect. The coordinates are approximately at the center of the radioactive occurrences which are localities 7 and 8 of Grybeck, Berg, and Karl (1984). Called the the 'Kadake Bay' occurrence by Still and others (2002).

Commodities:

Main: Th, U

Other: Ce, La

Ore minerals: Pyrite, unidentified radioactive minerals

Gangue minerals: Apatite, magnetite, siderite

Geologic description:

The Tertiary Kootznahoo Formation consists of light brown, poorly sorted, non-marine, dolomitic sandstone that contains clay clasts, carbonized wood fragments, and dolomitic concretions; thin shale layers are in the sandstone (Muffler, 1967). The sandstone ranges from silty, fine-grained and thin-bedded to medium- and coarse-grained; it is partly conglomeratic, and medium- to thick-bedded. Siderite, magnetite, pyrite, and apatite are present in some lithologies. All carbonized wood fragments show radioactivity when tested in place. Instrument readings varied from 2 to 50 times background. One sample gave readings in eU of 1300, plus-or-minus 400 parts per million (ppm) uranium, and gamma eU of 2300, plus-or-minus 700 ppm uranium. Samples from a four-inch-thick bed of fine-grained Tertiary sandstone contained 11 and 12 ppm uranium and up to 30 percent magnetite. (The description is summarized from Eakins, 1975; Dickinson, 1979; Dickinson and Campbell, 1982; Dickinson and Pierson, 1988; and Still and others, 2002).

Still and others (2002) collected several samples of thin, black carbonaceous shale interbeds in the sandstone that gave slightly elevated readings on a Scintillometer; they contained up to 46 ppm uranium, 23 ppm lanthanum, and 41 ppm cerium.

Alteration:

Age of mineralization:

Tertiary or younger based on age of the host rock, the Tertiary Kootznahoo Formation.

Generic deposit model:

Deposit model:

Sandstone uranium (Cox and Singer, 1986; model 30c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

30c

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Block of 30 claims staked in 1976 and active until at least 1981 (U.S. Bureau of Mines, 1980). A few samples were collected and analyzed by the Bureau of Land Management (Still and others, 2002) but there has apparently been little private work done in recent years.

Production notes:

None.

Reserves:

None.

Additional comments:

This area has been selected for transfer to Sealaska and the Kake Tribal Corporations and in 2002 was classified as 'interim conveyed, pending patent'.

References:

Dickinson, K.A., 1979, A uranium occurrence in the Tertiary Kootznahoo Formation on Kuiu Island, southeast Alaska: U.S. Geological Survey Open-File Report 79-1427, 5 p.

Dickinson, K.A., and Campbell, J.A., 1982, The potential for uranium deposits in the Tertiary Kootznahoo Formation of the southern part of the Admiralty trough, southeastern Alaska: U.S. Geological Survey Open-File Report 82-983, 18 p.

Dickinson, K.A., and Pierson, C.T., 1988, A statistical analysis of chemical and mineralogic data from the Tertiary Kootznahoo Formation in southeastern Alaska, with emphasis on uranium and thorium: U.S. Geological Survey Bulletin 1851, 19 p.

Eakins, G.R., 1975, Uranium investigations in southeastern Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 44, 62 p.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Muffler, L.J.P., 1967, Stratigraphy of the Keku Islets and neighboring parts of Kuiu and Kupreanof Islands, southeastern Alaska: U.S. Geological Survey Bulletin 1241-C, p. C1-C52.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

U.S. Bureau of Mines, 1980, Claim map, Petersburg quadrangle, Alaska: U.S. Bureau of Mines Map 117, 1 sheet, scale 1:250,000.

Primary Reference: Dickinson, 1979 (USGS OF 79-1427); Dickinson and Campbell, 1982

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near Gunnuk Creek)

Site type: Prospect

ARDF no.: PE002

Latitude: 56.9886 **Quadrangle:** PE D-6

Longitude: 133.8809

Location description and accuracy:

These claims are on upper Gunnuk Creek on northwestern Kupreanof Island, about three miles northeast of the town of Kake. The site is locality 9 of Grybeck, Berg, and Karl (1984). The location is known only generally and the coordinates are approximately at the center of the claims.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

The only information on this prospect is that four lode claims were staked for gold in 1968; apparently they have not been active since (U. S. Bureau of Mines, 1980; Still and others, 2002). Still and others (2002) searched for some sign of these claims and collected 5 stream sediment samples. They found no sign of the claims and the samples were not anomalous.

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Only known to be claims for lode gold.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

The only information on this prospect is that four lode claims were staked for gold in 1968; apparently they have not been active since (U.S. Bureau of Mines, 1980; Still and others, 2002).

Production notes:

No record of production and highly unlikely that there was any.

Reserves:

None.

Additional comments:

References:

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

U.S. Bureau of Mines, 1980, Claim map, Petersburg quadrangle, Alaska: U.S. Bureau of Mines Map 117, 1 sheet, scale 1:250,000.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Northern Copper Company; Tower Arm Copper; Portage Bay Copper Company

Site type:

Prospect

ARDF no.: PE005

Latitude: 56.8877 **Quadrangle:** PE D-5

Longitude: 133.3743

Location description and accuracy:

The Northern Copper prospect is at an elevation of about 1300 feet on the southern spur of Kupreanof Island. It is near the the center of the northern half of section 36, T. 57 S., R. 76 E. The area is heavily wooded and the prospect is is not easy to locate on the ground. Still and others (2002) have published detailed maps of the surface and underground workings.

Commodities:

Main: Cu, Zn

Other:

Ore minerals: Chalcopyrite, magnetite, pyrite, pyrrhotite, sphalerite

Gangue minerals:

Geologic description:

The Northern Copper prospect was first staked in 1900 and had several periods of activity, notably in 1900 and 1901 and between 1918 and 1921. Numerous workings were driven from 1900 to 1921 including a shaft, numerous trenches and open cuts, and three adits that are about 360 feet, 30 feet, and 285 feet long. A road was built part way to the prospect from the head of Duncan Canal and a tram was planned but not built from tidewater to the prospect. It has been active for short periods several times since, notably in 1978 and 1979 when Amoco Minerals Co. staked a large block of claims that covered the area around the Northern Copper prospect, and carried out extensive airborne and ground geophysics, geologic mapping, and soil and stream sediment geochemistry in the area. They also core drilled six holes to test geophysical anomalies near the Northern Copper prospect. There apparently has been no production. The prospect was covered by 4 claims patented in 1907 that were deeded to the Forest Service in 1995 and are now part of the Petersburg Creek-Duncan Salt Chuck Wilderness area. (More detailed information can be found in Wright and Wright (1908), Buddington, (1923); Roehm, 1945 [DGGS IR 195-37]; Twenhofel and others, 1949; Still and others (2002).

The rocks in the older upper workings workings consist of a thick layer of massive greenstone and chlorite schist, locally with garnet and pyroxene (Wright and Wright, 1908; Buddington, 1923; Roehm, 1945 [DGGS IR 195-37]; Twenhofel and others, 1949; Still and others, 2002). Karl and others (1999) consider the rocks to be Devonian in age. The greenstone also has layers or lenses of white crystalline marble. The mineralization consists of massive layers up to several feet thick, patches, and disseminations of sulfides, mainly pyrrhotite, pyrite, chalcopyrite, and minor sphalerite. The sulfide layers are generally oriented parallel to the layering in the greenstone. Still and others (2002) collected 36 samples in the massive greenstone. The highest copper values were 1.7 percent across 1.5 feet, 1.4 percent across 1.8 feet, and 3.5 percent in an outcrop sample. The highest zinc values were 1.2 percent across 3 feet and 2.4 percent across 1.5 feet. The highest silver value was 32.6 parts per million; the highest gold value was 165 parts per billion (ppb). A band of massive sulfides, mainly pyrrhotite, pyrite, and chalcopyrite, 0.2 to 2 feet thick is exposed in the 30-foot adit for about 20 feet. Samples contained up to 12.4 percent copper across 2 feet; the highest gold value was 440 ppb and the highest silver value was 37.7 ppm.

The work in the late 1970s by Amoco Minerals Co. identified a unit of gray argillite under the greenstone. The argillite contains layers 0.2 to 1.7 feet thick of massive pyrrhotite with chalcopyrite and minor sphalerite. Samples contained up to 2.5 percent copper across 1.4 feet; the maximum gold value was 29 ppb, the maximum silver value was 11.5 ppm.

The origin of the deposit is enigmatic. Most likely it is a metamorphosed volcanogenic massive sulfide deposit. But it may be a replacement deposit, or possibly a skarn-type deposit.

Alteration:

Age of mineralization:

Devonian or later based on the age of the host rocks.

Generic deposit model:

Deposit model:

Probably a metamorphosed volcanogenic massive sulfide deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

The Northern Copper prospect was first staked in 1900 and had several period of activity, notably in 1900 and 1901 and between 1918 and 1921. Numerous workings were driven from 1900 to 1921 including a shaft, numerous trenches and open cuts, and three adits that are about 360 feet, 30 feet, and 285 feet long. A road was built part way to the prospect from the head of Duncan Canal and a tram was planned but not built from tidewater to the prospect. It has been active for short periods several times since, notably in 1978 and 1979, when Amoco Minerals Co. staked a large block of claims that covered the area around the Northern Copper prospect, and carried out extensive airborne and ground geophysics, geologic mapping, and soil and stream sediment geochemistry in the area. They also core drilled six holes to test geophysical anomalies near the Northern Copper prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

The prospect was covered by 4 claims patented in 1907 that were deeded to the Forest Service in 1995; they are now part of the Petersburg Creek-Duncan Salt Chuck Wilderness area.

References:

Brew, D.A., Ovenshine, A.T., Karl, S.M., and Hunt, S.J., 1984, Preliminary reconnaissance geologic map of the Petersburg and parts of the Port Alexander and Sumdum 1:250,000 quadrangles, southeastern Alaska: U.S. Geological Survey Open-File Report 84-405, 43 p., 2 sheets, scale 1:250,000.

Buddington, A.F., 1923, Mineral deposits of the Wrangell district: U.S. Geological Survey Bulletin 739-B, p. 51-75.

Cobb, E.H., 1972, Metallic mineral resources map of the Petersburg quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-415, 1 sheet, scale 1:250,000.

Cobb, E. H., 1972, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Petersburg Quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-870, 53 p.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Roehm, J.C., 1945, Preliminary report of investigations and itinerary of J. C. Roehm in the Wrangell and Petersburg precincts, Alaska: Alaska Territorial Department of Mines Itinerary Report 195-37, 13 p.

Roehm, J.C., 1945, Preliminary report of investigations in the Juneau and Petersburg precincts and itinerary of J. C. Roehm: Alaska Territorial Department of Mines Itinerary Report 195-38, 10 p.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Twenhofel, W.S., Reed, J. C., and Gates, G.O., 1949, Some mineral investigations in southeastern Alaska: U.S. Geological Survey Bulletin 963-A, p. 1-45.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Taylor Creek

Site type: Prospect

ARDF no.: PE006

Latitude: 56.7937 **Quadrangle:** PE D-5

Longitude: 133.3638

Location description and accuracy:

This is a well known location that is about 1.5 miles upstream from the mouth of Taylor Creek in upper Duncan Canal. It is about 0.4 mile southeast of the center of section 36, T. 59 S., R. 76 E. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, pyrite, sphalerite

Gangue minerals: Calcite, dolomite

Geologic description:

The Taylor Creek deposit has been known since 1903 or 1904 (Wright and Wright, 1908; Kerns, 1950) and has been examined numerous times by government and industry. There was considerable activity during the 1940s, mainly restricted to surface sampling and some trenching and pitting (Fowler, 1948 [DGGS IR 195-2]; Fowler, 1948 [DGGS IR 117-5]; Roehm, 1946 [DGGS IR 195-41]; and Roehm, 1946 [DGGS IR 117-4]). The property has been been intermittently active since. Kerns (1950) reported on extensive diamond drilling carried out by the U. S. Bureau of Mines in 1948 and the 14 trenches they dug on several areas of mineralization. In 1997, Kennecott Exploration Company staked a large block of claims that included the deposit.

The deposit consists of Irregular masses and disseminated grains of galena, sphalerite, pyrite, and chalcopyrite in dolomitic limestone (Kerns, 1950). In the best exposures along Taylor Creek, pervasively disseminated pyrite, galena, and sphalerite occur over an area about 3 meters wide by 7 meters long in a brecciated zone. This zone occurs in a thinly laminated to phyllitic, light-gray and white, fine-grained dolomitic marble which overlies green crenulated muscovite-chlorite-calcite schist. The mineralization persists for approximately 100 m along the southwest bank of Taylor Creek. Maximum assay values in drill cores and outcrop samples collected by Kerns (1950) were 4.3 percent zinc, 0.95 percent lead, and 1.2 ounces of silver per ton. Several origins for the deposit has been suggested. Newer work suggests that the deposit is certainly spatially and possibly genetically associated with the Duncan Canal-Zarembo belt of Triassic massive sulfide mineralization defined by Berg and Grybeck (1980), and Berg (1981). Recent geologic mapping by Karl and others (1999) indicate that the rocks at Taylor Creek are part of the Triassic Hyd Group.

Still and others (2002) briefly examined the deposit and collected several samples. The best were: 1) a sample across 0.7 feet that contained 25.9 parts per million (ppm) silver, 7.72 percent lead, and 6.9 percent zinc; 2) a select sample that contained more than 500 ppm silver, 7,217 ppm lead, and 2.1 percent zinc, and 3) a grab sample of gossan that contained 903 parts per billion (ppb) gold, 160 ppm silver, 9.69 percent lead, and 3.0 percent zinc.

Alteration:

Age of mineralization:

Triassic of younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Probably a (remobilized?) volcanogenic massive sulfide deposit based on a spatial relationship to other massive sulfide deposits in the Duncan-Zarembo belt of mineralization defined by Berg and Grybeck, 1980.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

The Taylor Creek deposit has been known since 1903 or 1904 (Wright and Wright, 1908; Kerns, 1950) and has been examined numerous times by government and industry. Considerable activity during the 1940s, mainly restricted to surface sampling and some trenching and pitting (Fowler, 1948 [DGGS IR 195-2]; Fowler, 1948 [DGGS IR 117-5]; Roehm, 1946 [DGGS IR 195-41]; and Roehm, 1946 [DGGS IR 117-4]). The property has been been intermittently active since. Kerns (1950) reported on extensive diamond drilling carried out by the U.S. Bureau of Mines in 1948 and the 14 trenches they dug on several areas of mineralization. In 1997, Kennecott Exploration Co. staked a large block of claims that included the deposit.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Berg, H.C., 1981, Upper Triassic volcanogenic massive sulfide metallogenic province identified in southeastern Alaska, in Albert, N.R.D., and Hudson, Travis, eds., The United States Geological Survey in Alaska--Accomplishments during 1979: U.S. Geological Survey Circular 823-B, p. B104-B108.

Berg, H.C., and Grybeck, Donald, 1980, Upper Triassic volcanogenic Zn-Pb-Ag (-Cu-Au) mineral deposits near Petersburg, Alaska: U.S. Geological Survey Open-File Report 80-527, 11 p., 1 sheet.

Cobb, E.H., 1972, Metallic mineral resources map of the Petersburg quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-415, 1 sheet, scale 1:250,000.

Cobb, E. H., 1972, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Petersburg Quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-870, 53 p.

Fowler, H.M., 1948, Report of investigations in the Petersburg-Ketchikan mining precincts: Alaska Territorial Department of Mines Itinerary Report 195-2, 12 p.

Fowler, H.M., 1948, Taylor Creek lead-zinc prospect, Duncan Canal, Kupreanof Island, Alaska: Alaska Territorial Department of Mines Prospect Evaluation 117-5, 1 p.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Kerns, W.H., 1950, Investigation of Taylor Creek lead-zinc deposit, Kupreanof Island, Petersburg, Alaska: U.S. Bureau of Mines Report of Investigations 4669, 13 p.

Roehm, J.C., 1946, Preliminary report on Taylor Creek lead-zinc property of Ora P. Schoonover (Taylor Creek): Alaska Territorial Department of Mines Prospect Evaluation 117-4, 2 p.

Roehm, J.C., 1946, Report of Investigations and itinerary of J. C. Roehm in the Petersburg and Ketchikan mining precincts: Alaska Territorial Department of Mines Itinerary Report 195-41, 13 p.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Kerns, 1950

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near Towers Arm)

Site type: Prospects

ARDF no.: PE007

Latitude: 56.8397 **Quadrangle:** PE D-5

Longitude: 133.3717

Location description and accuracy:

This site is approximately at the center of a large block of at least 492 claims that cover more than 30 square miles around upper Towers Arm and North Arm of Duncan Canal. It is locality 14 of Grybeck, Berg, and Karl (1984). This early ARDF record covers an area where more detailed information has subsequently become available on several sites drilled by the company who staked the block of claims. This information can be found in records PE005, PE082, PE087.

Commodities:

Main: Cu

Other:

Ore minerals: Chalcopyrite

Gangue minerals:

Geologic description:

Numerous diamond drill holes were scattered widely on the claim block (which includes the Northern Copper prospect, PE005) in 1978 and 1979 by AMOCO Minerals from a camp located on the southern end of the peninsula between Towers Arm and the North Arm of Duncan Canal. The target of the exploration was massive-sulfide, base-metal deposits and the drilling was specifically directed to test airborne geophysical anomalies. Most if not nearly all of the holes did not intercept significant metal values and only chalcopyrite in minor amounts was found. The geophysical anomalies largely proved to be associated with graphitic layers (AMOCO Minerals staff, oral communication, 1979).

This early ARDF record covers an area where more detailed information has become available on several sites drilled by the company who staked the block of claims. This information can be found in records PE005, PE091, and PE095. Recent mapping by Karl and others (1999) indicates that some of the area probably includes Triassic Hyd Group rocks, a unit that is commonly associated with volcanogenic massive sulfide deposits in the Duncan Canal area.

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Unclear if significant mineralization was ever found.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Numerous diamond drill holes were drilled widely on this claim block in 1978 and 1979 by AMOCO Minerals from a camp located on the southern end of the peninsula between Towers Arm and the North Arm of Duncan Canal. The target of the exploration was massive-sulfide, base-metal deposits and the drilling was specifically directed to test airborne geophysical anomalies. Most if not all of the holes were devoid of significant metal values and the geophysical anomalies largely proved to be associated with graphitic layers (AMOCO Minerals staff, oral communication, 1979).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Primary Reference: This record

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Ironton Group

Site type: Prospect

ARDF no.: PE008

Latitude: 56.8261 **Quadrangle:** PE D-5

Longitude: 133.3563

Location description and accuracy:

Roehm's (1946) original description was not entirely clear but his description indicates that the Ironton Group consisted of five claims that were staked along the shoreline of upper half of Tower Arm, probably on the west shore and likely in section 19 or 30, T. 58 S., R. 76 E. Still and others (2002) found workings that are probably this prospect on the west shore about 1 to 1.5 miles from the end of Tower Arm; this would place it in section 19. The coordinate reflect their location.

Commodities:

Main: Pb, Zn

Other:

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals:

Geologic description:

Roehm (1945 [IR 195-41]) describes the prospects as a zone of mineralized schist that outcrops at high tide. Pyrite is disseminated and in thin seams in the schist. Small specks of sphalerite and galena occur in some of the thicker seams.

Recent geologic mapping by Karl and others (1999) indicates that the rocks on the west side of Tower Arm are mainly part of the Triassic Hyd Group that hosts volcanogenic massive-sulfide deposits in the region. Still and others (2002) located a few cuts, a short adit, and a trench about 1 to 1.5 miles from the head of Towers Arm that are probably at the Ironton Group. The rocks in the vicinity are interbedded greenstone, greenstone schist, quartz-calcite-chlorite schist, sericite schist, and black slate. The rocks commonly contain 3 to 15 percent pyrite but Still and others (2002) did not mention any other sulfides. They collected 10 samples whose metal content was barely above background or background.

Alteration:

Age of mineralization:

Triassic?

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

A few cuts, a short adit, and a trench that probably date to before 1945.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Roehm, J.C., 1946, Report of Investigations and itinerary of J. C. Roehm in the Petersburg and Ketchikan mining precincts: Alaska Territorial Department of Mines Itinerary Report 195-41, 13 p.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Silver Star; Silver King

Site type: Prospect

ARDF no.: PE009

Latitude: 56.8485 **Quadrangle:** PE D-4

Longitude: 133.2638

Location description and accuracy:

This prospect is about 1.6 miles west-southwest of Duncan Peak at an elevation of about 400 feet. It is about 0.5 south-southeast of the center of section 10, T. 58 S., R. 77 E.

There is some confusion in the old literature about the location and geology of two prospects in the area. For example, Cobb (1972 and 1978) or Berg and Cobb (1967), and an earlier generation of ARDF almost certainly combine two different prospects on the west side of Portage Mountain. Still and others (2002) spent considerable time in the field and library trying to decipher their locations and descriptions; this record is based on their location for the Silver Star prospect. The other prospect--XXX PE New A1028--which is about 2 miles to the north-northeast is a different type of deposit.

Commodities:

Main: Cu

Other: Pd, Pt

Ore minerals: Chalcopyrite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

The rocks in the vicinity of this prospect are mafic intrusions of late Cretaceous age (Brew and others, 1984). Between an elevation of 360 and 480 feet along a creek, there are outcrops of hornblendite and hornblende diorite that were examined by Still and others (2002). Disseminated pyrrhotite, pyrite, and chalcopyrite are common and there are veinlets up to 1 inch thick in the hornblendite with pyrite and pyrrhotite. Copper staining is locally prominent. Still and others (2002) took 17 samples. The maximum copper content was 4,666 parts per million but most samples contained much less. The highest platinum value was 39 parts per billion (ppb) and the highest palladium value was was 59 ppb; all other metals were in the background range. Buddington (1923) reports that the only workings were several cuts. Still and others (2002) suggest that the prospect is a magmatic segregation deposit.

Alteration:

Age of mineralization:

Late Cretaceous or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Magmatic segregation with copper?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

The only workings were several open cuts.

Production notes:

None.

Reserves:

None.

Additional comments:

This prospect is now in the Petersburg Creek-Duncan Salt Chuck Wilderness, which is closed to mineral exploration and mining.

References:

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg D-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-L, 21 p., 1 sheet, scale 1:63,360.

Brew, D.A., Ovenshine, A.T., Karl, S.M., and Hunt, S.J., 1984, Preliminary reconnaissance geologic map of the Petersburg and parts of the Port Alexander and Sumdum 1:250,000 quadrangles, southeastern Alaska: U.S. Geological Survey Open-File Report 84-405, 43 p., 2 sheets, scale 1:250,000.

Buddington, A.F., 1923, Mineral deposits of the Wrangell district: U.S. Geological Survey Bulletin 739-B, p. 51-75.

Cobb, E.H., 1972, Metallic mineral resources map of the Petersburg quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-415, 1 sheet, scale 1:250,000.

Cobb, E. H., 1972, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Petersburg Quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-870, 53 p.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Petersburg quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-870, 53 p.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Wright, F.E., and Wright, C.W., 1905, Economic developments in southeastern Alaska: U.S. Geological Survey Bulletin 259, p. 47-68.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near Kane Peak)

Site type: Occurrences

ARDF no.: PE010

Latitude: 56.9838 **Quadrangle:** PE D-4

Longitude: 133.0989

Location description and accuracy:

This well known mafic-ultramafic body is about 13 miles north-northwest of Petersburg. The body is a slightly elongate pluton about two and a half square miles in area that extends from just east of Kane Peak northeast to exposures for about a mile along the shoreline southeast of Cape Strait. The coordinates are approximately at the center of the body. This site is locality 16 and 17 of Grybeck, Berg, and Karl (1984). It is commonly informally referred to as the Kane Peak deposit or the Kane Peak ultramafic complex.

Commodities:

Main: Cr, Cu, Fe, Pt-group

Other:

Ore minerals: Chalcopyrite, chromite, magnetite, pentlandite, pyrrhotite

Gangue minerals:

Geologic description:

Kane Peak is a classic 'zoned' or Alaska-type mafic-ultramafic complex with a dunite-wehrlite (olivine-clinopyroxenite peridotite) core bordered by a hornblendite shell about 300 feet thick. (The foregoing description is based mainly on Himmelberg and Loney, 1995; but also see Walton, 1951; Taylor, 1967; and Taylor and Noble, 1969, for earlier interpretations of this and other Alaska-type bodies in southeastern Alaska.) About 80% of the body is dunite and wehrlite that grade into each other. Small-scale cumulus layering is present but the body is poorly exposed and its overall structure is uncertain. The body probably has steeply dipping contacts and extends under Frederick Sound to the northeast for a half mile or more (Brew, 1997). The mafic-ultramafic complex intrudes metamorphosed pelite of the Jurassic or Cretaceous Semour Canal Formation and is bordered to the northwest and and south by Cretaceous migmatite. The Kane Peak complex has been dated at 93.4 to 102.0 Ma by K-Ar methods.

Pyrrhotite, pentlandite, and chalcopyrite are sporadically disseminated through the peridotite; sparse disseminated chromite occurs widely in the dunite; and the hornblendite locally contains titaniferous magnetite. Himmelberg and Loney (1995) provide trace metal content of several metals including Co, Ni, and Cr.

Still and others (2002) collected samples at several localities. Analyses of samples collected along the shoreline showed nothing of interest. A stream-sediment sample from a stream on the northeast side of Kane Peak contained 124 parts per billion (ppb) platinum, and two samples from a malachite-stained outcrop on the south-facing slope of the east ridge contained 1,954 and 2,2078 parts per million copper, 113 and 78 ppb platinum, and 180 and 83 ppb palladium.

Alteration:

Age of mineralization:

Late to Early Cretaceous based on 93.4 to 102.0 Ma, K-Ar age dates (Himmelberg and Loney, 1995).

Generic deposit model:

Deposit model:

Zoned or Alaska-type ultramafic complex with disseminated, magmatic sulfides and oxides.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

In 1960, two claims were staked for iron on the body along the coast near Cape Strait, probably on magnetite-bearing hornblendite that crops out there (U.S. Bureau of Mines, 1980). In addition, the Kane Peak body has repeatedly been visited by geologists over the years as a potential site for Fe, Cu, and Pt-group deposits and for its scientific value. With the possible exception of the claims staked for Fe along Frederick Sound, there is little evidence at present (2007) of anything close to an economic deposit in the complex.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Brew, D.A., Ovenshine, A.T., Karl, S.M., and Hunt, S.J., 1984, Preliminary reconnaissance geologic map of the Petersburg and parts of the Port Alexander and Sumdum 1:250,000 quadrangles, southeastern Alaska: U.S. Geological Survey Open-File Report 84-405, 43 p., 2 sheets, scale 1:250,000.

Cobb, E.H., 1972, Metallic mineral resources map of the Petersburg quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-415, 1 sheet, scale 1:250,000.

Cobb, E. H., 1972, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Petersburg Quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-870, 53 p.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Himmelberg, G.R., and Loney, R.A., 1995, Characteristics and petrogenesis of Alaskan-type ultramafic-mafic intrustions, southeastern Alaska: U.S. Geological Survey Professional Paper 1564, 47 p.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Taylor, H.P., 1967, The zoned ultramafic complexes of southeastern Alaska, in Wyllie, P.J., ed., UIltramafic

and Related Rocks: New York, J. Wiley and Sons, p. 97-121.

Taylor, H.P., Jr., and Noble, J.A., 1969, Origin of magnetite in the zoned ultramafic complexes of southeastern Alaska, in Wilson, H.D.B., ed., Magmatic ore deposits: Economic Geology Monograph 4, p. 209-230.

U.S. Bureau of Mines, 1980, Claim map, Petersburg quadrangle, Alaska: U.S. Bureau of Mines Map 117, 1 sheet, scale 1:250,000.

Walton, M.S., 1951, The Blashke Island ultrabasic complex with notes on related areas in southeastern Alaska: U.S. Geological Survey Open-File Report 126, 266 p.

Primary Reference: Taylor and Noble, 1969; Himmelberg and Loney, 1995

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (on Wrangell Narrows)

Site type: Prospect

ARDF no.: PE013

Latitude: 56.5485 **Quadrangle:** PE C-3

Longitude: 132.9598

Location description and accuracy:

The only description of this prospect (Roehm, 1945) places it on the east side of Wrangell Narrows near December Point, about 2.8 miles north of Point Alexander and 1.2 mile north of Midway Rock. The coordinates reflect that position which is along the south edge of section 29, T. 61 S, R. 80 E., near the shoreline. The prospect was said to extend up from the shoreline into the forest. However, it could not be found in a recent search (Still and others, 2002).

Commodities:

Main: Ag, Au, Sb

Other: As, Hg

Ore minerals: Pyrite, stibnite

Gangue minerals:

Geologic description:

The only description of this prospect is by Roehm (1945 [IR 195-37]). Needle-like crystals of stibnite and pyrite occur along fractures in reddish-colored granite. One sample assayed 13.9 percent antimony and traces of gold and silver . The only working was a 25-foot trench. Karl and others (1999) map the rocks in the area as Cretaceous porphyritic tonalite with biotite, hornblende, epidote, and garnet.

Still and others (2002 could not locate this prospect but they did sample fractured reddish intrusive rock near December Point . Their samples contained up to 141 parts per million (ppm) antimony, 1,420 ppm arsenic, and 18.68 ppm mercury.

Alteration:

Age of mineralization:

Cretaceous or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Stibnite along fractures.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

This small prospect with a 25-foot trench was described in 1945 but could be found in the late 1990s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Roehm, J.C., 1945, Preliminary report of investigations and itinerary of J. C. Roehm in the Wrangell and Petersburg precincts, Alaska: Alaska Territorial Department of Mines Itinerary Report 195-37, 13 p.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Roehm, 1945 (IR 195-37)

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Cascade

Site type: Mine

ARDF no.: PE014

Latitude: 56.9897 **Quadrangle:** PE D-3

Longitude: 132.7938

Location description and accuracy:

This small mine can be been in outcrop just above the high-tide level on the eastern shoreline of Thomas Bay. It is near an unnamed point about 0.6 mile south of Spray Island in the NW1/4, section 25, T. 56 S., R. 79 E. The location is accurate.

Commodities:

Main: Ag, Au

Other: As, Cu, Pb

Ore minerals: Arsenopyrite, chalcopyrite, galena, pyrite, pyrrhotite

Gangue minerals: Quartz

Geologic description:

Buddington (1923) described this deposit as a quartz vein that can be traced for about 250 feet. It consists of a sheeted zone at least 12 feet thick; about half of the sheeted zone is milky-white quartz and half schist. The property was active intermittently until at least into the 1940s. In 1949, 6 tons of ore was mined that produced 6 ounces of gold and 1 ounce of silver. The quartz veins contain sparse, disseminated pyrite, arsenopyrite, chalcopyrite, pyrrhotite, and galena; specimens of arsenopyrite several inches across are common on the dump. The workings are less than 200 feet from the shore line and include two short adits, one 21 feet long and the other 71 feet long, and a trench. The rocks in the area consist of biotite schist and gneiss, gneissic granodiorite, and quartz monzodiorite (Brew and others, 1984).

Maas and Redman (1989) mapped and sampled the workings. One of their samples of a 4-inch-wide quartz vein contained 6,975 parts per billion (ppb) gold; their other 7 samples averaged 371 ppb gold. Still and others (2002) examined the property in 1998. They sampled the mineralized zones which are 3.5 to 6 feet thick. Their highest grade sample across 3.5 feet of vein contained 589 ppb gold but the average of their 8 samples was 137 ppb gold.

Alteration:

Unknown or minor.

Age of mineralization:

Cretaceous or younger based on the age of the metamorphic host rock.

Generic deposit model:

Deposit model:

Low-sulfide gold-quartz vein (Cox and Singer, 1986; model 36a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

There was some minor development on the prospect prior to 1921. The property was active intermittently until at least into the 1940s. A claim was active as recently as 1979.

Production notes:

In 1949, 6 tons of ore was mined that produced 6 ounces of gold and 1 ounce of silver.

Reserves:

None.

Additional comments:

References:

Brew, D.A., Ovenshine, A.T., Karl, S.M., and Hunt, S.J., 1984, Preliminary reconnaissance geologic map of the Petersburg and parts of the Port Alexander and Sumdum 1:250,000 quadrangles, southeastern Alaska: U.S. Geological Survey Open-File Report 84-405, 43 p., 2 sheets, scale 1:250,000.

Buddington, A.F., 1923, Mineral deposits of the Wrangell district: U.S. Geological Survey Bulletin 739-B, p. 51-75.

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Cobb, E. H., 1972, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Petersburg Quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-870, 53 p.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Maas, K.M., and Redman, E.C., 1989, Notes and sketch map of Cascade Mine: Unpublished report by the U.S. Bureau of Mines, 1 sheet, 3 p. (On file at the Bureau of Land Management, Minerals Information Center, Juneau, Alaska.)

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

U.S. Bureau of Mines, 1980, Claim map, Petersburg quadrangle, Alaska: U.S. Bureau of Mines Map 117, 1 sheet, scale 1:250,000.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (on Le Conte Bay)

Site type: Occurrence

ARDF no.: PE015

Latitude: 56.7855 **Quadrangle:** PE D-2

Longitude: 132.4551

Location description and accuracy:
Rumors of gold veins in the schist of Le Conte Bay were cited by Buddington (1923). But there is no record that any lode claims were staked in Le Conte Bay nor more recent confirmation of gold veins in the vicinity. The location defined by the coordinates were chosen arbitrarily in about the center at Thunder Point in Le Conte Bay. The site is locality 21 of Grybeck, Berg, and Karl (1984).

Commodities:

Main: Au?

Other:

Ore minerals:

Gangue minerals:

Geologic description:
Gold veins were reported in the schist belt in Le Conte Bay prior to 1923 (Buddington, 1923). He did not give details and there is no more-recent indication of any deposits in the vicinity nor have any lode claims been staked in the area.

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:
None known.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Buddington, A.F., 1923, Mineral deposits of the Wrangell district: U.S. Geological Survey Bulletin 739-B, p. 51-75.

Cobb, E. H., 1972, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Petersburg Quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-870, 53 p.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Primary Reference: Grybeck, Berg, and Karl, 1984

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Dave's Dream

Site type: Prospect

ARDF no.: PE016

Latitude: 56.8347 **Quadrangle:** PE D-2

Longitude: 132.449

Location description and accuracy:

This prospect is on what were four claims in a glacial valley on an unnamed stream that drains into the north side of Le Conte Bay about 2 1/2 miles west of the terminus of the Le Conte Glacier. The claims are in a relatively flat section of the creek, mostly in the SE1/4 of section 14, T. 58 S., R. 82 E., but a portion extends down into the NE1/4, section 23, T. 58 S., R. 82 E. The coordinates are at about the center of the claims.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Four placer gold claims were staked at the site in the mid-70s and there was at least serious prospecting through the late 1990s (Still and others, 2002). The site is in a glacial basin may have served as a natural trap for heavy minerals in a gravel section 60 feet or so thick. The Bureau of Land Management declared the claims invalid in 1996 and the prospect is now within the Stikine-Leconte Wilderness Area which is closed to mineral exploration and mining.

Alteration:

Age of mineralization:

Quaternary or Recent.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer gold (Cox and Singer, 1986; model 39a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Undetermined

Site Status: Undetermined

Workings/exploration:

Four placer gold claims were staked at the site in the mid-70s and there was at least serious prospecting through the late 1990s (Still and others, 2002). The Bureau of Land Management declared the claims invalid in 1996 and the prospect is now within the Stikine-Leconte Wilderness Area which is closed to mineral exploration and mining.

Production notes:

Possibly some gold produced during prospecting at the site.

Reserves:

None.

Additional comments:

The Bureau of Land Management declared the claims here invalid in 1996 and the prospect is now within the Stikine-Leconte Wilderness Area which is closed to mineral exploration and mining.

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: This description

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Buck Bar

Site type: Mines(?)

ARDF no.: PE017

Latitude: 56.7134 **Quadrangle:** PE C-1

Longitude: 132.0848

Location description and accuracy:

Fine placer gold was found on bars of the Stikine River at Buck Bar in the 1860's when Russia still owned Alaska and the Hudson Bay Company maintained a trading post at Wrangell near the mouth of the Stikine River (Blake, 1868; Spurr, 1898). However, there is no record of placer claims on the Stikine, no record of placer mining on the Stikine since at least 1900, and the location of Buck Bar is uncertain. This location follows Still and others (2002) who place Buck Bar between Shakes Slough and the mouth of the Ketili River in about the middle of section 31, T. 59 S., R.85 E.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Fine placer gold was mined at Buck Bar on the Stikine River in the 1860s when Russia still owned Alaska and the Hudson Bay Company maintained a trading post at Wrangell near the mouth of the Stikine River (Blake, 1860, Spurr, 1898). The location of Buck Bar is now uncertain but Still and others (2002) think it most likely that it is between the mouth of Shakes Slough and the mouth of the Ketili River. There is no record of more recent mining and the amount of gold that was mined in the 1860s was probably small. However, Brooks (1923) noted that this must have been the first gold mined in Alaska.

Alteration:

Age of mineralization:

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer gold (Cox and Singer, 1986; model 39a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

Fine placer gold was found on bars of the Stikine River in the 1860s during early exploration for gold in Alaska. There is no record of claims of significant gold placers in the Stikine or its tributaries since before the turn of the century. The diggings are probably best thought of as prospects rather than mines even if small amounts of gold were produced.

Production notes:

Probably trivial.

Reserves:

None.

Additional comments:

In view of the many generations of prospectors and others who for more than 100 years have passed along the natural corridor of the Stikine River into the interior of Canada without any further mention of placer gold on the Stikine River, this site should now be considered as little more than a historic artifact.

References:

Blake, W.P., 1868, Geographic notes upon Russian America and the Stikine River: U.S. Congress, 40th, 2nd Session, House Executive Document 177, part 2, 19 p.

Brooks, A.H., 1923, The Alaska mining industry in 1921: U.S. Geological Survey Bulletin 739-A, p. 1-50.

Cobb, E.H., 1972, Metallic mineral resources map of the Petersburg quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-415, 1 sheet, scale 1:250,000.

Cobb, E. H., 1972, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Petersburg Quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-870, 53 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Spurr, J.E., 1898, Geology of the Yukon gold district, Alaska, with an introductory chapter on the history and conditions of the district to 1897 by H.B. Goodrich: U.S. Geological Survey 18th Annual Report, Part 3, p. 87-392.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near Lovelace Creek)

Site type:

ARDF no.: PE018

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

The original description for this record only noted the presence of a large block of claims in the general vicinity. Subsequently field work and sampling were used to compile ARDF record PE019 that is within the block of claims in this record. The little information originally in this record is incorporated in PE019. This site number is only retained for accounting purposes.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor. USGS)

Last report date: 2011-03-04

Site name(s): TB

Site type: Occurrence

ARDF no.: PE019

Latitude: 56.5301 **Quadrangle:** PE C-5

Longitude: 133.5211

Location description and accuracy:

This occurrence is near the center of a large, vivid yellow-orange altered zone on southern Kupreanof Island that extends for up to a mile or more in all directions from the coordinates given above and can be seen for miles from the air. The site is plotted about 2 miles north of the center of Kushneahin Lake at the southeast corner of section 34, T. 61 S., R. 76 E.

Commodities:

Main: Cu?, Mo?, Zn

Other:

Ore minerals: Pyrite

Gangue minerals:

Geologic description:

Extensive vivid exposures of yellow-orange altered rhyolite, rhyolite tuff, and rhyolitic glass of Quaternary or Tertiary age crop out in many of the creeks and cut banks in the vicinity (Brew and others, 1984; Brew, 1997). Several exposures were briefly examined by the USGS in 1982 and 1996. Disseminated pyrite is present locally but there are no obvious signs of copper, molybdenum, or other ore minerals. The rocks are pervasively altered and locally brecciated. Several grab samples of the more-altered rhyolite and associated rocks show 5 parts per million (ppm) or less copper and molybdenum. The pyrite and host rocks are part of a large felsic igneous system; possibly a rhyolite dome. The surrounding area is heavily wooded but aerial reconnaissance shows widespread exposures of similar orange and yellow, iron-stained rocks over an area at least several miles in diameter. Although no obvious mineralization has been found, the site is included because this altered zone is so large, so prominent, and it indicates the presence of a very large felsic hydrothermal system. Resource Associates of Alaska (RAA) staked a hundred claims here in 1973, referring to it as the TB block. Several exposures were briefly examined by Still and others (2002) in the late 1990s. A grab sample contained only 425 ppm zinc.

Alteration:

Pyritization, silicification, and kaolinization(?).

Age of mineralization:

Quaternary or Tertiary.

Generic deposit model:

Deposit model:

Highly altered felsic igneous system.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

None other than probable examination by various industry and government geologists who have worked in the area.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-5 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-K, 18 p., 1 sheet, scale 1:63,360.

Brew, D.A., Ovenshine, A.T., Karl, S.M., and Hunt, S.J., 1984, Preliminary reconnaissance geologic map of the Petersburg and parts of the Port Alexander and Sumdum 1:250,000 quadrangles, southeastern Alaska: U.S. Geological Survey Open-File Report 84-405, 43 p., 2 sheets, scale 1:250,000.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near Totem Bay)

Site type: Occurrences

ARDF no.: PE021

Latitude: 56.4797 **Quadrangle:** PE B-5

Longitude: 133.4419

Location description and accuracy:

The coordinates are at the approximate center of a block of nine lode claims staked on southern Kupreanof Island in 1955. The center of the claims is in about the middle of the east side of section 19, T. 62 S., R. 77 E.

Commodities:

Main: Th, U

Other: Ce, La, Nd

Ore minerals:

Gangue minerals:

Geologic description:

In 1952, Houston and others (1958) searched the Totem Bay area for radioactive veins similar to those found to the south across Sumner Strait on southern Prince of Wales Island. He found no indications of them. However claims were staked here for radioactives in 1955 under the name Monongehela. Rocks in the vicinity consist of a thick sequence of Quaternary or Tertiary rhyolite (Brew, 1997 [OF 97-156-G]). Still and others (2002) briefly examined the area with a scintillometer and found a 3-foot-by-3-foot zone that was approximately 60 percent above background. A sample contained 7 parts per million (ppm) uranium, 17 ppm thorium, 43 ppm neodymium, 38 ppm lanthanum, and 110 ppm cerium.

Alteration:

Age of mineralization:

Tertiary or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Nine lode claims staked for radioactive minerals in 1955; apparently there has been no work since on these claims other than a brief examination by government geologists in the late 1990s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg B-5 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-G, 19 p., 1 sheet, scale 1:63,360.

Brew, D.A., Ovenshine, A.T., Karl, S.M., and Hunt, S.J., 1984, Preliminary reconnaissance geologic map of the Petersburg and parts of the Port Alexander and Sumdum 1:250,000 quadrangles, southeastern Alaska: U.S. Geological Survey Open-File Report 84-405, 43 p., 2 sheets, scale 1:250,000.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Houston, J.R., Bates, R.G., Velikanje, R.S., and Wedow, Helmuth, Jr., 1958, Reconnaissance for radioactive deposits in southeastern Alaska, 1952: U.S. Geological Survey Bulletin 1058-A, p. 1-31.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

U.S. Bureau of Mines, 1980, Claim map, Petersburg quadrangle, Alaska: U.S. Bureau of Mines Map 117, 1 sheet, scale 1:250,000.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near Indian Point)

Site type: Prospect

ARDF no.: PE023

Latitude: 56.7234 **Quadrangle:** PE C-4

Longitude: 133.2404

Location description and accuracy:

This site is the approximate center of block of four lode claims staked in 1977 about two miles south of Indian Point on southern Kupreanof Island. This site is near the center of section 26, T. 59 S., R. 77 E.

Commodities:

Main: Au

Other:

Ore minerals: Pyrite

Gangue minerals:

Geologic description:

This site is the near the center of a block of four lode claims staked in 1977 and active through 1978 (U.S. Bureau of Mines, 1980). The site was examined by Still and others (2002) who found a 0.15-foot thick band of pyrite along the foliation of sericite schist. Samples contained up to 187 parts per billion gold. The rocks in the area are part of a Mesozoic phyllite and slate unit (Brew, 1997).

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Thin layer of pyrite with small amount of gold.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Approximate center of block of four lode claims staked in 1977 and active through 1978.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

U.S. Bureau of Mines, 1980, Claim map, Petersburg quadrangle, Alaska: U.S. Bureau of Mines Map 117, 1 sheet, scale 1:250,000.

Primary Reference: U. S. Bureau of Mines, 1980

Reporter(s): H.C. Berg (Fullerton, California) and D.J. Grybeck (USGS)

Last report date: 2007-04-08

Site name(s): Unnamed (north of mouth of Castle River)

Site type: Occurrence

ARDF no.: PE024

Latitude: 56.6664 **Quadrangle:** PE C-4

Longitude: 133.2596

Location description and accuracy:

The coordinates are at the center of an area of mineralized outcrops that occur discontinuously just above the high tide line for about a half mile along the west shore of the large shallow bay at the mouth of the Castle River. The site is locality 29 of Grybeck, Berg, and Karl (1984) and this may be a continuation of the mineral occurrence at PE025 just to the northeast.

Commodities:

Main: Ag, Ba, Cu, Pb, Zn

Other:

Ore minerals: Pyrite, sphalerite

Gangue minerals:

Geologic description:

Outcrops of phyllitic, light greenish gray to cream, felsic metatuff intercalated with muscovite-rich siliceous phyllite occur discontinuously just above the high tide line for about a half mile along the edge of a large shallow bay. The metatuff locally contains massive-sulfide layers up to 6 feet thick with abundant pyrite and sparse sphalerite(?) (Grybeck, Karl, and Berg, 1984). Grab samples of the massive sulfide layers and felsic metatuff show up to 700 parts per million (ppm) lead, 350 ppm zinc, 10 ppm silver, and 2,000 ppm barium. These outcrops may be a continuation of the mineralized occurrence at PE025 just to the northeast. This is probably the locality noted by Buddington (1923) that he described as a pyrite layer about 4 feet wide exposed for 50 feet. Recent mapping by Karl and others (1999) indicates that these outcrops are part of the Hyd Group of Triassic age.

This occurrence was covered by a large block of claims staked by Pacific Alaska Resources Co in the late 1980s and early 1990s; the company planned to drill to test several geochemical anomalies in copper, zinc, and silver but apparently did not follow through. Still and others (2002) sampled several of these lenses; their samples contained up to 31.8 ppm silver, 1,304 ppm lead, 1.7 percent zinc, and 1,268 ppm arsenic.

Alteration:

Age of mineralization:

Late Triassic based on the age of the host rock.

Generic deposit model:

Deposit model:

Kuroko massive-sulfide deposit model (Cox and Singer, 1986, model 28a); alternately a Sierran Kuroko deposit (Bliss, 1992; 28a.1).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
28a or 28a.1

Production Status: None

Site Status: Active

Workings/exploration:
In 1979, nine lode claims were staked in the area that probably covered this deposit. By 1995, a considerable block of ground several square miles in area was staked on and northwest of this site and PE025. Informal discussions with industry geologists who worked in the area indicate that they found several to numerous additional occurrences of similar deposits on these claims (D.J. Grybeck, oral communication, 1996). An aerial examination of the area in 1996 indicated no obvious signs of surface exploration. In 1998, there was renewed interest in the area encouraged by the geophysical surveys the State of Alaska had flown over the area.

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Berg, H.C., 1981, Upper Triassic volcanogenic massive sulfide metallogenic province identified in southeastern Alaska, in Albert, N.R.D., and Hudson, Travis, eds., The United States Geological Survey in Alaska--Accomplishments during 1979: U.S. Geological Survey Circular 823-B, p. B104-B108.

Berg, H.C., and Grybeck, Donald, 1980, Upper Triassic volcanogenic Zn-Pb-Ag (-Cu-Au) mineral deposits near Petersburg, Alaska: U.S. Geological Survey Open-File Report 80-527, 11 p., 1 sheet.

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Buddington, A.F., 1923, Mineral deposits of the Wrangell district: U.S. Geological Survey Bulletin 739-B, p. 51-75.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000..

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Halobia

Site type: Prospect

ARDF no.: PE025

Latitude: 56.672 **Quadrangle:** PE C-4

Longitude: 133.2608

Location description and accuracy:

The prospect is in the intertidal zone at the mouth of a small creek that enters the northern side of the large shallow bay at the mouth of the Castle River; the site is in the NE1/4 section 15, T. 60 S., R. 77E. The locality as seen in 1996 was about 250 feet downstream from a log jam at the high tide mark on the creek. Massive sulfide lenses occur in the center of the creek bed but they are not conspicuous. The location is accurate.

Commodities:

Main: Ag, Pb, Zn

Other: As, barite, Cu

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals:

Geologic description:

Thin lenses of massive sulfides occur in siliceous phyllite that is intercalated with fossiliferous, Upper Triassic black carbonaceous phyllite; garnet-bearing limestone; siltstone; and silvery dark gray muscovite- and quartz-rich phyllite (Berg and Grybeck, 1980; Berg, 1981). The carbonaceous phyllite contains abundant pyrite. The massive sulfide lenses are in several zones 10-12 feet wide and 80-100 feet long in the creek bed in the intertidal zone. Individual lenses within these zones are up to 1 foot wide and 3 feet long; they contain abundant pyrite and up to 5 percent galena and sphalerite. Analyses of grab samples show up to 100 parts per million (ppm) copper, 100 ppm silver, and 1000 ppm arsenic. Several examples of the fossil Halobia collected in rocks interbedded with the sulfide lenses at the deposit unambiguously date the deposit as Late Triassic. Recent mapping by Karl and others (1999) include the rocks at this prospect in the Triassic Hyd Group, which is extensive in the area and hosts several volcanogenic massive sulfide deposits. The deposit is part of the Triassic Duncan Canal-Zarembo Island belt of dismembered, volcanogenic massive-sulfide deposits described by Berg and Grybeck (1980) and Berg (1981). Also see PE024 which is similar in origin and probably a continuation of this deposit.

Pacific Alaska Resources explored in the area in the 1980s and 1990s. They planned to drill several geochemical anomalies in copper, lead, and zinc, about one to one and one-half miles to the west of this occurrence at an elevation of 300 to 700 feet. They apparently did not follow through. Still and others (2002) who mention this work, say that the area to be drilled was east of the Halobia occurrence but that is unlikely as it would be near the shoreline or under Duncan Canal. Bittenbender and others (2000) describe several geochemical anomalies in this area. Still and others (2002) sampled the Halobia occurrence; their samples contained up to 30.8 ppm silver, 5,400 ppm lead, and 5.4 percent zinc.

Alteration:

Age of mineralization:

Unambiguously Late Triassic based on the age of fossils at the site.

Generic deposit model:

Deposit model:

Kuroko massive-sulfide deposit model (Cox and Singer, 1986, model 28a); alternately a Sierran Kuroko deposit (Bliss, 1992; 28a.1).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 28a.1

Production Status: None

Site Status: Active

Workings/exploration:

Discovered by the U.S. Geological Survey in 1979 (Berg and Grybeck, 1980). Nine lode claims were staked on the deposit in 1979; by 1995, a considerable block of ground several square miles in area was staked on and northwest of the original discovery (Department of Natural Resources unpublished Kardex mining claim information system). Informal discussions with industry geologists who worked in the area indicate that they have identified several to numerous additional occurrences of similar deposits on these claims (D.J. Grybeck, oral communications, 1996). Sampled by Still and others (2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Still, J.C., McDonald, M.E. Jr., and Gensler, E.C., 2000, Mineral investigations in the Stikine area, central southeast Alaska, 1997-1998: U.S. Bureau of Land Management Open-File Report 83, 265 p.

Berg, H.C., 1981, Upper Triassic volcanogenic massive sulfide metallogenic province identified in southeastern Alaska, in Albert, N.R.D., and Hudson, Travis, eds., The United States Geological Survey in Alaska--Accomplishments during 1979: U.S. Geological Survey Circular 823-B, p. B104-B108.

Berg, H.C., and Grybeck, Donald, 1980, Upper Triassic volcanogenic Zn-Pb-Ag (-Cu-Au) mineral deposits near Petersburg, Alaska: U.S. Geological Survey Open-File Report 80-527, 11 p., 1 sheet.

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area,

central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Berg and Grybeck, 1980

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Castle Island

Site type: Mine

ARDF no.: PE026

Latitude: 56.6521 **Quadrangle:** PE C-4

Longitude: 133.1667

Location description and accuracy:

The location of the Castle Island mine is well known. However, the original outcrop of the deposit was little more than a large rock at the northeast end of 'Castle Island'; that original outcrop has now been completely mined out to below sea level. Note the mine which is almost universally called 'Castle Island' is not identified as such on the USGS 1:63,360-scale topographic map and none of the Castle Islands is specifically labeled as Castle Island on the current (2007) maps. The island that is the site of the mine and is described here is an islet about about 650 yards long, located about 1,500 feet south of Big Castle Island, which is shown on current topographic maps.

Commodities:

Main: Barite

Other: Ag, Cu, Pb, Sn

Ore minerals: Barite, bornite, chalcopyrite, galena, pyrite, pyrrhotite, sphalerite, tetrahedrite

Gangue minerals:

Geologic description:

The Castle Island barite deposit was known before World War I (Burchard, 1914; Buddington, 1923; Buddington, 1925; Buddington and Chapin, 1929) and was studied several times subsequently (Williams and Decker, 1932 (DGGS IR 117-1); Race, 1963 (DGGS PE 117-9). It was mined nearly continuously from 1966 to 1980 by a succession of companies: Alaska Barite Co from 1966 to 1969; Inlet Oil from from to 1975; and Chromalloy America from 1975 to 1980. The mine closed in 1980 and all the mining equipment and buildings were removed from the island. The original deposit was a small outcrop at the northeast end of the island that was entirely removed by mining. Much of the mining was done underwater from an offshore barge that used a dragline to recover ore fragmented by submarine blasting. The total production was about three-quarters of a million tons of barite, almost all of which was mined from 1968 to 1980 as direct shipping ore.

The ore body consisted of a lenticular, massive barite lens about 300 feet long and up to 200 feet thick that was mined to a depth of about 130 feet below sea level. [This description of the mineralization is synthesized from Burchard (1914); Buddington (1923); Buddington (1925); unpublished written and oral data from David Carnes, U. S. Bureau of Mines; unpublished field notes, analyses, and laboratory studies by the D.J. Grybeck; analyses summarized in Grybeck, Berg, and Karl (1984); and Still and others (2002).] The exact stratigraphic relations are unclear because most of the deposit was under salt water. However, examination of unpublished drilling data and cross sections maintained by the mine indicates that the barite lens probably occurred along the trough of a symmetrical syncline that trends about N30W with limbs that dip about 60NE. The hanging wall was limestone and gray schist; the footwall was graphitic calcareous schist. The drilling also indicated a considerable tonnage of lower grade barite interbedded with 'gray schist,' 'chert,' and 'graphitic schists,' and the possibility of at least one more high-grade barite lens offshore. Mine-run material was massive, white to light gray, almost pure barite that almost invariably contained a percent or so of sulfides as tiny disseminated grains. Assays of the massive barite indicate that it typically contained about 0.5 to 2 percent zinc, about 0.5 percent lead, a small amount of copper, and about 1 ounce of silver per

ton. Under the reflecting microscope, the sulfides are sphalerite, galena, pyrite, pyrrhotite, bornite, tetrahedrite-tennantite, and chalcopyrite, together with minor amounts of other unidentified ore minerals, all as tiny, generally equant grains (D.J. Grybeck, personal observation, 1996). Examination of waste dumps provide many samples that show all transitions from massive barite to layered pyrite(-sphalerite-quartz)-barite rock with the other sulfides noted previously that are disseminated though the rock in minor amount. The association of barite, layered sulfide-barite rocks, schistose metafelsite(?), and black carbonaceous, calcareous phyllite at the mine indicate that it is part of the Triassic Duncan Canal-Zarembo Canal belt of dismembered, volcanogenic massive-sulfide deposits described by Berg and Grybeck (1980) and Berg (1981).

The Castle Islands largely, and the island on which the barite mine occurs specifically, consist largely of Upper Triassic Hyd Group rocks which are dominantly felsic and intermediate volcanic flows and breccia, limestone and argillite. However, some of the islands of the Castle Islands also consist of Devonian limestone and Quaternary basalt whose relationship to the Hyd Group rocks is probably structurally complicated and largely hidden under water (Brew, 1997; Karl and others, 1999).

Alteration:

Age of mineralization:

Late Triassic based on the age of the host rock.

Generic deposit model:

Deposit model:

Barite facies of a Kuroko massive-sulfide model (Cox and Singer, 1986; model 28a); alternatively a barite facies of a Sierran Kuroko model (Bliss, 1992; model 28a.1).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 28a.1

Production Status: Yes; medium

Site Status: Inactive

Workings/exploration:

The Castle Island deposit was known before World War I. It was mined nearly continuously from 1966 to 1980 by a succession of companies: Alaska Barite Co from 1966 to 1969; Inlet Oil from from to 1975; and by Chromalloy America from 1975 to 1980. The mine closed in 1980 and all the mining equipment and buildings were removed from the island. The original deposit was a small outcrop at the northeast end of the island that was entirely removed by mining. Much of the mining was then done underwater from an offshore barge that used a dragline to recover ore that was fragmented by submarine blasting. Essentially, the mine was operated as a submarine open pit from a camp on the island. An earlier phase of drilling and sampling on the original barite outcrop that ultimately resulted in mining the deposit was documented by Race (1963 [PE 117-9]) and Williams and Decker (1932 [IR 117-1]).

Production notes:

The exact production was not systematically reported but total production was about three-quarters of a million tons of barite, most of which was mined from 1968 to 1980 as direct shipping ore. Swainbank and others (1995) indicate that the total production was 776,390 tonnes (865,000 tons) of raw and refined barite produced from 1963 to 1980. Still and others (2002) say that Alaska Barite Company produced 234,000 tons of barite by surface mining from 1966 to 1969 and that Inlet Oil and Chromalloy America produced another 552,888 tons of barite from 1970 to 1980 from the submarine portion of the barite lens.

Reserves:

In 1977, Carnes (1980) inferred that the deposit contained 390,000 tons of low-grade barite resources with a grade of 83 percent BaSO4 and 315,000 tons of higher grade barite resources. In 1980, Holdsworth (1980) estimated that the deposit contained 69,600 tons of ore-grade material. (From 1977 to 1980, the mine produced about 35,000 tons of barite.) When it closed, the mine had little if any reserves that could be economically mined with then-current technology (oral and written communication, 1996, from David Carnes, U. S. Bureau of Mines, who was the mining engineer in charge of the mine over most of its life).

Additional comments:

References:

Berg, H.C., 1981, Upper Triassic volcanogenic massive sulfide metallogenic province identified in southeastern Alaska, in Albert, N.R.D., and Hudson, Travis, eds., The United States Geological Survey in Alaska--Accomplishments during 1979: U.S. Geological Survey Circular 823-B, p. B104-B108.

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Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

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Burchard, E.F., 1914, A barite deposit near Wrangell: U.S. Geological Survey Bulletin 592-D, p. 109-117.

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Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Petersburg quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-870, 53 p.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

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Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan

Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Race, W.H., 1963, Castle Island barite deposit, Duncan Canal, Alaska (Petersburg quadrangle): Alaska Territorial Department of Mines Prospect Evaluation 117-9, 15 p., 1 sheet, scale 1:480.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Swainbank, R.C., Bundtzen, T.K., Clough, A.H., Henning, M.W., and Hansen E.W., 1995, Alaska's mineral industry 1994: Alaska Division of Geological and Geophysical Surveys Special Report 49, 77 p.

Williams, J.A., and Decker, P.A., 1932, Exploring Castle Island barite deposit by diamond drilling, Duncan Canal: Alaska Territorial Department of Mines Miscellaneous Report 117-1, 47 p. (1 sheet, scale 1:250,000).

Primary Reference: This record

Reporter(s): H.C. Berg (Fullerton, California) and D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Helen S

Site type: Mine

ARDF no.: PE028

Latitude: 56.5687 **Quadrangle:** PE C-4

Longitude: 133.0676

Location description and accuracy:

The Helen S Mine is near the northwest corner of Woewodski Island, just inland from the shore and about 100 yards north of the mouth of the creek that drains Harvey Lake. It is in the southwest corner of section 22, T. 61 S., R. R 79 E. The mine is well known and easily accessible. Figure 15 of Still and others is a detailed map of the mine.

Note that there is a massive-sulfide deposit (PE093) that adjoins and/or overlaps the Helen S Mine; it is an entirely entirely different type of deposit and is described separately.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Arsenopyrite, galena, gold, sphalerite

Gangue minerals: Quartz

Geologic description:

The gold-quartz veins of the Helen S mine were discovered in 1902 by a prospector (Wright and Wright, 1908; Buddington, 1923; Still and others, 2002, Roppel, 2005). Later that year, E.N. Harvey, who had taken over the management of the Hattie property (PE032) of the Olympic Mining Company about 2 miles south, largely moved the equipment of the Hattie to the Helen S. There was considerable activity on the Helen S in 1903 and 1904, including the construction of several buildings, setting up a boiler and hoist, sinking two shafts and driving 650 feet of drift out from them. The crew that averaged 31 people. In addition, the 20-stamp mill that was originally meant for the Hattie but had never been set up there was moved to the Helen S. In 1903 and/or 1904, the mill processed an unknown amount of ore that produced about $35,000 (probably mainly if not entirely in gold at $20.67 per ounce). By the end of 1904, however, the mine was in financial difficulties and mining ceased . The Helen S claim was patented in 1910 and Harvey continued to maintain the property as he tried to obtain funds for further work. However, there was little actual mining activity on the property and in 1915, the mine was assigned to a Petersburg bank as a result of a legal judgment against the Olympic Mining Company. The bank soon sold the property and the patented claims have been held since by a succession of private individuals; in 1978 it was sold to a group of residents of Petersburg. More recently, it was examined and sampled by Still and others (2002) as part of a regional mineral assessment by the Bureau of Land Management.

All the early production was from quartz veins of unknown orientation that contained sparse arsenopyrite, pyrite, galena, and sphalerite. There is little outcrop in the immediate vicinity of the workings. Those few and the material on the dumps is black, slate, greenstone, and felsic and intermediate metavolcanic rocks of the Triassic Hyd Group (Brew, 1997; Karl and others, 1999.) Still and others (2002) collected several samples from a 1.5-foot-thick quartz vein that is exposed just below the surface in the shaft about 400 feet north of the old mill site. A grab sample contained 0.328 ounce of gold per ton. Several quartz veins up to 2.3 feet thick are exposed in a small pit behind the cabin near the mouth of the small creek that runs along the west side of the mine. Still and others (2002) collected 6 samples there that contained up to 58 parts per billion gold, 573 parts per million (ppm) copper, and 2,870 ppm zinc.

Note that there is a distinctly different type of deposit, volcanogenic massive sulfides, adjacent to or overlapping the Helen S mine; that deposit is described separately (PE New B1035).

Alteration:

None specifically noted.

Age of mineralization:

The gold-quartz veins are Triassic or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Gold quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The gold-quartz veins of the Helen S mine were discovered in 1902 by a prospector (Wright and Wright, 1908; Buddington, 1923; Still and others, 2002, Roppel, 2005). Later that year, E.N. Harvey, who had taken over the management of the Hattie property (PE032) of the Olympic Mining Company about 2 miles south, largely moved the equipment of the Hattie to the Helen S. There was considerable activity on the Helen S in 1903 and 1904, including the construction of several buildings, setting up a boiler and hoist, sinking two shafts and driving 650 feet of drift out from them. The crew that averaged 31 people. In addition, the 20-stamp mill that was originally meant for the Hattie but had never been set up there was moved to the Helen S. In 1903 and/or 1904, the mill processed an unknown amount of ore that produced about $35,000 (probably mainly if not entirely in gold at $20.67 per ounce). By the end of 1904, however, the mine was in financial difficulties and mining ceased. The Helen S claim was patented in 1910 and Harvey continued to maintain the property as he tried to obtain funds for further work. However, there was little actual mining activity on the property and in 1915, the mine was assigned to a Petersburg bank as a result of a legal judgment against the Olympic Mining Company. The bank soon sold the property and the patented claims have been held since by a succession of private individuals; in 1978 it was sold to a group of residents of Petersburg. More recently, it was examined and sampled by Still and others (2002) as part of a regional mineral assessment by the Bureau of Land Management.

Production notes:

A small amount of ore with a grade of about 0.177 ounce of gold per ton was milled sometime between 1902 and 1915 but total production is uncertain and was probably small (Roehm, 1945). Roehm noted that the ore averaged $3.66 per ton (without specifying the price of gold). Roppel (2005) indicated that the mill processed an unknown amount of ore in 1903 and/or 1904 that produced $35,000 (probably mainly or nearly all in gold at $20.67 per ounce.)

Reserves:

None.

Additional comments:

All the workings are on a patented claim.

References:

Berg, H.C., and Grybeck, Donald, 1980, Upper Triassic volcanogenic Zn-Pb-Ag (-Cu-Au) mineral deposits

near Petersburg, Alaska: U.S. Geological Survey Open-File Report 80-527, 11 p., 1 sheet.

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Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

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Roppel, Patricia, 2005, Striking it rich! Gold mining in southern Southeastern Alaska: Greenwich, Connecticut, Coachlamp Productions, 286 p.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Lost Lake

Site type: Prospect

ARDF no.: PE029

Latitude: 56.5734 **Quadrangle:** PE C-4

Longitude: 133.059

Location description and accuracy:

The Lost Lake prospect is on the north bank of the small lake, locally named 'Lost Lake' on northwestern Woewodski Island (lake '175' on the USGS 1:63,360-scale topographic map). The deposit is about 25 feet north of the lake; it extends extends east and west of a small creek that flows to the north from about the center of north shore of the the lake. Drilling pads and landing sites were visible in 1996 at the prospect and there was additional drilling in 2004. The prospect is near the center of section 22, T. 61 S., R. 79 E. The location is known to within 100 yards and easily located.

Commodities:

Main: Ag, Ba, Pb, Zn

Other: Au?

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

This prospect was found in the late 1970s and has been explored or examined by a number of companies since, including Cominco Exploration, Colony Pacific, Amselco, and Kennecott Exploration. In 1996, it was held by Westmin Resources Limited, who had other properties on Woewodski Island. In 2008, the prospect is held by Bravo Ventures Group. The deposit consists of massive sulfide layers that are covered by only a thin layer of vegetation at several outcrops beside the lake. They have been sampled several times in shallow pits but most of the area is covered by muskeg and vegetation. Several drilling sites were obvious at the prospect in 1996 (D. Grybeck, personal observation) and at least 16 holes are said to have been drilled by then. Four more holes were drilled in 2004.

A resistant layer of cream- to light-gray colored schist about 10 feet thick dams in the north side of Lost Lake. The foliation strikes about N 80 E to S 75 E, i.e., roughly parallel to the north side of the lake, and dips about 70-85 S. The schist contains at least two layers of massive sulfides 8 inches to 16 inches thick that consist mainly of sphalerite with moderate amounts of pyrite and sparse galena (D.J. Grybeck, unpublished field notes, 1996). Analyses of a number of samples of similar(?) schist sampled nearly by Newberry and Brew (1989) indicate that: 1) the schist is probably hydrothermally altered basalt, 2) the schist is geochemically analogous to schist at the Greens Creek mine on Admiralty Island, and 3) the deposit is probably Triassic in age.

Still and others (2002) sampled surface exposures of the bands of massive sulfides exposed at the surface. A 4.4-foot chip sample at one outcrop contained 153.8 parts per million (ppm) silver, 5,519 ppm lead, and 11.5 percent zinc. A 7.5-foot sample across another outcrop with two narrow bands of mineralization contained 83.9 ppm silver, 5,180 ppm led, and 4.5 percent zinc. A third outcrop that exposes a 1.1-foot-thick band of pyrite, sphalerite, and galena in schist contained 282 ppm silver, 2.79 percent lead, and 24.15 percent zinc.

Bravo Ventures Group (2008) reported that high grade zinc mineralization was intersected in two of the three holes drilled in 2004. Samples contained up to 70 grams of silver per ton and 13.6 percent zinc across 1.3 meters and 21 grams of silver per ton and 4.5 percent zinc across 5.9 meters.

Westmin Resources (1997) cited a 'geologic reserve' for the Lost Lake deposit as approximately 500,000 tonnes grading 8.1 percent zinc, 0.6 percent lead, and 77.76 grams of silver per ton.

Alteration:

The schist that host the massive sulfide layers is probably hydrothermally altered basalt.

Age of mineralization:

Probably Triassic based on geochemistry of the host rocks (Newberry and Brew, 1989), and the deposit's similarity to other deposits in the Triassic, Duncan Canal-Zarembo belt of massive sulfide deposits defined by Berg and Grybeck (1980) and Berg (1981).

Generic deposit model:

Deposit model:

Barite facies of a Kuroko volcanogenic massive-sulfide model (Cox and Singer, 1986; model 28a). Alternatively a barite facies of a volcanogenic Sierran Kuroko model (Bliss, 1992; model 28a.1).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 28a.1

Production Status: None

Site Status: Active

Workings/exploration:

This prospect was found in the late 1970s and has been explored or examined by a number of companies since, including Cominco Exploration, Colony Pacific, Amselco, and Kennecott Exploration. In 1996, it was held by Westmin Resources Limited, who had other properties on Woewodski Island. In 2008, the prospect is held by Bravo Ventures Group Several drilling sites were obvious at the prospect in 1996 (D. Grybeck, personal observation,) and at least 16 holes are said to have been drilled by then. Four more holes were drilled in 2004. Still and others (2002) sampled surface exposures which expose bands of massive sulfides.

Production notes:

None.

Reserves:

Westmin Resources (1997) cited a 'geologic reserve' for the Lost Lake deposit as approximately 500,000 tonnes grading 8.1 percent zinc, 0.6 percent lead, and 77.76 grams of silver per ton.

Additional comments:

References:

Berg, H.C., 1981, Upper Triassic volcanogenic massive sulfide metallogenic province identified in southeastern Alaska, in Albert, N.R.D., and Hudson, Travis, eds., The United States Geological Survey in Alaska--Accomplishments during 1979: U.S. Geological Survey Circular 823-B, p. B104-B108.

Berg, H.C., and Grybeck, Donald, 1980, Upper Triassic volcanogenic Zn-Pb-Ag (-Cu-Au) mineral deposits near Petersburg, Alaska: U.S. Geological Survey Open-File Report 80-527, 11 p., 1 sheet.

Bravo Ventures Group, 2008, http://www.bravoventuregroup.com/en/index.php?page=projects&projectid=14#section24, as of February 15, 2008.

Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000

Newberry, R.J., and Brew, D.A., 1989, Epigenetic hydrothermal origin of the Groundhog Basin-Glacier Basin silver-tin-lead-zinc deposits, southeastern Alaska: U.S. Geological Survey Bulletin 1903, p. 113-121.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Westmin Resources, 1997: http://westmin-resources.com/explore.html

Primary Reference: Still and others, 2002

Reporter(s): H. C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (along Harvey Creek)

Site type: Mine

ARDF no.: PE030

Latitude: 56.5664 **Quadrangle:** PE C-4

Longitude: 133.0655

Location description and accuracy:

This small mine on northwestern Woewodski Island is about 900 feet east-southeast of the mouth of the creek that drains Harvey Lake; it is along a trail from saltwater to the Harvey Lake Forest Service cabin. There are several occurrences of mineralization along the creek from about 800 to 2,000 feet above its mouth. The coordinates are at the location of a small mine dump and mill that was active in the 1930s.

Commodities:

Main: Au

Other:

Ore minerals: Arsenopyrite, gold, pyrite

Gangue minerals: Quartz

Geologic description:

The rocks in the area consist of silicified and pyritized phyllite and light greenish gray metatuff (?) that is part of the Triassic Hyd Group (Karl and others, 1999). Still and others (2002), guided by an unpublished 1930s-vintage report found several auriferous quartz stringers along about 800 feet of the creek banks and in nearby outcrops; their samples contained up to 1.89 ounce of gold per ton. There is also a small mill and dump and a small pelton wheel along the creek that probably date to the 1930s. Grab samples of the dump that they thought probably represented the mill feed, contained 5,482 to 7,944 parts per billion. Two shallow holes that were drilled near the dump in 1977 to test the mine did not reveal significant mineralization.

Alteration:

The Triassic phyllite and metatuff that host the deposit are silicified and pyritized in the area.

Age of mineralization:

Triassic or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Low-sulfide gold quartz vein (Cox and Singer, 1986; model 36a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

This mine was active in a small way in the 1930s; a small Pelton wheel and hammer mill remain by a small dump.

Production notes:

Production uncertain but a small amount of gold was probably recovered during the 1930s.

Reserves:

None.

Additional comments:

References:

Buddington, A.F., 1923, Mineral deposits of the Wrangell district: U.S. Geological Survey Bulletin 739-B, p. 51-75.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Maid of Mexico

Site type: Mine

ARDF no.: PE031

Latitude: 56.5652 **Quadrangle:** PE C-4

Longitude: 133.029

Location description and accuracy:

This is a well known mine on central Woewodski Island. It is about 0.5 mile north-northeast of the center of the east end of Harvey Lake and about 0.4 mile south-southeast of the center of section 23, T 61 S, R. 79E. In 1996, a trail was still passable from the center of the north shore of Harvey Lake, north to the mine, but in later years it was difficult to follow in the heavy timber and vegetation. The location is accurate.

Commodities:

Main: Au

Other: Ag, Cu, Pb, Zn

Ore minerals: Chalcopyrite, galena, gold, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The Maid of Mexico vein was discovered about 1902 and explored by more than 1000 feet of underground workings from several adits prior to World War II (Still and others, 2002). A small mill was built on the property about 1920 and some production resulted, probably about 1,200 ounces from 1915 to 1938. Roppel (2005) recounts much historical detail about the early history of the Maid of Mexico, the personalities involved in it, and its changes in ownership until World War II. The property was active in 1979 and the owners had cleaned out the drifts in anticipation of production; apparently little has been done done. However, it was still held privately in 2002 according to Still and others. Williams (1953) noted that the Alaska Department of Mines had seven confidential maps dating from 1933 to 1935 of the underground workings in their files. He noted 130 feet of crosscut from 3 adits, 260 feet of drifting on the vein, and several raises and winzes.

The Maid of Mexico vein is about 2-6 feet thick, averaging about 4 feet. It can be traced for at least 1,000 feet on the surface but the underground working expose only a small portion of it (Still and others, 2002). The vein consists mainly of white quartz with sparse sphalerite, pyrite, galena, chalcopyrite, and free gold. It is mostly in black carbonaceous argillite associated with pyrite-bearing, calcareous felsic metatuff, felsic dikes, and minor limestone and mudstone. The black carbonaceous unit is overlain (?) by greenstone, greenschist, and marble. Several faults are known in the underground workings. Brew (1997) correlates the country rock with the Triassic Hyd Group, which in the Duncan Canal area typically consists of felsic and intermediate flows and breccia, argillite, and minor limestone.

Nine samples of the vein collected by Williams (1953) assayed trace to 0.64 ounces of gold per ton, a trace of silver, 0.20-0.68 percent lead, and 0.30 to 0.77 percent Zn. Using several old unpublished maps that date to the 1930s when the property was active, Still and others (2002) compiled a map of the surface workings, the three adits, and at least some of the underground workings. They also sampled a cut at the surface that exposes a quartz vein up to 1.8 feet thick. It contained from 5 to 1,351 parts per billion (ppb) gold. As reconstructed from the old maps, 69 samples taken underground along a 250-foot drift averaged 0.2 ounce of gold per ton across a widths of 1 to 4 feet; two of the raises averaged 0.3 ounce of gold per ton across a width of 1 to 4 feet. Another raise 80 feet long averaged 0.16 ounce of gold per ton, and a sample

from raise another contained 2.80 ounce of gold per ton. Still and other also noted that the samples collected by Williams were considerably less rich than those cited on the old maps and the average grade of the ore that was being mined as noted by Buddington (1923 was about 1 ounce of gold per ton.

Alteration:

None specifically noted.

Age of mineralization:

Triassic or younger based on age of the host rock.

Generic deposit model:

Deposit model:

Gold quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes

Site Status: Active

Workings/exploration:

The deposit was explored by more than 1000 feet of underground workings from three adits prior to World War II. The property was active in 1979 and the owners had cleaned out the drifts in anticipation of production but apparently little has been done since (D.J. Grybeck, unpublished field notes). The mine was still held privately in 2002 according to Still and others. Williams (1953) noted that the Alaska Department of Mines had seven confidential maps dating from 1933 to 1935 of the underground workings in their files. He cited 130 feet of crosscut from the portal of the mine and 260 feet of drifting on the vein; also several raises and winzes. Using several old unpublished maps that date to the 1930s when the property was active, Still and others (2002) compiled a map of the surface workings, the three adits on the property, and at least some of the nearly thousand feet of underground workings.

Production notes:

Small test shipments were made as early as 1917 and the property produced ore during the 1930s. The remains of a small mill are still present on the property. Detailed production records are not available but Still and others (2002) indicate that about 1,200 ounces of gold was produced from 1915 to 1936.

Reserves:

None.

Additional comments:

References:

Berg, H.C., and Grybeck, Donald, 1980, Upper Triassic volcanogenic Zn-Pb-Ag (-Cu-Au) mineral deposits near Petersburg, Alaska: U.S. Geological Survey Open-File Report 80-527, 11 p., 1 sheet.

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Buddington, A.F., 1923, Mineral deposits of the Wrangell district: U.S. Geological Survey Bulletin 739-B, p. 51-75.

Cobb, E.H., 1972, Metallic mineral resources map of the Petersburg quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-415, 1 sheet, scale 1:250,000.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Petersburg quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-870, 53 p.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Roehm, J.C., 1945, Preliminary report of investigations and itinerary of J. C. Roehm in the Wrangell and Petersburg precincts, Alaska: Alaska Territorial Department of Mines Itinerary Report 195-37, 13 p.

Roppel, Patricia, 2005, Striking it rich! Gold mining in southern Southeastern Alaska: Greenwich, Connecticut, Coachlamp Productions, 286 p.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Williams, J.A., 1953, Preliminary report on Maid of Mexico property (Woewodski Island): Alaska Territorial Department of Mines Prospect Evaluation 117-6, 4 p., 1 sheet, scale 1:63,360.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Still and others, 2002

Reporter(s): H. C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Hattie

Site type: Mine

ARDF no.: PE032

Latitude: 56.532

Quadrangle: PE C-4

Longitude: 133.0477

Location description and accuracy:

The adit of the Hattie Mine is about 0.1 mile east of the shoreline near the southwest end of Woewodski Island. It it about 0.3 mile east-southeast of the southeast tip of Butterworth Island, near the northwest corner of section 2, T. 61 S., R. 79 E. The location is accurate. Figure 22 of Still and others is a map of the underground workings of the Hattie Mine.

Commodities:

Main: Au

Other: Cu, Pb, Zn

Ore minerals: Chalcopyrite, galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The Hattie Mine dates to at least 1899 and by 1902, the Olympic Mining Company had driven several hundred feet of underground workings and had built a substantial camp and a mill building on the shore below the adit of the mine. Roppel (2005) documents much of the early history and personalities of the property and shows an early picture of the camp. Mill machinery was ordered and shipped to the property but never assembled at the Hattie. Shortly thereafter the underground work proved disappointing and the operations of the company and the new mill equipment moved north on Woewodski Island to the Helen S Mine (PE028). The Hattie camp burned in 1911 and there does not seem to have been any underground work on the property since. There is no documented production. However, there have been persistent rumors of at least a small test ore shipment in the early part of the century that was processed at the nearby Helen S mill with mixed results (Roehm, 1945). Since the 1970s, much of Woewodski Island has been covered by claims by a succession of companies: Cominco Exploration, Colony Pacific, Amselco, Kennecott Exploration, Westmin Resources, and currently (Feb 2008) the Bravo Venture Group. Many of the claims covered the Hattie property but other than geochemical sampling and routine sampling of the Hattie dump and underground workings for background, there has been no recent work on the Hattie itself. The underground workings were still accessible in the late 1990s when Still and others (2002) sampled them as part of a regional mineral assessment by the Bureau of Land Management. The workings consist of about 325 feet of drifts, a 65-foot raise, and a winze.

The rocks in the vicinity are mainly rusty-weathering, light-greenish gray calcareous metarhyolite that is part of the Triassic Hyd Group (Brew, 1997, Karl and others, 1999). The metarhyolite is intruded by Mesozoic epidote-hornblende gabbro and by fresh, medium-grained Cretaceous diorite.

Four brecciated quartz veins up to 10 feet thick cut sheared diorite in the mine workings (Still and others, 2002); they contain sparse to rare disseminated pyrite, and rare grains of chalcopyrite, galena, and sphalerite. Gold values are uncertain but probably low; the best assay from several samples collected by the USGS on the dump in the early 1980s was 0.05 ounce of gold per ton (Grybeck, Berg, and Karl, 1984). Roehm (1945) noted that the deposit had low silver and gold values. Of the 27 samples collected underground and from the dumps at the Hattie by Still and others (2002), the highest gold value was 134 parts per billion (ppb) gold and all the rest contained less than 37 ppb.

Alteration:

Age of mineralization:

Cretaceous or younger based on the age of the diorite host rock.

Generic deposit model:

Deposit model:

Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Active?

Workings/exploration:

The Hattie Mine dates to at least 1899 and by 1902, the Olympic Mining Company had driven several hundred feet of underground workings and had built a substantial camp and a mill building on the shore below the adit of the mine. Roppel (2005) documents much of the early history and personalities of the property and shows an early picture of the camp. Mill machinery was ordered and shipped to the property but never assembled at the Hattie. Shortly thereafter the underground work proved disappointing and the operations of the company and the new mill equipment moved north on Woewodski Island to the Helen S Mine (PE028). The Hattie camp burned in 1911 and there does not seem to have been any underground work on the property since. Since the 1970s, much of Woewodski Island has been covered by claims by a succession of companies: Cominco Exploration, Colony Pacific, Amselco, Kennecott Exploration, Westmin Resources, and currently (Feb 2008) the Bravo Venture Group. Many of the claims covered the Hattie property but other than geochemical sampling and routine sampling of the Hattie dump and underground workings for background, there has been no recent work on the Hattie itself. The underground workings were still accessible in the late 1990s when Still and others (2002) sampled them as part of a regional mineral assessment by the Bureau of Land Management. The workings consist of about 325 feet of drifts, a 65-foot raise, and a winze.

Production notes:

There is no documented production. However, there have been persistent rumors of at least a small test ore shipment in the early part of the century that was processed at the nearby Helen S mill with mixed results (Roehm, 1945).

Reserves:

None.

Additional comments:

References:

Berg, H.C., and Grybeck, Donald, 1980, Upper Triassic volcanogenic Zn-Pb-Ag (-Cu-Au) mineral deposits near Petersburg, Alaska: U.S. Geological Survey Open-File Report 80-527, 11 p., 1 sheet.

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Cobb, E.H., 1972, Metallic mineral resources map of the Petersburg quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-415, 1 sheet, scale 1:250,000.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Petersburg quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-870, 53 p.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Roehm, J.C., 1945, Preliminary report of investigations and itinerary of J. C. Roehm in the Wrangell and Petersburg precincts, Alaska: Alaska Territorial Department of Mines Itinerary Report 195-37, 13 p.

Roppel, Patricia, 2005, Striking it rich! Gold mining in southern Southeastern Alaska: Greenwich, Connecticut, Coachlamp Productions, 286 p.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Wright, F.E., and Wright, C.W., 1905, Economic developments in southeastern Alaska: U.S. Geological Survey Bulletin 259, p. 47-68.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Still and others, 2005; Roppel, 2005

Reporter(s): H. C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (in vicinity 'Brushy Creek')

Site type: Prospect

ARDF no.: PE033

Latitude: 56.5204 **Quadrangle:** PE C-4

Longitude: 133.0188

Location description and accuracy:

This prospect consists of several cuts in the banks of 'Brushy Creek' between elevations of 90 to 170 feet. Brushy Creek is the informal name given to the creek that flows southwest, about 1.3 miles northwest of the southern tip of Woewodski Island. The coordinates are at about the center of the workings which trend southwest through the southwest quarter of section 1, T. 61 S., R. 79 E. The location is accurate.

Commodities:

Main: Ag, Au, Pb, Zn

Other:

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals:

Geologic description:

During the middle 1990s, Westmin Resources was active on Brushy Creek near the southern tip of Woewodski Island.). They excavated a series of cuts along the creek bank for about 3,000 feet between elevations of 90 to 170 feet and collected gridded soil samples over the area.

The rocks in the area are greenstone and greenschist of the Triassic Hyd Formation (Brew, 1997; Karl and others, 1999). Still and others (2002) collected samples in the cuts of iron-stained silicified volcanic rocks with thin bands of and disseminated pyrite, sphalerite, and galena. The best, a 2-foot chip sample, contained 423 parts per billion gold, 27.9 parts per million (ppm) silver, 7,380 ppm lead, and 2.6 percent zinc. Six others contained 1,731 ppm to 2.2 percent zinc.

Alteration:

Volcanic rocks near the mineralization are silicified.

Age of mineralization:

Late Triassic based on the age of the host rock and similarities to massive sulfide deposits in the Duncan-Zarembo belt of mineralization.

Generic deposit model:

Deposit model:

Volcanogenic massive sulfide deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

During the middle 1990s, Westmin Resources was active on Brushy Creek near the southern tip of Woewodski Island. They excavated a series of cuts along the creek bank for about 3,000 feet between elevations of 90 to 170 feet and collected gridded soil samples over the area. Still and others (2002) sampled the area as part of a regional mineral assessment for the Bureau of Land Management.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): H. C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): East Lake

Site type: Prospects

ARDF no.: PE034

Latitude: 56.5587

Quadrangle: PE C-4

Longitude: 133.0245

Location description and accuracy:

This record includes several prospects scattered in a heavily forested area somewhat larger than 1,000 feet in diameter, centered about 0.5 mile east of the east end of Harvey Lake. The center of the area is about 0.5 miles west-northwest of the center of section 25, T 61 S, R. 79 E. Still and others (2002, figure 18) show the location of 9 holes drilled in 1999 and the location of the several samples they collected.

Commodities:

Main: Ag, Au, Zn

Other:

Ore minerals: Sphalerite

Gangue minerals: Barite

Geologic description:

At various times from the 1970s to the present, much of central Woewodski Island was staked by a succession of companies; these include Resource Associates of Alaska, Cominco Exploration, Colony Pacific, Amselco, Kennecott Exploration, Houston Oil and Minerals, Westmin Resources, and the Olympic Resources Group. During the late 1980s and early 1990, there was considerable geochemical sampling in this area and a hole was drilled sometime before 1998 that was reported to intersect notable zinc values. (Still and others, 2002). In 1999, P. Beardslee of Petersburg drilled 9 shallow holes in the area that intersected thin bands of massive pyrite. Still and others (2002) found several outcrops in the thick forest that covers the area. One outcrop of iron-stained schist with 10 percent disseminated and banded pyrite did not contain significant metal values. However a sample nearby with 0.4 feet of massive pyrite exposed in a small landslide contained 1,023 parts per million zinc. Brew (1997) correlates the country rock in this area with the Triassic Hyd Group which typically consists of felsic and intermediate flows and breccia, argillite, and minor limestone in the Duncan Canal area.

In 2007, Bravo Ventures Group (2008) drilled two holes that totaled 432.6 meters; the holes were sited on anomalies that were defined with detailed gravity and 3D IP, ground geophysical surveys. The holes intersected several intervals of semi-massive pyrite and fine grained black to gray argillite. Both holes intersected intervals at least 16 meters thick with more than 1 parts per million silver, more than 0.1 percent zinc, and notable but discontinuous gold and barium values.

Alteration:

None noted specifically.

Age of mineralization:

Triassic or younger based on age of the host rock.

Generic deposit model:

Deposit model:

Kuroko massive sulfides.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

At various times from the 1970s to the present, much of central Woewodski Island was staked by a succession of companies; these include Resource Associates of Alaska, Cominco Exploration, Colony Pacific, Amselco, Kennecott Exploration, Houston Oil and Minerals, Westmin Resources, and the Olympic Resources Group. During the late 1980s and early 1990, there was considerable geochemical sampling in this area and a hole was drilled sometime before 1998 that was reported to intersect notable zinc values. (Still and others, 2002). In 1999, P. Beardslee of Petersburg drilled 9 shallow holes in the area that intersected thin bands of massive pyrite. Still and others (2002) found several outcrops in the thick forest that covers the area and sampled them. In 2007, Bravo Ventures Group (2008) drilled two holes that totaled 432.6 meters; the holes were sited on anomalies that were defined with detailed gravity and 3D IP, ground geophysical surveys.

Production notes:

None.

Reserves:

None.

Additional comments:

Area covered by active claims in 2008.

References:

Bravo Venture Group, 2008, Woewodski program update: http://www.bravoventuregroup.com/en/index.php?page=news&newsid=109 (as of March 17, 2008).

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002; Bravo Venture Group, 2008

Reporter(s): H. C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Mad Dog; Fortune

Site type: Prospect

ARDF no.: PE035

Latitude: 56.5321 **Quadrangle:** PE C-4

Longitude: 133.0555

Location description and accuracy:

This prospect is at the southeastern tip of Butterworth Island next to the south end of Whiskey Pass, which is the channel between Woewodski Island and Butterworth Island. The deposit extends out into the flat that uncovers at low tide between Butterworth Island and the small unnamed island off its south tip. It is near the northeast corner of section 3, T. 62 S, R. 79 E. The location is accurate.

Commodities:

Main: Ag, Au, Pb, Zn

Other:

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals: Barite?

Geologic description:

The Mad Dog prospect has been known since at least 1978 and has been examined and sampled by a succession of companies: Cominco Exploration, Colony Pacific, Amselco, Kennecott Exploration, and Westmin Resources. It currently (2008) is held by the Bravo Venture Group. Several holes have been drilled over the years; most recently Bravo drilled 4 holes in 2004. Some of the better mineralization is in the intertidal zone and only uncovers at low tide. The mineralization does not appear to extend onto Woewodski Island.

The host rocks on the southern tip of Butterworth Island are greenschist and greenstone of the Triassic Hyd Group (Brew, 1997; Karl and others, 1999). However, most of the island is Upper Cretaceous hornblende diorite.

The deposit consists of volcanogenic massive sulfide layers and lenses in Triassic Hyd Group rocks analogous to other similar deposits in the Duncan-Zarembo mineral belt (Berg and Grybeck, 1980; Berg, 1981). The massive sulfide layers and lenses are from about 0.1 to 1 foot thick , follow the layering in greenschist and phyllite, and consist mainly of pyrite, black sphalerite, and galena. The bands have an unusually high silver content relative to other massive sulfide deposits in the area. One of the better exposed zones of mineralization at the tip of Butterworth Island shows sulfide bands and lenses across 15 feet that extend for about 160 feet along strike. More mineralization was found near the tip of the small unnamed island south of Butterworth Island but it is exposed only at low tide. Still and others (2002) collected 15 samples of the richer portions of the mineralization. They contained from 58 to 3,927 parts per billion gold, 43 to 630.4 parts per million (ppm) silver, 341 to 9.76 percent lead, and 3,951 ppm to 20.1 percent zinc.

In their 2004 drilling, Bravo Venture Group (2008) cut a 20-meter-thick mineralized zone. One intercept 3.8 meters long contained 16.4 ounces of silver per ton, 2.8 percent lead, and 22.4 percent zinc, and several other intercepts contained 131 to 437 grams of silver per ton, 0.59 to 5.03 percent lead, and 10.95 to 20.2 percent zinc.

Alteration:

Age of mineralization:

Upper Triassic based on similarity to other volcanogenic massive sulfide deposits in the area.

Generic deposit model:

Deposit model:

Barite facies of a Kuroko volcanogenic massive-sulfide model (Cox and Singer, 1986, model 28a). Alternatively a barite facies of a volcanogenic Sierran Kuroko model (Bliss, 1992, model 28a.1).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 28a.1

Production Status: None

Site Status: Active

Workings/exploration:

The Mad Dog prospect has been known since at least 1978 and has been examined and sampled by a succession of companies: Cominco Exploration, Colony Pacific, Amselco, Kennecott Exploration, and Westmin Resources. It currently (2008) is held by the Bravo Venture Group. Several holes have been drilled over the years; most recently Bravo drilled 4 holes in 2004.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Berg, H.C., 1981, Upper Triassic volcanogenic massive sulfide metallogenic province identified in southeastern Alaska, in Albert, N.R.D., and Hudson, Travis, eds., The United States Geological Survey in Alaska--Accomplishments during 1979: U.S. Geological Survey Circular 823-B, p. B104-B108.

Berg, H.C., and Grybeck, Donald, 1980, Upper Triassic volcanogenic Zn-Pb-Ag (-Cu-Au) mineral deposits near Petersburg, Alaska: U.S. Geological Survey Open-File Report 80-527, 11 p., 1 sheet.

Bravo Venture Group, 2008, http://www.bravoventuregroup.com/en/index.php?page=projects&projectid=14 (as of March 4, 2008).

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002; Bravo Venture Group (2008)

Reporter(s): H. C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Lake; Margery Group

Site type: Mine

ARDF no.: PE038

Latitude: 56.4737 **Quadrangle:** PE B-1

Longitude: 132.0958

Location description and accuracy:

The location of this mine as shown in Gault and others (1953). It is about two miles east of the east end of Virginia Lake at an elevation of about 1,450 feet and about 0.5 mile southeast of the center of section 23, T. 62 S., R. 86 E. The location is accurate.

Commodities:

Main: Ag, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, pyrite, sphalerite

Gangue minerals: Calcite, quartz

Geologic description:

The Lake mine was first staked in 1905 as the Margery claims and by 1908 was exposed in several open cuts and short tunnels (Wright and Wright, 1905, 1908). One ton of ore was shipped in 1920 (Gault and others, 1953). It was still active in 1925 when it was restaked as the Lake claims and was active until at least 1927 (Buddington, 1926, Smith 1930a, Smith 1930b). It was restaked in 1965 and then again in 1978 by the Pacific Coast Molybdenum Co. who held the claims until 1986 (Still and others, 2002). The workings consist of three adits, numerous trenches, and surface stripping; most probably date to before 1927.

The mineralization occurs along a major fault zone that strikes N25 to 35 E and dips 70 to 90 degrees to the southeast (Gault and others, 1953; Still and others, 2002) The rocks in the vicinity are dark-colored phyllite and slate, quartzite, chlorite schist, and biotite schist that are about 2000 feet west of large Cretaceous biotite tonalite to granodiorite pluton (Gault and others, 1953; Brew, 1997). The fault zone is 5 to 12 feet wide and has been exposed in the adits and numerous trenches and pits for about 1,450 feet. The mineralization is all within the fault zone and consists of quartz breccia with major galena and lesser sphalerite, pyrite, and chalcopyrite, as well as as massive sulfide bands up to 0.5 feet thick, and sulfide-bearing quartz veinlets and pods.

Still and others (2002) collected several samples. A sample in a narrow vein of galena and sphalerite in Adit 1 (of Gault and others, 1953) contained 161 parts per million (ppm) silver, 8.54 percent lead, and 2.10 percent zinc. A 4.6-foot sample across the face of Adit 2 contained 10.3 ppm silver, 1.058 percent lead, and 1.3 percent zinc; a select dump sample from this adit contained 4.73 ounces of silver per ton, 10.5 percent lead, and 6.60 percent zinc. Still and others also sampled several trenches and pits; the samples contained 178 to 411 ppm silver, 2,049 to 3,266 ppm copper, 7.89 to 25.1 percent lead, and 3.60 to 16.4 percent zinc.

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Sulfide-bearing quartz breccia along a regional fault.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Probably inactive

Workings/exploration:

The Lake mine was first staked in 1905 as the Margery claims and by 1908 was exposed in several open cuts and short tunnels (Wright and Wright, 1905, 1908). One ton of ore was shipped in 1921 (Gault and others, 1953); It was still active in 1925 when it was restaked as the Lake claims and was active until at least 1927 (Buddington, 1926, Smith 1930a, Smith 1930b). It was restaked in 1965 and again in 1978 by the Pacific Coast Molybdenum Co. who held the claims until 1986 (Still and others, 2002). The workings consist of three adits, numerous trenches, and surface stripping; most probably date to before 1927.

Production notes:

One ton of ore shipped to smelter in 1920 (Gault and others, 1953).

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg B-1 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-C, 20 p., 1 sheet, scale 1:63,360.

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Gault, H.R., Rossman, D.L., Flint, G.M., Jr., and Ray, R.G., 1953, Some lead-zinc deposits of the Wrangell district, Alaska: U.S. Geological Survey Bulletin 998-B, p. 15-58.

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Smith, P.S., 1930, Mineral industry of Alaska in 1928: U.S. Geological Survey Bulletin 813-A, 96 p.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

U.S. Bureau of Mines, 1980, Claim map, Petersburg quadrangle, Alaska: U.S. Bureau of Mines Map 117, 1

sheet, scale 1:250,000.

Wright, F.E., and Wright, C.W., 1905, Economic developments in southeastern Alaska: U.S. Geological Survey Bulletin 259, p. 47-68.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Gault and others, 1953; Still and others, 2002

Reporter(s): H. C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Groundhog Basin

Site type: Prospects

ARDF no.: PE040

Latitude: 56.514 **Quadrangle:** PE C-1

Longitude: 132.0632

Location description and accuracy:

The coordinates are near the center of a group of adits and other workings that extend for nearly a mile on the east side of upper Groundhog Basin The prospect is is in the NW1/4, section 7, T. 62 S., R. 86 E. between elevations of 2,000 and 2,500 feet. Gault and others (1953) includes an excellent detailed geologic map of the prospects, as do Still and others (2002).

Commodities:

Main: Ag, Pb, Sn, Zn

Other: Au, Cu, Mo, Sn

Ore minerals: Arsenopyrite, cassiterite, chalcopyrite, cubanite?, fluorite, galena, magnetite, pyrite, pyrrhotite, sphalerite, tennantite-tetrahedrite

Gangue minerals: Quartz, pyroxene, various calc-silicate skarn minerals

Geologic description:

The country rocks in the area of the Groundhog Basin base-metal deposits are Tertiary to Cretaceous biotite schist, biotite-garnet-quartz schist, quartzofeldspathic gneiss, and minor marble and calc-silicate gneiss, all metamorphosed from Mesozoic or Paleozoic protoliths (Gault and others, 1953; Brew, 1997; Still and others, 2002). The metamorphic rocks near the prospects are cut by several large Tertiary felsic dikes and sills that are related to a biotite granite stock that is well exposed about a mile northeast of the belt of mineralization that contains this deposit. The granite has been dated at 16.3 Ma. Newberry and Brew (1989) classify this stock as a 'zinnwaldite' or 'tin' granite and they genetically relate this granite to the base metal prospects in Groundhog Basin and also the nearby porphyry molybdenum deposit (PE102). A large Cretaceous tonalite pluton intrudes the metamorphic rocks less than 3,000 feet west of the Groundhog Basin deposits.

The Groundhog Basin deposits were discovered in 1904 and were extensively explored in 1916-1917. Four claims were patented over the mineralization in 1930. In the early 40s, Ventures Ltd. did considerable surface trenching, drove about 450 feet of underground workings from four adits, and drilled three holes, 107 to 335 feet deep. Gault and others (1953) described much of this early work and did considerable geologic mapping in the area. In 1976, Bunker Hill Mining Company optioned this property and a large block of claims around it (Still and others, 2002). They collected surface samples and drilled 24 holes, 25 to 350 feet deep, but dropped the property at the end of the field season. From 1968 through 1981, Groundhog Basin and the surrounding area was optioned by a succession of companies: Humble Oil and Refining Co., El Paso Natural Gas Co. and AMAX Exploration Inc.; but they did little work specifically on the Groundhog Basin deposits. In 1983, Houston Oil and Minerals Exploration Company sampled the deposits. In 1988, Newberry and Brew (1989) studied the core from previous drilling and the company reports on the Groundhog Basin prospects; they were the first to publicly report on the tin content of the mineralization. The deposit has undoubtedly been examined by numerous companies since but there has been no extensive work since about 1990.

Four distinct steeply-dipping 'ore beds' have been defined, which collectively extend for nearly a mile and parallel the strike of the metamorphic host rocks. The most extensive and thickest, beds 3 and 4, extend

horizontally for about 3,700 feet through a vertical distance of about 1,500 feet (Gault and others, 1953; Still and others, 2002). The ore beds consist of a) masses of ore minerals up to several feet thick, mainly of sphalerite, pyrite, pyrrhotite, galena, chalcopyrite, magnetite, and cubanite(?); and b) layers containing the same assemblage of ore minerals disseminated through the metamorphic host rock. The ore beds are interlayered with steeply-dipping, medium- to high-grade pelitic and quartzofeldspathic schist and gneiss, and locally with banded calc-silicate gneiss. Garnet, pyroxene, and epidote are common near the ore beds in the calcareous rocks and locally form massive skarns. There is considerable detail available that can be found in Gault and others (1953) and Still and others (2002) on the geometry and sampling of the ore beds that is only summarized here.

Newberry and Brew (1989) identified tin in cassiterite as a major constituent of the ore beds and has classified the deposits as Ag-Sn-Pb-Zn skarns that replace calcareous beds in the schist and gneiss. They genetically tie the skarns to a 16.3 Ma zinnwaldite 'tin' granite that crops out north of the deposits. Near this zinnwaldite granite, massive sulfide samples commonly contain several percent tin and selected samples contain up to 18%. They interpreted the mineral paragenesis as: 1) formation of pervasive albite-zinnwaldite gneiss in the cupola of an evolving granite with formation of pyroxene-garnet in adjacent biotite schist and mafic dikes; 2) deposition of lower temperature zinnwaldite-sphalerite-cassiterite veins in the granite and formation of the Ag-Sn-Pb-Zn ore bodies in Groundhog Basin by replacement of calcareous layers in the schist and gneiss; and 3) peripheral sphalerite-galena-fluorite veins as distal, lower temperature manifestation of the granite-related hydrothermal system.

Gault and others (1953), document various attempts to define the ore reserves and resources of the deposit and to quantify the size and grade of certain portions of the 'ore beds.' They conclude, however, that there is insufficient information to justify making detailed estimates of the ore reserves in Groundhog Basin. However, in summary, they state, '...it appears reasonably certain that several hundred thousand tons each of solid and disseminated ore are present.' There solid ore contains about 8 percent zinc, 1.5 percent lead, and 1.5 ounces of silver per ton. The disseminated ore contains about 2.5 percent zinc and 1 percent lead.

Newberry and Brew (1989) estimated that the deposit contains about 1 million tonnes of ore containing 0.8 percent tin but emphasize the great uncertainty of their estimate. Still and others (2002) note several other estimates of the reserves or resources of the Groundhog Basin deposit. They conclude that the best mineralization is the 'solid ore' in beds 3 and 4 as exposed on the surface, in underground workings, and in drill holes. They estimate that those beds contain about 466,000 tons of 'indicated and inferred resources' with an average grade of 8 percent zinc, 3.5 percent lead, 1 ounce of silver per ton, and 0.39 percent copper.

The molybdenite-fluorite deposits that overlap this site are described separately (PE102).

Alteration:

Deposit associated with formation of pyroxene-epidote-garnet skarn in the host rocks.

Age of mineralization:

16.3 Ma based on a genetic tie to a nearby, zinnwaldite 'tin' granite (Newberry and Brew, 1989).

Generic deposit model:

Deposit model:

Banded Ag-Cu-Sn-Pb-Zn tabular replacement bodies, veins, and stringers.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

The Groundhog Basin deposits were discovered in 1904 and were extensively explored in 1916-1917. Four claims were patented over the mineralization in 1930. In the early 40s, Ventures Ltd. did considerable

surface trenching, drove about 450 feet of underground workings from four adits, and drilled three holes, 107 to 335 feet deep. Gault and others (1953) described much of this early work and did considerable geologic mapping in the area. In 1976, Bunker Hill Mining Company optioned this property and a large block of claims around it (Still and others, 2002). They collected surface samples and drilled 24 holes, 25 to 350 feet deep, but dropped the property at the end of the field season. From 1968 through 1981, Groundhog Basin and the surrounding area was optioned by a succession of companies: Humble Oil and Refining Co., El Paso Natural Gas Co. and AMAX Exploration Inc.; but they did little work specifically on the Groundhog Basin deposits. In 1983, Houston Oil and Minerals Exploration Company sampled the deposits. In 1988, Newberry and Brew (1989) studied the core from previous drilling and the company reports on the Groundhog Basin prospects; they were the first to publicly report on the tin content of the mineralization. The deposit has undoubtedly been examined by numerous companies since but there has been no extensive work since about 1990.

Production notes:

None.

Reserves:

Gault and others (1953), document various attempts to define the ore reserves and resources of the deposit and to quantify the size and grade of certain portions of the 'ore beds.' They conclude, however, that there is insufficient information to justify making detailed estimates of the ore reserves in Groundhog Basin. However, in summary, they state, '...it appears reasonably certain that several hundred thousand tons each of solid and disseminated ore are present.' There solid ore contains about 8 percent zinc, 1.5 percent lead, and 1.5 ounces of silver per ton. The disseminated ore contains about 2.5 percent zinc and 1 percent lead.

Newberry and Brew (1989) estimated that the deposit contains about 1 million tonnes of ore containing 0.8 percent tin but emphasize the great uncertainty of their estimate. Still and others (2002) note several other estimates of the reserves or resources of the Groundhog Basin deposit. They conclude that the best mineralization is the 'solid ore' in beds 3 and 4 as exposed on the surface, in underground workings, and in drill holes. They estimate that those beds contain about 466,000 tons of 'indicated and inferred resources' with an average grade of 8 percent zinc, 3.5 percent lead, 1 ounce of silver per ton, and 0.39 percent copper.

Additional comments:

The Groundhog Basin prospect is covered by 4 patented claims.

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-1 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-H, 23 p., 1 sheet, scale 1:63,360.

Brew, D.A., Ovenshine, A.T., Karl, S.M., and Hunt, S.J., 1984, Preliminary reconnaissance geologic map of the Petersburg and parts of the Port Alexander and Sumdum 1:250,000 quadrangles, southeastern Alaska: U.S. Geological Survey Open-File Report 84-405, 43 p., 2 sheets, scale 1:250,000.

Buddington, A.F., 1923, Mineral deposits of the Wrangell district: U.S. Geological Survey Bulletin 739-B, p. 51-75.

Cobb, E.H., 1972, Metallic mineral resources map of the Petersburg quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-415, 1 sheet, scale 1:250,000.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Petersburg quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-870, 53 p.

Gault, H.R., Rossman, D.L., Flint, G.M., Jr., and Ray, R.G., 1953, Some lead-zinc deposits of the Wrangell district, Alaska: U.S. Geological Survey Bulletin 998-B, p. 15-58.

George, R.H., and Wyckoff, B.S., 1973, Whistlepig mineral exploration program, Alaska, Final report 1972 (with attached diamond drill hole logs and analyses): Unpublished El Pas National Gas Company report

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Newberry, R.J., and Brew, D.A., 1989, Epigenetic hydrothermal origin of the Groundhog Basin-Glacier Basin silver-tin-lead-zinc deposits, southeastern Alaska: U.S. Geological Survey Bulletin 1903, p. 113-121.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002 Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Gault and others, 1953; Newberry and Brew, 1989

Reporter(s): H. C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (in Glacier Basin)

Site type: Prospects

ARDF no.: PE041

Latitude: 56.4779 **Quadrangle:** PE B-1

Longitude: 132.0264

Location description and accuracy:

The coordinates are at the lower of two adits in an elongate mineralized area that extends southeast from Marsha Peak to Glacier Basin. The adit is near the center of section 20, T. 62 S., R. 86 E.; it includes several small mineral occurrences and two prospects that are mapped in detail on Plate 9 of Gault and others (1953).

Commodities:

Main: Ag, Au, Be, Pb, Zn

Other: Mo?

Ore minerals: Beryl, galena, magnetite, sphalerite

Gangue minerals: Calc-silicate minerals, fluorite, quartz

Geologic description:

The mineralization on the north side of Glacier Basin was first discovered in 1898 and by 1943 was prospected by three short adits and numerous cuts and pits (Gault and others, 1953; Still and others, 2002). Several companies were active in the area from 1964 to the early 1980s but most of their work was to the north and they probably did little on this prospect beyond general reconnaissance.

The Glacier Basin prospects contain two distinct types of deposits that may be genetically related (Gault and others, 1953; Newberry and Brew, 1989; Still and others, 2002). The first consists of small, discontinuous, banded galena-sphalerite-magnetite lenses and layers that are probably continuous with those in Groundhog Basin (PE040). These deposits are relatively small and more scattered as compared to those in Groundhog Basin, but are essentially the same in mineralogy and origin. The host rocks are gneiss and schist that consists mainly of interlayered amphibolite, marble, and calc-silicate units. Four of these layers have been identified north of Glacier Basin below 3,000 feet in elevation. At the surface, they extend for up to 2,000 feet; they strike north-northwest and dip 50 to 60 degrees southwest. They are interpreted as replacement deposits with skarn affinities. The second type of deposit consists of quartz-fluorite veins and breccia with galena; they are exposed in two small adits where they cut a Tertiary rhyolite sill. Berryhill (1964) sampled these occurrences; he found and found found 5 widely spaced fluorite breccias north of Glacier Basin that contain beryllium which occurs as amorphous blebs of pale blue or creamy white beryl The veins average about 0.1 percent beryllium. Several other rhyolite bodies are nearby; most are conformable with the foliation of the metamorphic rocks. The rhyolite sills and dikes are probably cogenetic with the 20 Ma or younger bodies associated with the molybdenite deposits in the area (see PE043) and/or with the 15-17 Ma zinnwaldite 'tin' granite associated with the Groundhog Basin lead-zinc-silver deposits.

Newberry and Brew (1989) provide analytical data for the tin content of several sulfide-rich occurrences at this site. The tin content is distinctly lower than ore samples from Groundhog Basin and their conclusion is that the Glacier Basin deposits are farther from the source of the hydrothermal fluids that formed them, i.e. from the zinnwaldite 'tin' granite at the north end of Groundhog Basin. Still and others (2002) collected several samples at the lower adit of disseminated and massive sulfides at the contact of a quartz rhyolite sill and gneiss; the best contained 3.97 to 7.98 ounces of silver per ton, 4.64 to 33.4 percent lead, and 4.32 to 7.9

percent zinc. Several samples farther north of the quartz-fluorite veins contained up to 611 parts per billion gold, 1,378 parts per million (ppm) lead, and 2,061 ppm zinc.

Alteration:

Deposits locally associated with development of pyroxene-epidote-garnet skarn.

Age of mineralization:

Probably related to nearby 15-20 Ma rhyolite sills and dikes.

Generic deposit model:

Deposit model:

Banded Ag-Cu-Sn-Pb-Zn tabular replacement bodies, veins, and stringers; (Be)-fluorite-galena veins and breccia.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

The mineralization on the north side of Glacier Basin was first discovered in 1898 and was prospected by three short adits and numerous cuts and pits by 1943 (Still and others, 2002). Several companies were active in the area from 1964 to the early 1980s but most of their work was to the north and they apparently did little on this prospect beyond general reconnaissance.

Production notes:

None.

Reserves:

None.

Additional comments:

Gault and others, (1953) provide detailed maps of the underground workings as well as a detailed surface geologic map that covers Groundhog Basin and extends southward to Glacier Basin to include this this site.

References:

Berryhill, R.V., 1964, Reconnaissance of Glacier Basin for beryllium minerals: U.S. Bureau of Mines unpublished draft report, 12 p., 1 plate. (available from the Bureau of Land Management, Minerals Information Center, Juneau, Alaska).

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg B-1 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-C, 20 p., 1 sheet, scale 1:63,360.

Cobb, E.H., 1972, Metallic mineral resources map of the Petersburg quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-415, 1 sheet, scale 1:250,000.

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Gault, H.R., Rossman, D.L., Flint, G.M., Jr., and Ray, R.G., 1953, Some lead-zinc deposits of the Wrangell district, Alaska: U.S. Geological Survey Bulletin 998-B, p. 15-58.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Newberry, R.J., and Brew, D.A., 1989, Epigenetic hydrothermal origin of the Groundhog Basin-Glacier Basin silver-tin-lead-zinc deposits, southeastern Alaska: U.S. Geological Survey Bulletin 1903, p. 113-121.

Roppel, P., 1987, Little to show for basin effort: Southeast Log, p. 4-5.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Gault and others, 1953

Reporter(s): H.C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA).

Last report date: 2008-03-04

Site name(s): Berg Basin

Site type: Prospect

ARDF no.: PE042

Latitude: 56.4468 **Quadrangle:** PE B-1

Longitude: 132.0108

Location description and accuracy:

This is a well documented prospect on a unnamed south-flowing tributary to the north end of Berg Creek. However, an extended ground and air search for the prospect by Jan Still of BLM and D. J. Grybeck of the USGS in 1996 showed that the area was covered with thick vegetation and talus; the adit was only seen from the air and difficult of access. The prospect is at an elevation of about 1,780 feet at the top of a steep talus slope about 0.5 mile southwest of the center of section 32, T. 63 S., R. 86 E.

Commodities:

Main: Ag, Au, Pb, Zn

Other: Cu

Ore minerals: Chalcopyrite, galena, native gold, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

This prospect was discovered in 1907. It was explored by several surface pits, a tunnel about 800 feet long, and several hundred feet of diamond drilling in 1947 and 1948 (Fowler, 1950) Seven men were working at the property then but apparently there has been no work since.

The country rocks in the area are biotite schist and subordinate marble and calc-silicate rocks that are intruded by Eocene tonalite and granodiorite and by younger dikes and sills of rhyolite, basalt, and pegmatite (Brew and others, 1984).

The deposit consists of a stockwork of quartz veinlets carrying pyrite, galena, and sphalerite, and of sporadic small masses of sphalerite and galena (Gault and others, 1953; Still and others, 2002). Some of the veins contain moderate values of gold and silver. The small sulfide masses occur in a composite basaltic dike, in thin breccia zones along the contacts of basalt and rhyolite dikes and sills, along contacts of basalt dikes with schist near rhyolite, and disseminated in the rhyolite. One diamond drill hole intersected 5 feet of solid and disseminated galena. No galena or sphalerite have been found except where basaltic dikes are associated with rhyolite sills and dikes. The galena contains up to 28 ounces of silver per ton. A quartz vein reported to carry about 0.68 ounce of gold per ton crops out at the surface but could not be found in the underground workings.

Alteration:

Age of mineralization:

The age of the deposit is inferred to be mid-Cenozoic, based on its spatial and apparently genetic association with dikes and sills that cut the Eocene tonalite.

Generic deposit model:

Deposit model:

Polymetallic veins? (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: Undetermined

Site Status: Undetermined

Workings/exploration:

This prospect was discovered in 1907. It was explored by several surface pits, a tunnel about 800 feet long, and several hundred feet of diamond drilling in 1947 and 1948 (Fowler, 1950) Seven men were working at the property then but apparently there has been no work since.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., Ovenshine, A.T., Karl, S.M., and Hunt, S.J., 1984, Preliminary reconnaissance geologic map of the Petersburg and parts of the Port Alexander and Sumdum 1:250,000 quadrangles, southeastern Alaska: U.S. Geological Survey Open-File Report 84-405, 43 p., 2 sheets, scale 1:250,000.

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Chapin, Theodore, 1918, Mining developments in the Ketchikan and Wrangell mining districts: U.S. Geological Survey Bulletin 662-B, p. 63-75.

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Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Gault and others, 1953

Reporter(s): H. C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Camp Six; Huff's Prospect; Nelson Glacier; Whistlepig

Site type:

ARDF no.: PE043

Latitude:

Quadrangle:

Longitude:

Location description and accuracy:

As originally compiled, this site included sparse information on several prospects and occurrences spread over a considerable area. Much new information has come available from several sources and this old site has now become six new sites. This ARDF number is preserved only for accounting purposes.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-03-05

Site name(s): Unnamed (near Point St. Albans)

Site type: Occurrence

ARDF no.: PE045

Latitude: 56.1097 **Quadrangle:** PE A-6

Longitude: 133.9587

Location description and accuracy:

The veins at this occurrence are exposed on a bedrock bench on the intertidal zone about 2.0 mile north of Point St. Albans. The deposit is about 350 yards southwest of triangulation station 'June' shown on the current (1968) 1:63,360 topographic map, near the northeast corner of section 33, T. 66 S., R. 74 E. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other: As, Sb

Ore minerals: Arsenopyrite, berthierite (FeSb2S4), chalcopyrite, galena, pyrite, sphalerite

Gangue minerals: Calcite, quartz

Geologic description:

The veins here were first noted by Houston and others (1958) in their work on the uranium resources of Alaska; they provide little information other than they contain less than 0.0001 equivalent uranium and sphalerite. A claim was staked on the deposits in 1954 but Still and others note that as of 2002, there are no claims on the deposit. This description of the occurrence is largely based on field work in the early 1980s during a mineral resource assessment of the Petersburg quadrangle (Grybeck and others, 1984) and later work by Still and others (2002), all of whom examined the deposit as part of government programs.

Several quartz-calcite veins and lenses up to 6 feet thick and up to a hundred feet long are exposed in rocks exposed in the intertidal zone; they contain abundant sphalerite, galena, pyrite, arsenopyrite, and berthierite (FeSb2S4) (Grybeck, Berg, and Karl, 1984). The veins cut the periphery of a Cretaceous hornblende diorite pluton, which intrudes turbidites of the Silurian Bay of Pillars Formation (Brew, and others, 1984). Selected samples of the veins contain up to 0.5 parts per million (ppm) gold, 300 ppm silver, 360 ppm copper, about 2 percent lead, and 14 percent zinc. As described by Still and others (2002), the quartz-calcite veins are widely spaced and contain spotty, high-grade mineralization across narrow widths. The highest gold values were 8,767 and 5,839 parts per billion; four of the samples contained high silver values of from 126 to 342 ppm. Their samples also contained up to 9.9 percent, zinc, up to 8.15 percent lead, and high contents of mercury, arsenic, and antimony. A sample of massive pyrrhotite and pyrite with interstitial quartz contained 3,094 ppm copper.

Alteration:

None or minor.

Age of mineralization:

Veins cut Cretaceous hornblende diorite.

Generic deposit model:

Deposit model:

Polymetallic vein (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Undetermined

Workings/exploration:

First noted by Houston and others (1958, p. 24) in their work on the uranium resources of Alaska; they provide little information about the veins other than they contain less than 0.0001 equivalent uranium and sphalerite. A claim had been staked on the deposits in 1954 but Still and others note that as of 2002, there are no claims on the deposit. The description of this site is largely based on field work in the early 1980s during a mineral resource assessment of the Petersburg quadrangle (Grybeck, Karl, and Berg, 1984) and later work by Still and others (2002), all of whom examined the deposit as part of government programs.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., Ovenshine, A.T., Karl, S.M., and Hunt, S.J., 1984, Preliminary reconnaissance geologic map of the Petersburg and parts of the Port Alexander and Sumdum 1:250,000 quadrangles, southeastern Alaska: U.S. Geological Survey Open-File Report 84-405, 43 p., 2 sheets, scale 1:250,000.

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Houston, J.R., Bates, R.G., Velikanje, R.S., and Wedow, Helmuth, Jr., 1958, Reconnaissance for radioactive deposits in southeastern Alaska, 1952: U.S. Geological Survey Bulletin 1058-A, p. 1-31.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

U.S. Bureau of Mines, 1980, Claim map, Petersburg quadrangle, Alaska: U.S. Bureau of Mines Map 117, 1 sheet, scale 1:250,000.

Primary Reference: Still and others, 2002

Reporter(s): H. C. Berg (Fullerton, California); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Frenchie; BP Adit

Site type: Prospect

ARDF no.: PE058

Latitude: 56.4187 **Quadrangle:** PE B-3

Longitude: 132.9548

Location description and accuracy:

The Frenchie prospect is at an elevation of less than 100 feet on the south bank of an unnamed creek about one-half mile south of the head of St. John Harbor. It is near the center of the SE1/4, section 8, T. 63 S., R. 80 E. The location is accurate.

Commodities:

Main: Au, Cu, Pb, Zn

Other: Ba

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals:

Geologic description:

The Frenchie deposit was first described as a gold prospect by Buddington in 1923. In 1978, BP Alaska Exploration staked 34 claims on the prospect, mapped and sampled it, conducted airborne and ground geophysical surveys, did stream sediment and soil geochemistry in the area, and recognized it as a volcanogenic massive sulfide deposit (Brewer, 1979). In 1979, geologists from the U.S. Geological Survey examined the thick layer of pyrite that is the most prominent outcrop of the prospect (Berg and Grybeck, 1980) and recognized as one of the deposits along the Duncan Canal-Zarembo belt of Upper Triassic volcanogenic, massive sulfide deposits. Three holes were drilled in 1984 and five more were drilled in 1966 by Westmin Resources (Rockingham, 1996). As of 2007, the property is again active (Mark Robinson, oral communication, 2007). Buddington (1923) describes a 100-foot adit in the pyrite bed and a shaft that was sunk about 100 feet north of the adit. (The shaft could not be located by Still and others, 2002).

The main massive sulfide layer is up to 6 feet thick and and crops out for at least 600 feet along the creek bank (Brewer, 1979; Berg and Grybeck, 1980; Still and others, 2002). This layer consists of 50-75 percent massive sulfides in a siliceous matrix. The sulfides are chiefly pyrite, accompanied by minor sphalerite, chalcopyrite, and galena that form lenses, bands, and knots in the massive pyrite. The hanging wall of the deposit consists of a thin layer of black phyllite above the massive sulfide layer, about 18 inches of siliceous argillite and chert with up to 10 percent pyrite and sphalerite above that, and then about 13 feet of pyritized argillite and schist to the top of the outcrop in the cliff beside the creek. The footwall consist of siliceous, quartz-muscovite phyllite. All are intruded by Tertiary(?) andesite dikes. The massive sulfide layer is cut by several faults but none dislocates the layer significantly. The deposit disappears under surficial material to the west and it truncated by a fault to the east. Karl and others (1999) map the rocks in the area as part of the Upper Triassic Hyd Group that is the host of many of the massive sulfide deposits to the north along the Duncan Canal-Zarembo mineral belt.

Thirteen samples were collected by Brewer (1979) across the main massive sulfide layer; they averaged 0.047 ounce of gold per ton, 0.42 ounce of silver per ton, 0.55 percent copper, 0.08 percent lead, and 1.48 percent zinc, and 5 to 20 percent barite. Still and others (2002) also sampled the deposit. Eight chip samples across the main layer of massive sulfides contained 0.019 ounce of gold per ton, 0.32 ounce of silver per ton, 0.25 percent copper, 0.16 percent lead, 2.4 percent zinc, and 0.08 percent arsenic.

In 2016, Zarembo Minerals Co. LLC focused on better defining the grade and distribution of gold at the

Frenchie deposit by conducting metallic-sieve analyses; results indicate 92 percent of the gold in re-analyzed samples is in the coarser, plus-80-mesh size fraction, which is normally discarded in a standard gold fire assay. A previously sampled, 16-foot-thick section of outcrop now has revised grades of 4.4 grams of gold per tonne, up to 4 percent zinc, and minor lead and silver (Freeman, 2016). In 2017, Zarembo Minerals reprocessed public-domain helicopter electromagnetic and magnetic surveys for the area (Burns and others, 1996), contracted for 3D inversions, and field checked inversion interpretations (Mark Robinson, written communication, 2017).

Alteration:

Age of mineralization:

Late Triassic as part of the Duncan-Zarembo Island mineral belt defined by Berg and Grybeck (1980) and Berg (1981).

Generic deposit model:

Deposit model:

Kuroko volcanogenic massive sulfide deposit (Singer and Cox, 1986; model 28a), or Sierran Kuroko volcanogenic massive sulfide deposit (Bliss, 1992; model 28a.1).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 28a.1

Production Status: None

Site Status: Active

Workings/exploration:

The Frenchie prospect was first described as a gold prospect by Buddington in 1923. In 1978, BP Alaska Exploration staked 34 claims on the prospect, mapped and sampled it, conducted airborne and ground geophysical surveys, carried out stream sediment and soil geochemistry surveys in the area, and recognized it as a volcanogenic massive sulfide deposit (Brewer, 1979). Examined by the U.S. Geological Survey in 1979 (Berg and Grybeck, 1980). Three holes were drilled in 1984 and five more were drilled by Westmin Resources in 1996 (Rockingham, 1996). In 2007, the property is again active (Mark Robinson, oral communication, 2007). Buddington (1923) describes a 100-foot adit into the main massive sulfide layer and a shaft that was sunk about 100 feet north of the adit. (The shaft could not be located by Still and others, 2002).

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Production notes:

None.

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Berg, H.C., 1981, Upper Triassic volcanogenic massive sulfide metallogenic province identified in southeastern Alaska, in Albert, N.R.D., and Hudson, Travis, eds., The United States Geological Survey in Alaska--Accomplishments during 1979: U.S. Geological Survey Circular 823-B, p. B104-B108.

Berg, H.C., and Grybeck, Donald, 1980, Upper Triassic volcanogenic Zn-Pb-Ag (-Cu-Au) mineral deposits near Petersburg, Alaska: U.S. Geological Survey Open-File Report 80-527, 11 p., 1 sheet.

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg B-3 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-E, 23 p., 1 sheet, scale 1:63,360.

Brewer, N.H., 1979, Frenchie project, Zarembo Island, Alaska: Unpublished BP Alaska Exploration summary report, 49 p. (On file at the Bureau of Land Management, Mineral Information Center, Juneau, Alaska.)

Buddington, A.F., 1923, Mineral deposits of the Wrangell district: U.S. Geological Survey Bulletin 739-B, p. 51-75.

Burns, L.E., Geoterrex-Dighem, WGM, Inc., and U.S. Bureau of Land Management, 1999, CD-ROM containing profile and gridded data and section lines of 1999 geophysical survey data for Ketchikan area, parts of the Craig, Dixon Entrance, and Ketchikan quadrangles, southeastern Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report 1999-15, 1 DVD. http://doi.org/10.14509/320

Freeman, C., 2016, ‘We can finally get back to business!’: North of 60 Mining News, p. 11.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Rockingham, C.J., 1996, Report on the 1996 field work, Frenchy claims, Zarembo Islands, southeast Alaska: Unpublished report by Westmin Resources Limited, 8 p. (Report on file at the Bureau of Land Management, Minerals Information Center, Juneau, Alaska.)

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Unnamed (along Snow Passage)

Site type: Occurrences

ARDF no.: PE060

Latitude: 56.2729 **Quadrangle:** PE B-3

Longitude: 132.936

Location description and accuracy:

There are several occurrences of fluorite for about 1,200 feet of the shoreline of Zarembo Island opposite the east side of Bushy Island. The occurrences are mostly in section 33, T. 64 S., R. 80 E.

Commodities:

Main: F

Other: Au, Ba, Ce, La

Ore minerals: Fluorite

Gangue minerals: Chalcedony, quartz

Geologic description:

Sparse fluorite occurs in Tertiary or Quaternary rhyolite for along 1,200 feet of the shoreline of Zarembo Island opposite Bushy Island (Karl and others, 1999; Still and others, 2002). The fluorite occurs as fillings in narrow, vuggy fracture zones, as a coating on chalcedony- or quartz-encrusted fragments in breccia zones, and as geode-like bodies commonly called 'thunder eggs' (Buddington, 1923). Philpotts and Evans (1992) illustrate the geodes and provide a detailed study of their REE content and mineralogy. Although mineralogically interesting, the site as now known is little more than a mineral occurrence. Now and then, specimens of Zarembo fluorite are offered to mineral collectors by dealers. A few brecciated fracture zones up to 3 feet thick and 100 feet long are filled with cream-colored chalcedony. Still and others (2002) sampled the geodes, silicified zones, and fluorite; their samples contained up to 291 parts per billion (ppb) gold, 1,768 parts per million (ppm) barium, 65 ppm cerium, and 38 ppm lanthanum. The fluorite is probably formed by degassing during cooling of the rhyolite in which it occurs.

Alteration:

Fluorite formed during degassing of the Tertiary or Quaternary host rock.

Age of mineralization:

Tertiary or Quaternary based on the age of the host rock.

Generic deposit model:

Deposit model:

Fluorite in rhyolite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Long known in good exposures along the coast; to date of more interest to mineral collectors than as a viable prospect to the mining industry.

Production notes:

As now known, appears to be no more than an interesting mineralogical occurrence. Some specimens of this fluorite have been sold to mineral collectors.

Reserves:

None.

Additional comments:

References:

Buddington, A.F., 1923, Mineral deposits of the Wrangell district: U.S. Geological Survey Bulletin 739-B, p. 51-75.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Petersburg quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-870, 53 p.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Philpotts, John, and Evans, J.R., 1992, Rare earth minerals in 'thunder eggs' from Zarembo Island, southeast Alaska, in Bradley, D.G., and Dusel-Bacon, Cynthia, eds., Geological studies in ALaska by the U.S. Geolgical Survey, 1991: U.S. Geological Survey Bulletin 2041, p. 98-105.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Philpotts and Evans, 1995

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Lost Zarembo

Site type: Occurrence

ARDF no.: PE062

Latitude: 56.3807 **Quadrangle:** PE B-3

Longitude: 132.9007

Location description and accuracy:

This occurrence is well exposed on the north wall of a rock quarry adjacent to a logging road; the quarry is shown by symbol of the 1:63,360-scale topographic map in the NE1/4, section 27, T. 63 S., R. 80 E. It is at an elevation of about 600 feet about 4.0 mile southeast of the Zarembo Spring at the head of St. Johns Harbor.

Commodities:

Main: Ag, Au, Ba, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

Grybeck, Berg, and Karl (1984) describe this deposit as three, massive sulfide layers in orange-weathering, greenish-gray metarhyolite along the west wall of a quarry. The most prominent exposure of the sulfides is a 4-foot-thick layer that crops out for about 50 feet and is truncated at both ends by faults. Selected portions of the massive sulfide layers contain up to 30 percent sulfides, mainly sphalerite, accompanied by minor pyrite, chalcopyrite, and galena; the matrix is fine-grained silica and barite. Analyses of selected grab samples show up to 0.55 parts per million (ppm) gold, about 8 percent zinc, 0.25 percent lead, 0.39 percent copper, 30 ppm or less silver, and up to 5,000 ppm barium. The occurrence forms a wedge-shaped, fault-bounded outcrop about 30 by 100 feet in size that abuts steeply-dipping Tertiary basalt, diabase, and rhyolite dikes. The outcrop of the massive sulfide deposit is small and the quarry walls are dominated by the steeply dipping Tertiary dikes. The association of massive sulfides interbedded with metarhyolite indicates that this occurrence is part of the Duncan Canal-Zarembo belt of dismembered, Upper Triassic volcanogenic massive sulfide deposits described by Berg and Grybeck (1980) and Berg (1981). Karl and others (1999) map the rocks in this area as part of the Triassic Hyd Group which is the host for most of the other massive sulfide deposit along this mineralized belt.

The occurrence was examined and sampled by Still and others (2002). Their samples across the sulfide layers contained 8.3 to 27.6 parts per million (ppm) silver, 966 to 3,781 ppm copper, 818 to 3,567 ppm lead, 1.9 to 4.6 percent zinc, and 1.53 to 10.10 percent barium.

Alteration:

Outcrop is iron-stained, probably from weathering of sulfides.

Age of mineralization:

As now known, this deposit marks the southern end of the Upper Triassic Duncan-Zarembo volcanogenic mineral belt defined by Berg and Grybeck (1980) and Berg (1981).

Generic deposit model:

Deposit model:

Kuroko volcanogenic massive-sulfide deposit (Cox and Singer, 1986; model 28a); alternatively a Sierran Kuroko volcanogenic massive sulfide deposit (Bliss, 1992; model 28a.1).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 28a.1

Production Status: None

Site Status: Inactive

Workings/exploration:

Originally found by the USGS in the late 70s. Examined and sampled by Still and others (2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Berg, H.C., 1981, Upper Triassic volcanogenic massive sulfide metallogenic province identified in southeastern Alaska, in Albert, N.R.D., and Hudson, Travis, eds., The United States Geological Survey in Alaska--Accomplishments during 1979: U.S. Geological Survey Circular 823-B, p. B104-B108.

Berg, H.C., and Grybeck, Donald, 1980, Upper Triassic volcanogenic Zn-Pb-Ag (-Cu-Au) mineral deposits near Petersburg, Alaska: U.S. Geological Survey Open-File Report 80-527, 11 p., 1 sheet.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Grybeck, Berg, and Karl, 1984

Reporter(s): D.J. Grybeck (USGS)

Last report date: 2007-04-08

Site name(s): Wally Gator

Site type: Prospect

ARDF no.: PE063

Latitude: 56.2797 **Quadrangle:** PE B-3

Longitude: 132.7048

Location description and accuracy:

The coordinates for this prospect are at the site of the best known mineralization in three claim blocks that total 386 claims. The site is about 1.8 miles west-northwest of Round Point on Zarembo Island at an elevation of about 1500 feet. It is about 0.2 mile northwest of the center of section 36, T. 64 S., R. 82 E. The claim blocks extend over much of the ridge northwest of Round Point, i.e. much of the southeastern third of T. 64 S., R. 82 E.; see Grybeck, Berg, and Karl (1984) for the outline of these claim blocks as of 1980.

Commodities:

Main: Ag, Ba, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, pyrite, sphalerite

Gangue minerals:

Geologic description:

In 1978, Mapco Inc. staked three claim blocks totaling 386 claims on Zarembo Island that covered much of section 36, T. 64 S., R. 82 E., and the area to the southeast of the creek that flows into the south end of Meter Bight. The claims were staked for molybdenum, fluorine, and uranium (although there is no evidence that any of these particular commodities were found in the succeeding exploration or in the samples that have been analyzed). As briefly examined in 1979 with company geologists, the mineralization then being explored was at an elevation of about 1000 feet near the creek that flows southeast across section 36 (Donald Grybeck, unpublished field observations, 1979). The mineralized exposure consisted of rusty-weathering, light green-gray felsic metavolcanic rocks with small lenses, pods, and layers up to a foot thick that contain disseminated sulfides, mainly pyrite and possibly sphalerite and chalcopyrite. The felsic metavolcanic rocks are interbedded with light gray, silicified limestone and dark gray argillite. Mapping by Karl and others (1999) indicates that much of the area of section 36 consists of the Triassic Hyd Group which hosts most of the volcanogenic massive sulfide deposits in the Duncan-Zarembo belt (Berg and Grybeck, 1980). Grab samples contained less than 5 parts per million (ppm) copper, 50 to 150 ppm lead, 200 to 11,000 ppm zinc, and 150 to 5,000 ppm barium.

ATNA Resources Inc. did considerable work in the late 1980s on this prospect which that they called the 'Wally Gator' (DeLancey, 1990). They apparently concentrated their work along the creek that flows through the middle of section 36. They located three massive sulfide showings over a distance of about 800 feet. Samples from a 5-foot-thick layer in quartz-sericite schist, their most impressive mineralization, contained up to 5.5 percent zinc, 1.3 percent lead, 0.3 ounce of silver per ton, and 5.9 percent barium. Samples from a 3-foot-thick section of siliceous quartz-sericite schist contained up to 3.4 percent copper, 1.6 percent zinc, 2.0 ounces of silver per ton, and 2.1 percent barium. ATNA put down two 'Winkie'-drill holes here. The lowest mineralization was in chlorite schist that had chalcopyrite and pyrite in bands in the schist and along fractures. Samples contained up to 3.2 percent copper, and 2.4 percent zinc. They also did a geochemical soil survey in the area that identified soils with up to 1,396 parts per million (ppm) zinc and 16,960 ppm barium. Still and others (2002) also visited this location; their samples generally reflect about the same metal values as the ATNA work.

Alteration:

Age of mineralization:

Upper Triassic based on the age of the host rocks.

Generic deposit model:

Deposit model:

Kuroko volcanogenic massive-sulfide deposit (Cox and Singer, 1986; model 28a); alternatively a Sierran Kuroko volcanogenic massive sulfide deposit (Bliss, 1992; model 28a.1).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 28a.1

Production Status: None

Site Status: Undetermined

Workings/exploration:

In 1978, Mapco Inc. staked three claim blocks totaling 386 claims that covered much of section 36, T. 64 S., R. 82 E., and the area to the southeast of the creek that flows into the south end of Meter Bight. In the late 1980s, ATNA Resources Inc. did considerable work at this prospect which they called the 'Wally Gator' in the late 1980s (DeLancey, 1990). They apparently concentrated their work along the creek that flows through the middle of section 36. Still and others (2002) also visited this location and their samples generally reflected about the same metal values as the ATNA work.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Berg, H.C., and Grybeck, Donald, 1980, Upper Triassic volcanogenic Zn-Pb-Ag (-Cu-Au) mineral deposits near Petersburg, Alaska: U.S. Geological Survey Open-File Report 80-527, 11 p., 1 sheet.

DeLancey, P. R., 1990, Report on the Spiderman, Wally Gator, and Go mineral properties, southeast Alaska: Unpublished report by ATNA Resources Inc., 14 p. (On file at the Bureau of Land Management, Mineral Information Center, Juneau, Alaska).

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area,

central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Grybeck, Berg, and Karl, 1984

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near Round Point)

Site type:

ARDF no.: PE064

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

The original record for this site was based on limited information that only referred to a large block of claims in the general area. Subsequently much more detailed information has come available that was used to update ARDF site PE063 within the block of claims. What little information that was originally in this record was used in updating PE063. This ARDF site number is only retained for accounting purposes.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-03-04

Site name(s): Gallavantin

Site type: Prospect

ARDF no.: PE066

Latitude: 56.4148 **Quadrangle:** PE B-2

Longitude: 132.6312

Location description and accuracy:

This prospect cover three claims named the Gallavantin 1-3 that cover an area about 0.4 mile by 0.8 mile in size near the shore at the north end of the entrance to Deep Bay. The center of the claims is near the southwest corner of section 9, T. 63 S., R. 82 E.

Commodities:

Main: Cu, Fe

Other:

Ore minerals: Chalcopyrite, magnetite, pyrite

Gangue minerals:

Geologic description:

Three claims were staked at this site for iron and copper in 1974. Karl and others (1999) map a small Cretaceous gabbro pluton here that is probably the bedrock under all of the claims. Still and others (2002) classified much of the pluton as hornblendite in which they discovered disseminated chalcopyrite, pyrite, and magnetite at several localities along the shoreline and on a logging road which crosses the area. A sample of the best mineralization contained 2,760 parts per million (ppm) copper, 10 parts per billion (ppb) platinum, and 28 ppb palladium. The best sample collected along the road contained 1,172 ppm copper, 10 ppb platinum and 7 ppb palladium.

Alteration:

Age of mineralization:

Cretaceous or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Disseminated chalcopyrite, magnetite, and pyrite in hornblendite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

A block of three claims was staked at this site in 1974. Examined and sampled by government geologists in the late 1990s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg B-2 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-D, 21 p., 1 sheet, scale 1:63,360.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

U.S. Bureau of Mines, 1980, Claim map, Petersburg quadrangle, Alaska: U.S. Bureau of Mines Map 117, 1 sheet, scale 1:250,000.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Exchange

Site type: Prospect

ARDF no.: PE067

Latitude: 56.4219 **Quadrangle:** PE B-2

Longitude: 132.5338

Location description and accuracy:

This long-known prospect is in and just above the intertidal zone near Wedge Point on Woronkofski Island. It is about 0.6 mile west of the center of section 7, T. 63 S., R. 84 E. The location is accurate.

Commodities:

Main: Ag, Au, Pb

Other:

Ore minerals: Galena, gold, pyrite

Gangue minerals: Quartz

Geologic description:

The Exchange prospect was first staked in 1900 and has been described several times in similar terms (Wright and Wright, 1908; Roehm, 1945; Still and others, 2002). The workings include open cuts and two short adits. Two of the claims were restaked in 1974, were active through at least 1982, and were probably still active in 1996. Karl and others (1999) map the rocks in the area as part of the Jurassic or Cretaceous Seymour Canal Formation which is mainly graywacke. However, the prospect is in intrusive rocks that are probably similar to the Cretaceous tonalite that makes up much of Woronkofski Island (Still and others, 2002). The deposit consists of an irregular quartz vein that strikes north and dips 30W; it is up to 16 feet thick and can be traced for 250 feet. The vein contains small amounts of galena and pyrite. Still and others (2002) collected nine samples. The highest grade was a 5-foot sample across the vein; it contained 923 parts per billion gold, 26.6 parts per million (ppm) silver, and 944 ppm lead.

Alteration:

Age of mineralization:

Probably Cretaceous or younger based on the probably age of the intrusive host rocks.

Generic deposit model:

Deposit model:

Gold-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

The property was first staked in 1900 and developed by surface trenches and two short adits. Two of the claims were restaked in 1974, were active through at least 1982, and were probably still active in 1996.

Production notes:

No record of production.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg B-2 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-D, 21 p., 1 sheet, scale 1:63,360.

Cobb, E.H., 1972, Metallic mineral resources map of the Petersburg quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-415, 1 sheet, scale 1:250,000.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Petersburg quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-870, 53 p.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Roehm, J.C., 1945, Preliminary report of investigations and itinerary of J. C. Roehm in the Wrangell and Petersburg precincts, Alaska: Alaska Territorial Department of Mines Itinerary Report 195-37, 13 p.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

U.S. Bureau of Mines, 1980, Claim map, Petersburg quadrangle, Alaska: U.S. Bureau of Mines Map 117, 1 sheet, scale 1:250,000.

Wright, F.E., and Wright, C.W., 1905, Economic developments in southeastern Alaska: U.S. Geological Survey Bulletin 259, p. 47-68.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near Elephants Nose)

Site type: Prospect

ARDF no.: PE068

Latitude: 56.4316 **Quadrangle:** PE B-2

Longitude: 132.5117

Location description and accuracy:

The coordinates are at the approximate location of a single claim staked in 1955 and apparently not active since (U.S. Bureau of Mines, 1980). The claim is near the shoreline northwest of Elephants Nose in section 6, T. 63 S., R. 83 E.

Commodities:

Main: Th, U

Other:

Ore minerals:

Gangue minerals:

Geologic description:

There is no information on this prospect other than that a claim was staked here for thorium and uranium in 1955 and apparently has not been active since. The rocks in the area are hornfelsed graywacke of the Jurassic and Cretaceous Seymour Canal Formation (Brew, 1997 [OF 97-156-D]; Karl and others, 1999).

Alteration:

Age of mineralization:

Jurassic or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

There is no information on this prospect other than that a claim was staked here for thorium and uranium in 1955 and apparently has not been active since.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg B-2 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-D, 21 p., 1 sheet, scale 1:63,360.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

U.S. Bureau of Mines, 1980, Claim map, Petersburg quadrangle, Alaska: U.S. Bureau of Mines Map 117, 1 sheet, scale 1:250,000.

Primary Reference: U.S. Bureau of Mines, 1980

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near Keating Range)

Site type: Prospect

ARDF no.: PE072

Latitude: 56.1462 **Quadrangle:** PE A-2

Longitude: 132.6265

Location description and accuracy:

The coordinates are at the approximate center of block of forty-seven lode claims on the northern part of the Keating Range, western Etolin Island. The claims were staked in 1978 and were active through at least 1981 (U.S. Bureau of Mines, 1980). The site is in section 18, T. 66 S., R. 83 E., of the Copper River Meridian.

Commodities:

Main: Unknown

Other:

Ore minerals:

Gangue minerals:

Geologic description:

A block of forty-seven lode claims was staked in 1978 by MAPCO, Inc. and were active through at least 1981 (U.S. Bureau of Mines, 1980). The rocks in the vicinity consist of augite-bearing flows, volcanic breccia, tuff, graywacke, phyllite, and slate of the Jurassic or Cretaceous Stephens Passage Group and their hornfelsed equivalents across the Mosman fault (Brew, 1997 [OF 97-156-A]; Karl and others, 1999). Still and others (2002) briefly visited the area but found no evidence of mineralization.

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

A block of forty-seven lode claims was staked in 1978 by MAPCO, Inc. and were active through at least 1981 (U.S. Bureau of Mines, 1980).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg A-2 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-A, 20 p., 1 sheet, scale 1:63,360.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

U.S. Bureau of Mines, 1980, Claim map, Petersburg quadrangle, Alaska: U.S. Bureau of Mines Map 117, 1 sheet, scale 1:250,000.

Primary Reference: U.S. Bureau of Mines, 1980

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near Steamer Bay)

Site type: Occurrences

ARDF no.: PE073

Latitude: 56.1388 **Quadrangle:** PE A-2

Longitude: 132.657

Location description and accuracy:

The coordinates are at about the center of a block of 26 claims staked near the south end of Steamer Bay in 1972 and held through 1973. The center is about 0.4 mile north of the center of section 24, T. 65 S., R. 82 E.

Commodities:

Main: Ag, Cu, Pb, Zn

Other:

Ore minerals:

Gangue minerals:

Geologic description:

A block of 26 claims was staked in 1972 near the south end of Steamer Bay and they were active through 1973; apparently they have not been active since (U.S. Bureau of Mines, 1980; Still and others, 2002). Rocks in the area consist of massive and pillowed greenstone, pillow breccia, and tuff of the Seymour Canal Formation of Jurassic and Cretaceous age (Brew, 1997 [OF 97-156-A]; Karl and others, 1999). Still and others (2002) traversed two streams for a short distance but did not find any outcropping mineralization. They collected two float samples , the best of which, a piece of silicified breccia, contained 10.9 parts per million (ppm) silver, 1,408 ppm copper, 1.01 percent lead, and 1.9 percent zinc.

Alteration:

Age of mineralization:

Jurassic or younger based on the age of the rocks in the area.

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

A block of 26 claims was staked in 1972 and they were active through 1973; apparently they have not been active since (U.S. Bureau of Mines, 1980; Still and others, 2002). Still and others (2002) traversed two streams for a short distance but did not find any outcropping mineralization or signs of exploration; they did find two float samples with metal values.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg A-2 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-A, 20 p., 1 sheet, scale 1:63,360.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

U.S. Bureau of Mines, 1980, Claim map, Petersburg quadrangle, Alaska: U.S. Bureau of Mines Map 117, 1 sheet, scale 1:250,000.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (on Niblack Islands)

Site type: Occurrences

ARDF no.: PE077

Latitude: 56.0392 **Quadrangle:** PE A-1

Longitude: 132.1031

Location description and accuracy:

The coordinates are at the approximate center of ten claims at five locations that were staked for copper in 1956; apparently they have not been active since.

Commodities:

Main: Cu

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Ten claims at five locations were staked for copper in 1956 on the Niblack Islands in Ernest Sound; apparently they have not been active since (U.S. Bureau of Mines, 1980). A brief examination by the USGS in 1979 did not reveal any signs of mineral deposits (Grybeck, Berg, and Karl, 1984, locality 79). Rocks in the vicinity consist largely of migmatite and granite (Brew and others, 1984). The islands were also searched for indications of mineralization by Still and others, 2002; they found nothing other than a sample of granite that may have had a copper content a bit above background.

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Ten claims at five locations were staked for copper in 1956 on the Niblack Islands in Ernest Sound;

apparently they have been not active since (U.S. Bureau of Mines, 1980). Several attempts by government geologists and engineers to find evidence of mineralization have been fruitless.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., Ovenshine, A.T., Karl, S.M., and Hunt, S.J., 1984, Preliminary reconnaissance geologic map of the Petersburg and parts of the Port Alexander and Sumdum 1:250,000 quadrangles, southeastern Alaska: U.S. Geological Survey Open-File Report 84-405, 43 p., 2 sheets, scale 1:250,000.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

U.S. Bureau of Mines, 1980, Claim map, Petersburg quadrangle, Alaska: U.S. Bureau of Mines Map 117, 1 sheet, scale 1:250,000.

Primary Reference: U.S. Bureau of Mines, 1980

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near Kake)

Site type: Occurrence

ARDF no.: PE078

Latitude: 56.9889 **Quadrangle:** PE D-6

Longitude: 133.9636

Location description and accuracy:

This occurrence is in a rock pit about a mile northwest of the town of Kake. It is about 0.5 mile, west-northwest of the center of section 27, T. 56 S., T. 72 E. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Zn

Other:

Ore minerals: Chalcopyrite, pyrite, sphalerite

Gangue minerals: Calcite

Geologic description:

This occurrence was found in a reconnaissance of logging roads on northwest Kupreanof Island by Still and others (2002) during a Bureau of Land Management mineral assessment. The occurrence consists of two or three calcite veins with pyrite, sphalerite, and chalcopyrite in siliceous argillite. The veins are about 1 inch thick and extend for about 20 feet where they are cut off by a fault. The rocks in the area consist of argillite and graywacke of the Mississippian and Devonian Cannery Formation and Mesozoic phyllite and slate (Brew and other, 1984). A representative sample of the veins contained 1,135 parts per billion gold, 30.5 parts per million (ppm) silver, 7,327 ppm copper, and 5.4 percent zinc.

Alteration:

Age of mineralization:

Mississippian or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Thin calcite veins with pyrite, sphalerite, and chalcopyrite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only limited sampling by government geologists.

Production notes:

None.

Reserves:

None.

Additional comments:

This occurrence is on lands that belong to the Kake Village Corporation.

References:

Brew, D.A., Ovenshine, A.T., Karl, S.M., and Hunt, S.J., 1984, Preliminary reconnaissance geologic map of the Petersburg and parts of the Port Alexander and Sumdum 1:250,000 quadrangles, southeastern Alaska: U.S. Geological Survey Open-File Report 84-405, 43 p., 2 sheets, scale 1:250,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near head of Portage Bay)

Site type: Occurrence

ARDF no.: PE079

Latitude: 56.9147

Quadrangle: PE D-4

Longitude: 133.2689

Location description and accuracy:

This occurrence is in a borrow pit about 0.5 mile south of the head of Portage Bay; it is near the center of section 22, T. 57 S., R. 77 E. The location is accurate.

Commodities:

Main: Au, Ag, Cu, Mo, Ni, Pb, Zn

Other:

Ore minerals: Arsenopyrite, chalcopyrite, galena, molybdenite, pyrite, pyrrhotite, sphalerite

Gangue minerals: Quartz

Geologic description:

This mineralization was discovered by Still and others (2002). The rocks in this borrow pit consist mainly of fine- to medium-grained gray to dark green diorite. Intrusive rocks were previously unknown at this site although intermediate intrusive rocks of Cretaceous age have been mapped to the north and south of the pit (Brew and others, 1984). Pyrrhotite makes up 1-2 percent of the diorite and fine-grained chalcopyrite is common in the pit. The sulfides occurs as thin coatings along fractures. Rare molybdenite was also identified. The intrusive in the pit is cut by several faults and the sulfides are commonly localized along them. One of the faults contains bands of sulfides, mainly pyrrhotite with chalcopyrite, sphalerite, galena, arsenopyrite, and pyrite. Hornfels, probably metamorphosed from Cretaceous phyllite, is exposed north of the pit (Brew and others, 1984).

Still and others (2002) collected 12 samples from 8 to 20 feet long in the pit. They averaged 163 parts per million (ppm) copper. A select sample of sulfide-rich material contained 3,271 parts per billion (ppb) gold, 12.9 ppm silver, 3.025 ppm copper, 4,708 ppm lead, 1.4 percent zinc, and 9,762 ppm arsenic. Other samples contained up to 855 ppm molybdenum and 1,365 ppm nickel.

Alteration:

Age of mineralization:

Cretaceous(?) or younger based on the age of nearby intrusive rocks.

Generic deposit model:

Deposit model:

Porphyry copper?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Sampling by Bureau of Land Management geologist in borrow pit.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., Ovenshine, A.T., Karl, S.M., and Hunt, S.J., 1984, Preliminary reconnaissance geologic map of the Petersburg and parts of the Port Alexander and Sumdum 1:250,000 quadrangles, southeastern Alaska: U.S. Geological Survey Open-File Report 84-405, 43 p., 2 sheets, scale 1:250,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and Bittenbender, 2002

Reporter(s): Donald Grybeck ((Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Portage Mountain Group

Site type: Prospect

ARDF no.: PE080

Latitude: 56.875 **Quadrangle:** PE D-4

Longitude: 133.2439

Location description and accuracy:

There is some confusion in the old literature about the location and geology of two prospects in the area between Portage Mountain and the North Arm of Duncan Canal. Still and others (2002) spent considerable time in the field and library trying to decipher their location and descriptions. They concluded that the Portage Mountain Group consisted of 4 quartz-calcite veins that are at an elevation of between 2,000 and 3,000 feet on the west side of Portage Mountain. They could not find the old workings that they think are in the NE 1/4, NW 1/4, section 2, T. 58 S., R. 77 E. The coordinates above reflect their preferred location (The other prospect is the Silver Star prospect which consists of hornblendite with sulfides is at an elevation of about 400 feet, about 1.6 mile west-southwest of Duncan Peak; it is ARDF PE009.)

Commodities:

Main: Ag, Au, Cu

Other:

Ore minerals: Bornite, chalcopyrite, pyrite, pyrrhotite tetrahedrite

Gangue minerals: Calcite, quartz

Geologic description:

As described by Wright and Wright (1905, 1908) and Roehm (1945), the deposit consists of four, thin northeast-striking quartz-calcite veins with pyrite, pyrrhotite, chalcopyrite, bornite, and tetrahedrite. Samples of the veins contained up to 0.4 ounce of gold per ton and 2 ounces of silver per ton. The rocks have been variously mapped as metasedimentary rocks of the Jurassic to Cretaceous Seymour Canal Group by Karl and others (1999) or Cretaceous Stephens Passage Group by Brew (1997) that have been intruded by Cretaceous diorite. Roehm (1945) noted that the workings included a 130-foot adit and open cuts. However, Still and others (2002) could not locate the prospect in spite of a diligent search.

Alteration:

Age of mineralization:

Too little evidence to determine.

Generic deposit model:

Deposit model:

Polymetallic quartz-calcite veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Roehm (1945) noted that the workings included a 130-foot adit and open cuts. However, Still and others (2002) could not locate the prospect in spite of a diligent search.

Production notes:

None.

Reserves:

None.

Additional comments:

This prospect is now in the Petersburg Creek-Duncan Salt Chuck Wilderness which is closed to mineral exploration and mining.

Some recent U.S. Geological Survey publications including Cobb (1978) Cobb (1972), Berg and Cobb (1967), and an earlier generation of ARDF probably combine two different prospects on the west side of Portage Mountain that are described separately in ARDF as this prospect and PE 009.

References:

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg D-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-L, 21 p., 1 sheet, scale 1:63,360.

Cobb, E.H., 1972, Metallic mineral resources map of the Petersburg quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-415, 1 sheet, scale 1:250,000.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Petersburg quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-870, 53 p.

Roehm, J.C., 1945, Preliminary report of investigations and itinerary of J. C. Roehm in the Wrangell and Petersburg precincts, Alaska: Alaska Territorial Department of Mines Itinerary Report 195-37, 13 p.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Wright, F.E., and Wright, C.W., 1905, Economic developments in southeastern Alaska: U.S. Geological Survey Bulletin 259, p. 47-68.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Still and others, 2002

Reporter(s): Donald Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (on Towers Creek)

Site type: Prospect

ARDF no.: PE081

Latitude: 56.8578 **Quadrangle:** PE D-5

Longitude: 133.4017

Location description and accuracy:

This prospect is on Towers Creek at an elevation of about 170 feet, about about 1.5 miles from the head of Towers Arm. It is near the center of section 11, T. 58 S., R. 76 E.

Commodities:

Main: Cu

Other:

Ore minerals: Chalcopyrite, pyrite

Gangue minerals:

Geologic description:

Still and others (2002) sampled this prospect which consists of an outcrop/boulder in Towers Creek of iron-stained, calcareous, silicified schist with disseminated and narrow bands of pyrite with sparse chalcopyrite. The country rock is Devonian schist near the contact with Triassic argillite of the Hyd Group (Karl and others, 1999). Six samples across the schist and the sulfide bands contained 175 to 713 ppm copper. This prospect was one of the discoveries by Amoco Minerals in 1978 and 1979. This work included airborne and ground geophysics, geologic mapping, soil and stream geochemical samples, and core drilling on a large block of claims covering the Tower Creek prospect.

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Volcanogenic massive sulfide deposit?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

This prospect was one of the discoveries by Amoco Minerals in 1978 and 1979. This work included airborne and ground geophysics, geologic mapping, soil and stream geochemical samples, and core drilling on a large block of claims covering the Tower Creek prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): Donald Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Salt Chuck

Site type: Prospect

ARDF no.: PE082

Latitude: 56.8408 **Quadrangle:** PE D-4

Longitude: 133.3226

Location description and accuracy:

This prospect is near the center of the peninsula that separates North Arm from Towers Arm at the head of Duncan Canal. It is near the center of section 17, T. 58 S., R 77 E. The location is accurate.

Commodities:

Main: Ag, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, pyrite, sphalerite

Gangue minerals:

Geologic description:

The Salt Chuck prospect was found in late 1978 when Amoco Minerals Co. carried out a major exploration program at the head of Duncan Canal that included aerial and ground geophysics, geologic mapping, soil and stream sediment geochemistry, and diamond core drilling over many hundreds of claims (AMOCO Mineral Company, 1979; Zelinska, 1979).

At Salt Chuck, airborne electromagnetic anomalies followed ground electromagnetic and soil geochemistry surveys. The prospect is tied to an 8,000-foot-long anomaly defined by airborne and ground geophysics and by five diamond drill holes that were drilled to test this anomaly. The holes were drilled to a depth of 600 to 1,000 feet along about 5,000 feet of the anomaly. Several massive-sulfide bands were cut in the drilling but they were thin, discontinuous and generally low grade. The best intersections were one that was 1.7 feet long and averaged 1.86 percent copper and another that was 10 feet long and averaged 0.877 percent copper.

The rocks in the vicinity of the Salt Chuck prospect are Devonian phyllite, schist, and greenstone (Karl and others, 1999).

Amoco geologists also located several outcrops of mineralization in this area (AMOCO Mineral Company, 1979; Zelinska, 1979). The westernmost is about 3 miles north of the tip of the peninsula between Towers Arm and North Arm and 0.6 mile inland from North Arm. The mineralization there is an outcrop 10 feet long by 5 feet wide that consists of a band of chalcopyrite-rich massive sulfides in rhyolite. Samples averaged 6.3 percent copper, 0.02 percent zinc, and 0.32 ounce of silver per ton. Another mineralized zone is about 2,000 feet to the east where three sulfide bands, each less than 6 inches thick, are exposed along the beach. The bands consist of chalcopyrite, sphalerite, and galena, in rhyolite. Samples contain 0.01 to 0.13 percent copper, 0.10 to 25.3 percent lead, 0.15 to 7.8 percent zinc, and 0.2 to 13.62 ounces of silver per ton. These outcrops of mineralization were examined and sampled by Still and others (2002); their analyses were generally similar to those done by Amoco. They also suggested that the prospects were likely to be replacement deposits rather than volcanogenic massive sulfide deposits.

Alteration:

Age of mineralization:

Devonian or later based on the age of the host rocks.

Generic deposit model:

Deposit model:

Volcanogenic massive sulfide deposit? Replacement deposits?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

The Salt Chuck prospect was found in the late 1978 when Amoco Mineral Company Company carried out a major exploration program at the head of Duncan Canal that included aerial and ground geophysics, geologic mapping, soil and stream sediment geochemistry, and diamond core drilling over many hundreds of claims. At the Salt Chuck prospect, airborne electromagnetic anomalies were followed by ground electromagnetic and soil geochemistry surveys. The prospect is tied to an 8,000-foot-long anomaly defined by airborne and ground geophysics and by five diamond drill holes that were drilled to test this anomaly. The holes were drilled to a depth of 600 to 1,000 feet along about 5,000 feet of the anomaly.

Production notes:

None.

Reserves:

None.

Additional comments:

This prospect is now within the Petersburg Creek-Duncan Salt Chuck Wilderness which is closed to mineral exploration and mining.

References:

Amoco Mineral Company, 1979, Behm Canal project D-77-37, geology and geophysics map: Unpublished map by Amoco Minerals Company, 1 sheet, scale 1:24,000. (Copy in the files of the Bureau of Land Management, Minerals Information Center, Juneau Alaska.)

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Zelinski, W., 1979, Termination report, Behm Canal project (D-77-36), southeastern Alaska: Unpublished report by Amoco Minerals Company, 5 p. (Copy in the files of the Bureau of Land Management, Minerals Information Center, Juneau Alaska.)

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): RD8

Site type: Occurrences

ARDF no.: PE083

Latitude: 56.8384 **Quadrangle:** PE D-5

Longitude: 133.5709

Location description and accuracy:

This record covers a scattering of several occurrences in an area about 5 miles by 2 1/2 mile in size with the long dimension oriented north. The center of the area is east of the head of Big John Creek near hill 1908 which is southwest of Towers Lake and about 0.3 mile southwest of the center of section 14, T. 58 S., R. 74 E.

Commodities:

Main: Au, Ba, Co, Zn

Other: As,Cu, Hg, Ni, Pb, Sb

Ore minerals: Pyrite

Gangue minerals: Quartz

Geologic description:

This site was originally of interest because of widespread geochemical anomalies in a large suite of elements, zinc in particular. The samples commonly contain anomalous copper, molybdenum, and nickel, and various samples were anomalous in silver, lead, cadmium, manganese, mercury, arsenic, and antimony (Bittenbender and others, 2001). Still and others (2002) indicate that the suite suggests the presence of volcanogenic massive sulfide deposits. In following up these anomalies, they found several occurrences of mineralization in scattered borrow bits and road cuts. None seemed to explain the magnitude of the widespread geochemical anomalies but they do lend support to the concept of massive sulfide mineralization in the area.

The rocks in the area are part of the Cannery Formation of Permian and Mississippian age (Karl and others, 1999); they are a heterogeneous unit of chert, cherty argillite, silicified limestone, siltstone, and graywacke, with minor conglomerate, tuff, and volcanic rocks. In the three most notable areas of outcrop where the mineralization was found, it consists of: 1) pyrite in seams and layers in a 20-foot-thick unit of silicified schist, chert, and graphitic schist, 2) seams and patches of fine-grained to crystalline pyrite in quartz veins and silicified schist and slate, and 3) layers of pyrite up to 2 inches thick in a layer of silicified schist at least 10 feet thick in a unit of argillite. Numerous samples were collected and analyzed. None had high values in any of the common ore elements but many had values above background. The highest values were 136 parts per billion gold, 1,762 parts per million (ppm) zinc, 0.9 ppm silver, 166 ppm copper, 920 ppm lead, 727 ppm arsenic, 486 ppm nickel, and 9,176 ppm barium.

Alteration:

The schists is commonly silicified.

Age of mineralization:

Probably contemporaneous with the Permian and Mississippian host rocks.

Generic deposit model:

Deposit model:

Volcanogenic massive sulfide deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

The only work was sampling by the Bureau of Land Management during a regional mineral assessment.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bittenbender, P.E., Bean, K.W., and Still, J.C., 2001, Stikine airborne geophysical survey followup, central Southeast Alaska, 2000: Bureau of Land Management, Alaska Technical Report 37, 116 p.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): Donald Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near Taylor Creek)

Site type: Prospect

ARDF no.: PE084

Latitude: 56.7961 **Quadrangle:** PE D-5

Longitude: 133.3832

Location description and accuracy:

This prospect which was first located in 1997, is south of the middle part of Taylor Creek and about 0.6 mile north of hill 1606. It is about 0.4 mile west-southwest of the center of section 36, T. 59 S., R. 76 E. The location is accurate.

Commodities:

Main: Ag, Au, Pb, Zn

Other:

Ore minerals:

Gangue minerals:

Geologic description:

This prospect was first staked by Kennecott Exploration Company in 1997 based on geophysical and geophysical anomalies and they drilled five holes in 2000. Still and others (2002) examined the property and collected several samples. The rocks in the area consist of calcareous chlorite schist interbedded with calcareous graphitic slate; they are part of the Triassic Hyd Group as mapped by Karl and others (1999). At the surface, the mineralization consists of massive to semi-massive layers of pyrite parallel to the foliation of the host rocks and most of the layers are about an inch thick. Four samples were collected by Still and others (2002). One sample across a 3.0-foot layer of semi-massive pyrite contained 197 parts per billion (ppb) gold, 19.2 parts per million (ppm) silver, 335 ppm lead, and 479 ppm zinc. Another sample across a 0.6-foot layer of semi-massive pyrite in slate contained 453 ppm lead and 2,518 ppm zinc. They considered the deposit to be a volcanogenic massive sulfide deposit similar to others in the area.

Alteration:

Age of mineralization:

Contemporaneous with the Triassic host rock.

Generic deposit model:

Deposit model:

Volcanogenic massive sulfide deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Staked in 1997 and 5 holes were drilled by Kennecott in 2000. Sampled by the Bureau of Land Management in the late 1990s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): Donald Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near mouth of Port Camden)

Site type: Occurrence

ARDF no.: PE085

Latitude: 56.795 **Quadrangle:** PE D-6

Longitude: 133.9434

Location description and accuracy:

This occurrence is along the west shore of Camden Bay about 0.6 mile southeast of the point between the mouth of Camden Bay and Kadake Bay. It is about 2.3 miles west-southwest of Port Camden and about 0.3 mile southeast of the center of section 32, T. 58 S., R. 73 E. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

The Kuiu 1-9 claims were staked for gold at this site in 1976 and Mapco Inc. staked the Krista claims in 1979 (Still and others, 2002). There is no documentation of any work by industry since. The rocks in the area are non-marine sandstone, part of the Tertiary Kootznahoo Formation, intruded by gabbro (Muffler, 1967). This section of coast was also examined in conjunction with the investigation of the uranium deposits about 0.5 mile to the north (PE001); both are in the same formation . The Bureau of Land Management collected a panned-concentrate sample and eight stream samples from streams draining into Port Camden along about 0.3 mile of the shore line here (Still and others, 2002). The panned-concentrate sample contained 2,255 parts per billion (ppb) gold; the stream sediment samples contained up to 24 ppb gold.

Alteration:

Age of mineralization:

Tertiary or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

There were two generations of claims staked here in the 1970s; more recently the Bureau of Land Management collected several samples.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Muffler, L.J.P., 1967, Stratigraphy of the Keku Islets and neighboring parts of Kuiu and Kupreanof Islands, southeastern Alaska: U.S. Geological Survey Bulletin 1241-C, p. C1-C52.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): Donald Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Spruce Creek

Site type: Prospect

ARDF no.: PE086

Latitude: 56.6647

Quadrangle: PE C-4

Longitude: 133.0303

Location description and accuracy:

The Spruce Creek prospect is about 1.1 mile east of hill 2030 and about 1.1 mile north-northeast of hill 2605, both high points on the ridge that borders the east side of Duncan Canal opposite the Castle Islands. The prospect has three areas of mineralization and the coordinates are at the center of them near the middle of the south boundary of section 18, T. 60 S., R. 79 E.

Commodities:

Main: Ag, Au, Pb, Zn

Other:

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals: Calcite, quartz

Geologic description:

As described by Still and others (2002), The Spruce Creek prospects were discovered and staked in 1983. The claims were optioned to Westmin Resources, Ltd. in 1992 and they carried out geophysical surveys and soil geochemistry and mapped the mineralization before dropping the prospect in 1993. Paul Pieper who discovered the prospect drilled several shallow holes on the mineralization and held 10 claims as of 2002.

As mapped by Karl and others (1999), the rocks in the area are part of the Permian and Mississippian Cannery Formation that are in fault contact with volcanic and sedimentary rocks of the Triassic Hyd Group.

Still and others (2002) found three areas of mineralization. One in greenstone schist near a borrow pit consists of a 0.3-foot-thick quartz vein with pyrite, galena, and sphalerite. A sample across the vein contained 213 parts per billion (ppb) gold, 1,690 parts per million (ppm) lead, and 4,163 ppm zinc. Paul Pieper, the claim owner drilled a 19-foot hole there in 1996. Another occurrence of mineralization near a waterfall consists of gray bands of fine-grained sulfides in limestone. A 1.4-foot sample across the sulfide bands contained 416 ppb gold, 14.9 ppm silver, 820 ppm lead, and 5,221 ppm zinc. The third location is in a clearcut and consists of a 4-foot-thick bed of marble in greenstone. A sample taken in the marble of a 0.4-foot-thick band with galena and sphalerite contained 779 ppb gold, 59.1 ppm silver, 5.6 percent lead, and 2.1 percent zinc.

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Thin quartz veins with sulfides and bands of mineralization in marble.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Claims have been held on the property since 1983. Westmin Resources Ltd. had an option on the prospect from 1992 to 1993 and did considerable mapping, geochemistry, and ground geophysics. The owner has drilled several shallow holes on the mineralization prior to 2002.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Rubble; East Duncan Pyrite

Site type: Occurrences

ARDF no.: PE087

Latitude: 56.655 **Quadrangle:** PE C-4

Longitude: 133.0863

Location description and accuracy:

These occurrences are on large block of claims on the east side of Duncan Canal, east of the Castle Islands. The claim block extends for about 2 miles along the shoreline and inland for about 1.2 miles to the crest of the ridge that parallels Duncan Canal. The coordinates are on the shoreline at about the middle of the west side of the claim block along Duncan Canal. The occurrences are spread along the shoreline in section 23, T. 59 S., R. 78 E., and probably extend some distance into the sections to the northwest and southeast.

This record also includes the 'East Duncan Pyrite' occurrence listed in Still and others (2002) as a separate site. It appears similar to other occurrences described in this record and they note that it is within the claim block that defines this record. It is on a logging road just above the east shoreline of Duncan Canal opposite Big Castle Island.

Commodities:

Main: Ba, Cu, Pb, Zn

Other:

Ore minerals: Barite, chalcopyrite, galena, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

After Amoco Minerals Co looked at this area and defined several geophysical and geochemical anomalies, in 1985, Atna Resources Ltd. staked 70 claims here and termed the property the 'Rubble'. They abandoned the claims in 1988. Much of the area is covered by heavy vegetation but Still and others (2002) examined the outcrops along the shoreline for several miles and collected numerous rock and stream sediment samples.

Most of the shoreline exposures are part of the Triassic Hyd Group that is the host rock for many volcanogenic massive sulfides deposits in Duncan Canal and beyond (Karl and others, 1999). The claim block is underlain by alternating bands of Hyd Group rocks and the Permian and Mississippian Cannery Formation; the Hyd and Cannery rocks are separated by east-dipping thrust faults. The rocks along the shoreline that Still and others (2002) examined are mainly slate with interbeds of quartz-sericite schist, calcite-chlorite schist, and chert. The schist commonly contains bands and disseminations of pyrite and analyses commonly show 1 to 2 percent barite. Usually the pyrite bands are thin but locally they may be up to a foot thick and consist of to 80 percent pyrite. Samples from most of the pyrite bands are devoid of other metals in notable quantity. However, in one area marked by a conductive geophysical anomaly defined in a 1997 airborne geophysical survey (Alaska Division of Geological and Geophysical Surveys, 1997). Still and others (2002) examined the ground under the anomaly and found a 0.5-inch-thick quartz vein with sphalerite, galena, and chalcopyrite; boulders with 30-50 percent barite; and sulfide bands that include pyrrhotite in addition to pyrite. The geophysical anomaly was also marked by geochemical anomalies in copper, zinc, barium, and molybdenum (Bittenbender and others, 2001).

This record also includes the 'East Duncan Pyrite' occurrence listed by Still and others (2002). It is within the claim block that defines this site. At the occurrence, a pyrite-rich band occurs in a medium to dark gray

slate. Karl and others (1999) map the rocks in this area as part of the Triassic Hyd Group. Still and others (2002) collected three samples; the highest values in them were 9 parts per billion gold, 998 parts per million (ppm) copper, 244 ppm zinc, and all of the samples had about 0.5 percent barium.

Alteration:

Age of mineralization:

Triassic based on the age of the host rocks.

Generic deposit model:

Deposit model:

Barite facies of a Kuroko massive-sulfide model (Cox and Singer, 1986; model 28a); alternatively a barite facies of a Sierran Kuroko model (Bliss, 1992; model 28a.1).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 28a.1

Production Status: None

Site Status: Undetermined

Workings/exploration:

No workings are described but a large claim block was staked over the occurrences in 1985 and there probably was at least some ground exploration. Sampled by government geologists in the late 1990s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Alaska Division of Geological and Geophysical Surveys, Geoterrex-Dighem, and WGM Inc., 1997, 7200 Hz coplanar resistivity of the Stikine area, Southeast Alaska: Alaska Division of Geological and Geophysical Surveys, Report of Investigation 97-19-a-e, 5 sheets, scale 1:63.360.

Bittenbender, P.E., Bean, K.W., and Still, J.C., 2001, Stikine airborne geophysical survey followup, central southeastern Alaska: Bureau of Land Management, Alaska Technical Report 37, 116 p.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Nicirque

Site type: Prospect

ARDF no.: PE088

Latitude: 56.647 **Quadrangle:** PE C-4

Longitude: 133.0281

Location description and accuracy:

The Nicirque prospect is about 2.5 miles northeast of Grief Island in Duncan Canal at an elevation of about 2,300 feet. It is about 0.4 mile north-northeast of the center of section 30, T. 60 S., R. 59 E. The location is accurate to within one-quarter mile.

Commodities:

Main: Ag, Au, Zn

Other:

Ore minerals: Pyrite

Gangue minerals:

Geologic description:

The Nicirque prospect was staked in 1993 and was active at least as recently as 1998 (Still and others, 2002). It is near the fault contact of the Permian and Mississippian Cannery Formation with volcanic and sedimentary rocks of the Triassic Hyd Group (Karl and others, 1999). A fossil find at the prospect indicates that it may be in slate of Hyd Group. The mineralization is reportedly a massive pyrite vein in a breccia zone. Still and others (2002) collected a sample across three feet of slate with pyrite bands. The sample contained 56 parts per billion gold, 2.6 parts per million (ppm) silver, and 333 ppm zinc.

Alteration:

Age of mineralization:

Possibly Triassic based on the age of the host rock.

Generic deposit model:

Deposit model:

Pyrite bands in slate.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

There is no record of work at this prospect other than that it was first staked in 1983 and that the Bureau of Land Management examined the it and collected a sample.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near Boulder Point)

Site type: Occurrence

ARDF no.: PE089

Latitude: 56.5813 **Quadrangle:** PE C-3

Longitude: 132.9778

Location description and accuracy:

This occurrence is at Boulder Point along Wrangell Narrows on northeastern Woewodski Island, about 0.4 mile east-southeast of the center of section 18, T. 61 S., R . 80 E. The location is accurate.

Commodities:

Main: Cu

Other:

Ore minerals:

Gangue minerals:

Geologic description:

The rocks in the vicinity are part of the Triassic Hyd Group that consists mainly of volcanic flows and breccias, argillite, and some limestone (Brew, 1997; Karl and others, 1999). There is no indication of mineralization here other than Still and others (2002) collected samples of iron-stained andesite along several hundred feet of shoreline that locally contains pyrrhotite and chalcopyrite along fractures. The samples contained 246 to 929 parts per million copper.

Alteration:

The andesite host rock is silicified.

Age of mineralization:

Triassic or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

No workings. Still and others (2002) collected samples as part of a regional mineral assessment by the Bureau of Land Management.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others (2002)

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Scott Gold

Site type: Prospect

ARDF no.: PE090

Latitude: 56.5748 **Quadrangle:** PE C-4

Longitude: 133.0039

Location description and accuracy:

The Scott Gold prospect is about 1.6 miles northeast of the east end of Harvey Lake and about 0.5 mile northeast of the center of section 24, T. 61 S, R. 79 E. 9., of the Copper River Meridian. It is in a steep, heavily vegetated area along a gully at an elevation of about 580 feet. The location is accurate.

Commodities:

Main: Au, Pb, Zn

Other: Ba

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

At various times from the 1970s, much of central Woewodski Island has been staked by a succession of companies; these include Resource Associates of Alaska, Cominco Exploration, Colony Pacific, Amselco, Kennecott Exploration, Houston Oil and Minerals, Westmin Resources, and the Olympic Resources Group. During several episodes in the late 1980s and early 1990s, there was considerable soil sampling in the area including on the nearby Scott prospect (PE091) where three three holes were drilled (Still and others, 2002). The Scott Gold prospect shares a similar exploration history although only mineralized rubble is exposed along a shallow, west-trending gulch in heavy vegetation. Claims are still active on the Scott Show prospect in 2008.

The country rocks at the Scott Gold prospect are mainly semischist and phyllite, part of the Triassic Hyd Group (Karl and others, 1999, Brew, 1997). Silicified quartz-rich greenstone contain bands of disseminated pyrite, galena, and sphalerite. Samples collected by Still and others (2002) continued 834 to 1,793 parts per billion gold, 826 to 2,559 parts per million (ppm) lead, and 9,428 ppm to 2.52 percent zinc. One sample contained 13.76 percent barium.

Alteration:

The semischist and phyllite host rocks are notably silicified.

Age of mineralization:

Probably upper Triassic or younger based on the age of the host rocks and similarities to the Duncan-Zarembo belt of massive sulfide mineralization.

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Active

Workings/exploration:

At various times from the 1970s, much of central Woewodski Island has been staked by a succession of companies; these include Resource Associates of Alaska, Cominco Exploration, Colony Pacific, Amselco, Kennecott Exploration, Houston Oil and Minerals, Westmin Resources, and the Olympic Resources Group. During several episodes in the late 1980s and early 1990s, there was considerable soil sampling in the area including on the nearby Scott prospect (PE091) where three three holes were drilled (Still and others, 2002). The Scott Gold prospect shares a similar exploration history although only mineralized rubble is exposed along a shallow, west-trending gulch in heavy vegetation. Claims are still active on the Scott Show prospect in 2008. Examined and sampled by Still and others (2002) as part of a regional mineral assessment by the Bureau of Land Management.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Scott

Site type: Prospect

ARDF no.: PE091

Latitude: 56.5732 **Quadrangle:** PE C-4

Longitude: 133.0071

Location description and accuracy:

The Scott prospect is about 1.4 miles northeast of the east end of Harvey Lake and about 0.3 mile northeast of the center of section 24, T 61 S, R. 79 E. It is in a steep gully at an elevation of about 770 feet. The location is accurate. Figure 20 in Still and others (2002) is a detailed map of the Scott prospect.

Commodities:

Main: Ag, Au, Ba, Pb, Zn

Other:

Ore minerals:

Gangue minerals: Barite

Geologic description:

At various times from the 1970s, much of central Woewodski Island has been staked by a succession of companies; these include Resource Associates of Alaska, Cominco Exploration, Colony Pacific, Amselco, Kennecott Exploration, Houston Oil and Minerals, Westmin Resources, and the Olympic Resources Group. During several of these episodes in the 1980s and early 1990s, there was soil sampling on the Scott prospect and three holes were drilled there (Still and others, 2002). It has been examined several times since and claims are still active on it in 2008. The nearby Scott Gold prospect (PE090) shares a similar history.

The Scott deposit can be traced for 300 feet in a series of discontinuous exposures along a steep gully. The mineralization consists of bands and lenses of barite, pyrite, and galena, 0.1 to 2.0 feet thick, that parallel the layering in the host rock. The host rocks at the prospect are semischist and phyllite that are correlative with the Triassic Hyd Group (Karl and others, 1999, Brew, 1997). Individual lenses of mineralization can be traced for to up to 30 feet. Still and others (2002) collected 22 samples that contained up to 1,122 parts per billion (ppb) gold, 47.3 parts per million (ppm) silver, 2.63 percent lead, and 40.9 percent zinc. Lower metal values persist out into the wall rock as disseminated ore minerals and a sample of quartz and greenstone float found near the sulfide lenses contained up to 8,157 ppb gold. (There is no information available on the drill holes.)

Alteration:

None specifically noted.

Age of mineralization:

Triassic or younger based on age of the host rock.

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
28a

Production Status: None

Site Status: Active

Workings/exploration:

At various times from the 1970s, much of central Woewodski Island has been staked by a succession of companies; these include Resource Associates of Alaska, Cominco Exploration, Colony Pacific, Amselco, Kennecott Exploration, Houston Oil and Minerals, Westmin Resources, and the Olympic Resources Group. During several of these episodes in the 1980s and early 1990s, there was soil sampling on the Scott prospect and three holes were drilled there (Still and others, 2002). It has been examined several times since and claims are still active on it in 2008.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Hope

Site type: Prospect

ARDF no.: PE092

Latitude: 56.572 **Quadrangle:** PE C-4

Longitude: 133.0594

Location description and accuracy:

This prospect is near the middle of the south side of the small lake, locally called 'Lost Lake', that is about 0.7 mile north of the west end of Harvey Lake It is in the NE1/4, section 22, T. 61 S., R. 79 E.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals: Quartz

Geologic description:

Guided by an unpublished map dated 1933, Still and others (2002) located a 45-foot-long trench on four claims staked in the 1930s under the name 'Hope'. The trench exposes 12 feet of quartz rubble and 19 feet of a quartz vein in schist. The vein strikes N30W, and dips 45SW. A chip sample across 8.7 feet of the middle of the quartz vein averaged 4,400 parts per billion gold. Another trench is caved. The rocks in the area consist of felsic and intermediate volcanic flows and breccias, limestone, and argillite of the Hyd Group of Triassic age (Karl and others, 1999). In recent years, the prospect had often been covered by the claims of the 'Lost Show' prospect (PE029) on the north side of Lost Lake.

Alteration:

None noted.

Age of mineralization:

Triassic or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Low-sulfide gold quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active?

Workings/exploration:

Two trenches were dug on this prospect in the 1930s. One is now caved but the other was sampled by Still and others (2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (adjacent to Helen S Mine)

Site type: Prospect

ARDF no.: PE093

Latitude: 56.5693 **Quadrangle:** PE C-4

Longitude: 133.0683

Location description and accuracy:

This deposit adjoins or overlaps the veins at the Helen S Mine (PE028). At this prospect, volcanogenic massive sulfides are exposed in several pits and occur in float for about 700 feet along a small south-flowing creek whose mouth is about 50 yards north of the mouth of the creek that drains Harvey Lake on Woewodski Island. The coordinates are at a pit with the best exposed mineralization; it is about 400 feet north of the high-tide line in southwest corner of section 22, T. 61 S., R 79 E. Figure 15 of Still and others is a detailed map of this mineralization and the Helen S Mine.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other: Ba

Ore minerals: Arsenopyrite, chalcopyrite, galena, pyrrhotite, sphalerite

Gangue minerals: Barite, quartz

Geologic description:

This volcanogenic massive-sulfide deposit is within the old claim of the Helen S Mine (PE028). The massive sulfides are present in several pits that may date back to the early 1900s. However, the massive sulfides were not recognized until 1980 (Berg and Grybeck,1980). Subsequently, the deposit has been examined by numerous geologists and it was examined and sampled by Still and others (2002) as part of a regional mineral assessment for the Bureau of Land Management.

The rocks in the area are mainly metamorphosed felsic and intermediate flows and breccia and argillite of the Triassic Hyd Group that have been intruded by Mesozoic hornblende gabbro exposed just a few hundred feet to the west and Cretaceous diorite a mile to the south (Brew, 1997; Karl and others, 1999).

The best exposure of the massive sulfide mineralization is in an old pit about 400 feet north of the site of the old Helen S mill. The massive sulfides consist of crudely banded pyrite, pyrrhotite(?), arsenopyrite, sphalerite, and galena with barite in greenstone and greenschist. Similar mineralization occurs in several small pits and in float for about 400 feet north along a small creek. Still and others (2002) collected several samples in the southern pit; selected samples contained up to 113.5 parts per million (ppm) silver, up to 2.5 percent lead, and 3.0 percent zinc. Samples from the northern pits contained up to 2.13 ounces of silver per ton, 1.74 percent lead, and 8.5 percent zinc. The massive sulfide deposits do not contain detectable gold as distinct from the gold-quartz veins of the adjacent Helen S Mine. Berg and Grybeck (1980) interpreted the massive sulfides as part of the Duncan-Zarembo belt of dismembered, Upper Triassic volcanogenic massive sulfide deposits.

Alteration:

Age of mineralization:

The volcanogenic massive sulfides in the Duncan-Zarembo belt are Upper Triassic (Berg and Grybeck, 1980).

Generic deposit model:

Deposit model:

Barite facies of a Kuroko massive-sulfide model (Cox and Singer, 1986; model 28a); or alternatively a barite facies of a Sierran Kuroko model (Bliss, 1992; model 28a.1).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 28a.1

Production Status: None

Site Status: Active

Workings/exploration:

This volcanogenic massive-sulfide deposit is within the old claim of the Helen S Mine (PE028). The massive sulfides are present in several pits that may date back to the early 1900s. However, the massive sulfides were not recognized until 1980 (Berg and Grybeck, 1980). Subsequently, the deposit has been examined by numerous geologists and it was examined and sampled by Still and others (2002) as part of a regional mineral assessment for the Bureau of Land Management.

Production notes:

None.

Reserves:

None.

Additional comments:

All the workings are on a patented claim.

References:

Berg, H.C., and Grybeck, Donald, 1980, Upper Triassic volcanogenic Zn-Pb-Ag (-Cu-Au) mineral deposits near Petersburg, Alaska: U.S. Geological Survey Open-File Report 80-527, 11 p., 1 sheet.

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Buddington, A.F., 1923, Mineral deposits of the Wrangell district: U.S. Geological Survey Bulletin 739-B, p. 51-75.

Cobb, E.H., 1972, Metallic mineral resources map of the Petersburg quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-415, 1 sheet, scale 1:250,000.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Petersburg quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-870, 53 p.

Grybeck, D.J., Berg, H.C., and Karl, S.M., 1984, Map and description of the mineral deposits in the Petersburg and eastern Port Alexander quadrangles: U.S. Geological Survey Open-File Report 84-837, 86 p., 1 sheet, scale 1:250,000.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Roehm, J.C., 1945, Preliminary report of investigations and itinerary of J. C. Roehm in the Wrangell and

Petersburg precincts, Alaska: Alaska Territorial Department of Mines Itinerary Report 195-37, 13 p.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (on south Fork Andrew Creek)

Site type: Occurrences

ARDF no.: PE094

Latitude: 56.5686

Quadrangle: PE C-1

Longitude: 132.1044

Location description and accuracy:

These occurrences are on the South Fork of Andrew Creek at an elevation of about 1000 feet. They are about 12.6 miles east-northeast of Wrangell near the center of section 23, T. 61 S., R. 85 E.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

During a reconnaissance examination of Andrew Creek, Still and others (2002) found a piece of quartz float with visible gold in the South Fork of Andrew Creek at an elevation of about 1,000 feet. They could not locate the lode source but several other samples of quartz float in the creek contained 137 to 1,992 parts per billion (ppb) gold. They also collected 21 stream-sediment sample and a panned concentrate. The stream sediment samples contained up to 493 ppb gold and the panned concentrate sample contained 1,058 ppb gold. Andrew Creek largely flows on Mesozoic and Paleozoic schist and gneiss that is intruded by Cretaceous tonalite plutons (Brew, 1997; Karl and others, 1999) . These make up the western border zone of the Coast Plutonic Complex. East of Andrew Creek the complex consists largely of Tertiary tonalite and migmatite. (Brew, 1997; Karl and others, 1999).

Alteration:

Age of mineralization:

Uncertain because the mineralization was not found in place.

Generic deposit model:

Deposit model:

Visible gold in quartz float.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only sampling by government engineers and geologists.

Production notes:

None.

Reserves:

None.

Additional comments:

The area is now within the Stikine-LeConte Wilderness which is closed to mineral exploration and mining.

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-1 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-H, 23 p., 1 sheet, scale 1:63,360.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Finzens

Site type: Prospects

ARDF no.: PE095

Latitude: 56.568

Quadrangle: PE

Longitude: 132.9855

Location description and accuracy:

Wright and Wright (1908) showed 14 prospects on the heavily vegetated northeast portion of Woewodski Island; little more has been published about them since. The prospects are scattered along a belt about two miles long that extends north-northwest from near Point Lockwood on Wrangell Narrows. The coordinates are at about the center of the belt. The location of any one of the prospects is uncertain owing to the small scale and lack of detail on Wrights' map.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Although much of Woewodski Island has been staked by a succession of companies since the 1980s, there appears to be little if any work concentrated on the northeast of the island along Wrangell Narrows. The only indication of mineralization at this site is on an old, small-scale map by Wright and Wright (1908); they show 14 'X' marks scattered along a belt about two miles long with the notation 'Finzen's Prospects'. Since the main commodity of interest then was gold, it is assumed that the prospect were for gold. There is no more recent information on these prospects although Still and others (2002) collected several several stream sediment samples and rock in the vicinity for geochemical analysis. None showed significant metal values. The rocks in the vicinity are part of the Triassic Hyd Group that consists mainly of volcanic flows and breccias, argillite, and some limestone (Brew, 1997; Karl and others, 1999).

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active?

Workings/exploration:

Although much of Woewodski Island has been staked by a succession of companies since the 1980s, there appears to be little if any work concentrated on the northeast of the island along Wrangell Narrows. The only indication of mineralization at this site is on an old, small-scale map by Wright and Wright (1908); they show 14 'X' marks scattered along a belt about two miles long with the notation 'Finzen's Prospects.' Since the main commodity of interest then was gold, it is assumed that the prospect were for gold. There is no more recent information on these prospects although Still and others (2002) collected several several stream sediment samples and rock in the vicinity for geochemical analysis.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Wright, F.E., and Wright, C.W., 1908, The Ketchikan and Wrangell mining districts, Alaska: U.S. Geological Survey Bulletin 347, 210 p.

Primary Reference: Buddington, 1908

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (on west side of lower Duncan Canal)

Site type: Occurrence

ARDF no.: PE096

Latitude: 56.565 **Quadrangle:** PE C-4

Longitude: 133.1014

Location description and accuracy:

This occurrence is in a borrow pit near sea level on the west side of Duncan Canal opposite the mouth of the creek that drains Harvey Lake on Woewodski Island. It is near the southwest corner of section 21, T. 61 S., R. 79 E. The location is accurate.

Commodities:

Main: As, Au, Cu

Other:

Ore minerals: Chalcopyrite, pyrite

Gangue minerals:

Geologic description:

This occurrence was found during the exploration of the Duncan Canal area by Amoco Minerals Co. in the late 1970s. Still and others (2002) visited the site and collected several samples of greenstone that contained disseminated pyrite and chalcopyrite. The samples contained 15 to 821 parts per billion gold, 954 to 1,189 parts per million (ppm) copper, and 21 to 1,906 ppm arsenic. The rocks in the area are part of the Triassic Hyd Group which are known to be favorable for volcanogenic massive sulfide deposits in the Duncan Canal area (Karl and others, 1999).

Alteration:

Age of mineralization:

Triassic based on the age of the host rocks.

Generic deposit model:

Deposit model:

Volcanogenic massive sulfide deposit?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

First located in the late 1970s; only limited surface sampling by government and industry.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Maid of Texas

Site type: Prospect

ARDF no.: PE097

Latitude: 56.5648 **Quadrangle:** PE C-4

Longitude: 133.0289

Location description and accuracy:

The Maid of Texas prospect is often described with the adjacent Maid of Mexico Mine. It t is separate vein, however, and at least at some time in the past on separate claim(s). The Maid of Texas vein is parallel to the Maid of Mexico and about 200 feet to the southeast. It is about 0.4 mile south-southeast of the center of section 23, T 61 S, R. 79E. In 1996, a trail was still passable from the center of the north shore of Harvey Lake, north to the nearby Maid of Mexico Mine, but in later years it was difficult to follow in the heavy timber and vegetation. The location of the Maid of Texas is shown on Figure 17 of Still and others (2002). The location is accurate.

Commodities:

Main: Au

Other: Zn

Ore minerals: Native gold?

Gangue minerals: Quartz

Geologic description:

The Maid of Texas vein as located by Still and others (2002) is parallel to and about 200 feet southeast of the Maid of Mexico Mine. It was discovered before 1933 but there has been little work on it and no production from it. There is a small cut on the Maid of Texas vein that now can can be traced as a line of scattered quartz float that trends northeast. in gullies. Still and others (2002) collected three samples that contained up to 8 parts per billion (ppb) and 419 parts per million zinc. Two samples of iron-stained, pyrite-rich schist contained 51 and 61 ppb gold. The vein is at the contact of semischist and phyllite of the Triassic Hyd Group (Brew, 1997).

Alteration:

None specifically noted.

Age of mineralization:

Triassic or younger based on age of the host rock.

Generic deposit model:

Deposit model:

Gold quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only a cut opened before 1933.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Roehm, J.C., 1945, Preliminary report of investigations and itinerary of J. C. Roehm in the Wrangell and Petersburg precincts, Alaska: Alaska Territorial Department of Mines Itinerary Report 195-37, 13 p.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others (2002)

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (near Blind Slough)

Site type: Occurrence

ARDF no.: PE098

Latitude: 56.5525 **Quadrangle:** PE C-3

Longitude: 132.7542

Location description and accuracy:
This occurrence is in a borrow pit just north of the center of the head of Blind Slough at an elevation of about 120 feet. It is about 0.2 mile south of the center of section 27, T. 61 S., R. 81 E.

Commodities:

Main: Cu

Other: Pb, Zn

Ore minerals: Pyrrhotite

Gangue minerals:

Geologic description:
This occurrence was found by Still and others (2002) in a borrow pit beside a logging road. The occurrence consists of rubble of iron- and copper-stained hornblendite with massive pyrrhotite. A sample contained 1,007 parts per million (ppm) copper, 303 ppm lead, and 395 ppm zinc. Karl and others (1999) map the rocks around the pit as Cretaceous tonalite, granodiorite, and quartz diorite.

Alteration:

Age of mineralization:
Cretaceous or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:
Pyrrhotite in hornblendite with copper.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:
Sampling in a borrow pit by government geologists.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Independence

Site type: Prospect

ARDF no.: PE099

Latitude: 56.5476 **Quadrangle:** PE C-4

Longitude: 133.0423

Location description and accuracy:

The Independence prospect consists of a shaft and 12 cuts that extend for about 1,800 feet along a quartz vein. The coordinates are at the shaft which is at an elevation of about 500 feet, about 0.3 mile north-northwest of the north end of Harrys Lake on Woewodski Island. It is about 0.5 mile north of the center of section 35, T. 61 S., R. 79 E.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

The Independence prospect was found sometime before 1931 (Nelson, 1931) and by 1933 consisted of 12 cuts and a shaft 10 to 20 feet deep along a vein that extended for about 2,000 feet (Still and others, 2002). Apparently there has been no later work specifically on this prospect although much of the center of Woewodski Island has been covered by claims since the 1970s and this prospect probably still is.

The rocks in the vicinity are mainly felsic volcanic rocks of the Triassic Hyd Group (Brew, 1997, Karl and others, 1999). At the south end of the prospect, the volcanics are cut by Cretaceous hornblende diorite. The mineralization consist of a quartz vein up to 10 feet thick that strikes north and has been traced on the surface for about 2,000 feet. Still and others (2002) collected 8 samples from the pits along the vein and from the shaft dump. Six contained less than 5 parts per billion (ppb) gold, one contained 74 ppb gold, and one contained 94 ppb gold.

Alteration:

None specifically noted.

Age of mineralization:

Cretaceous or younger based on the age of the diorite host rock to the vein.

Generic deposit model:

Deposit model:

Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

The Independence prospect was found sometime before 1931 (Nelson, 1931) and by 1933 consisted of 12 cuts and a shaft 10 to 20 feet deep along a vein that extended for about 2,000 feet (Still and others, 2002). Apparently there has been no later work specifically on this prospect although much of the center of Woewodski Island has been covered by claims since the 1970s and this prospect probably still is.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Nelson, G.E., 1931, Report on the Maid of Mexico Group, Independence Group on Woewodski Island, south end of Wrangell Narrows and Cascade Group, Hope Group, Mystery Claim in Thomas Bay: Unpublished report by the Alaska Juneau Gold Mining Company, Juneau, Alaska (in files of the Minerals Information Center, Bureau of Land Management, Juneau, Alaska)

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Mad Dog 2

Site type: Prospect

ARDF no.: PE100

Latitude: 56.5472 **Quadrangle:** PE C-4

Longitude: 133.0254

Location description and accuracy:

The Mad Dog 2 prospect is about 0.9 mile south-southeast of the east end of Harvey Lake at an elevation of about 400 feet. It is near the northwest corner of section 36, T. 61 S., R. 79 E.

Commodities:

Main: Ag, Au, Cu, Zn

Other:

Ore minerals: Chalcopyrite, pyrite, sphalerite

Gangue minerals:

Geologic description:

Since the 1970s much of Woewodski Island has been covered by claims held by a succession of companies: Resource Associates of Alaska, Cominco Exploration, Colony Pacific, Amselco, Kennecott Exploration, Westmin Resources, and currently (2008) the Bravo Venture Group. This prospect probably was within those claims several times and it is under claim in 2008. In 1998, two holes were drilled on the Mad Dog 2 prospect by P. Beardslee (Still and others, 2002).

Most of the area is heavily vegetated. The sparse outcrop consists of metamorphosed intermediate to felsic volcanic rocks of the Triassic Hyd Formation (Brew, 1997; Karl and others, 1999). Near the 1998 drill site, Still and others (2002) located an outcrop of schist with a band of pyrite, chalcopyrite, and sphalerite 0.3 to 0.8 feet thick. Six samples contained 67 to 2,867 parts per billion gold, 2.4 to 27.1 parts per million (ppm) silver, 240 to 1,512 ppm copper, and 732 ppm to 2.9 percent zinc. The drill holes were said to miss any significant mineralization.

Alteration:

Age of mineralization:

Late Triassic based on the age of the host rock and similarities to massive sulfide deposits in the Duncan-Zarembo belt of mineralization.

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Active?

Workings/exploration:

Since the 1970s much of Woewodski Island has been covered by claims held by a succession of companies: Resource Associates of Alaska, Cominco Exploration, Colony Pacific, Amselco, Kennecott Exploration, Westmin Resources, and currently (2008) the Bravo Venture Group. This prospect probably was within those claims several times and it is under claim in 2008. In 1998, two holes were drilled on the Mad Dog 2 prospect by P. Beardslee (Still and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (near the south end of Woewodski Island)

Site type: Prospect

ARDF no.: PE101

Latitude: 56.5218 **Quadrangle:** PE C-3

Longitude: 132.9966

Location description and accuracy:

This prospect covers an area of about 1,500 feet by 5,000 feet , centered about 0.6 mile north of the southern tip of Woewodski Island. The center of the area is about 0.6 mile south-southeast of the northwest corner of section 5, T. 62 S., R. 80 E.

Commodities:

Main: Au

Other: As

Ore minerals:

Gangue minerals:

Geologic description:

In the late 1990s, Olympic Resources collected hundreds of soil samples on a grid and outlined an area about 1,500 feet by 5,000 feet in size with anomalous gold values. However, when the Bureau of Land Management (Still and others, 2002) recollected some samples in the area, on analysis they could not verify the original results. The discrepancy cannot be explained. In 2000, Olympic Resources drilled seven holes in the area; the results have not been published but were said to be 'not favorable' by Still and others (2002).

The rocks in the area are volcanics of the Triassic Hyd Group that have been intruded by a Upper Cretaceous hornblende diorite (Brew, 1997; Karl and others, 1999). While the persistent high gold values of the original soil sampling could not be confirmed by Still and others (2002), several of their soil samples contained anomalous gold and arsenic. Two samples contained 67 and 75 parts per billion (ppb) gold and 122 and 124 parts per million (ppm) arsenic. They also collected two samples of silicified greenstone with disseminated pyrite that contained 94 to 730 ppb gold and 1,374 to more than 10,000 ppm arsenic.

Alteration:

Volcanic rocks are silicified near one mineralized outcrop.

Age of mineralization:

Probably Triassic of younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

In the late 1990s, Olympic Resources collected hundreds of soil samples on a grid and outlined an area about 1,500 feet by 5,000 feet in size with anomalous gold values. However, Still and others (2002) could not confirm the original assays. In 2000, Olympic Resources drilled 7 holes in the area (Still and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-J, 21 p., 1 sheet, scale 1:63,360.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): AMAX Molybdenum

Site type: Prospect

ARDF no.: PE102

Latitude: 56.5164 **Quadrangle:** PE C-1

Longitude: 132.0607

Location description and accuracy:

The AMAX Molybdenum prospect consists of 4 deep holes drilled between 1976 and 1981 by Amax Exploration Inc. The holes extend along a line about 5,000 feet long trending about N 40 W. The location is at about the center of this line of holes, near the site of one of the holes. Still and others (2002) locate the holes precisely on their Plate 3. The center of the line of holes is at an elevation of about 3,000 feet about 1.3 miles southwest of Mount Waters and about 0.6 mile south-southwest of the center of section 6, T. 62 S., R. 85 E., in Groundhog Basin. The location is accurate.

Commodities:

Main: Mo

Other: W

Ore minerals: Molybdenite, scheelite

Gangue minerals: Fluorite, quartz

Geologic description:

The rocks in the prospect area are part of a belt of Mesozoic or Paleozoic sedimentary and volcanic rocks that have been metamorphosed to schist and gneiss. The belt is about 1 1/2 mile wide and strikes northwest (Brew, 1997; George and Wyckoff, 1973). The metamorphic rocks are bounded on the east by a thick, regionally extensive, 60 to 70 Ma tonalite sill and on the west by a 90 Ma granodiorite pluton (Brew, 1997 Still and others, 2002). On the north side of Groundhog Basin adjacent to the lines of drill holes that define this prospect, the metamorphic rocks are intruded by a 16.3 Ma biotite 'tin' granite pluton about 1,000 by 2,0000 feet in size. The granite is probably the source of the numerous rhyolite dikes and sills that extend from it and the mineralization in the area (Newberry and Brew, 1989).

From 1976 to 1981, AMAX Exploration Inc. drilled four holes, 506 to 2,727 feet deep, to test the molybdenum potential of the small biotite granite exposed on the ridge northeast of the drill holes. During surface mapping in the area, AMAX collected samples that contained up to 5,000 parts per million (ppm) molybdenum in the biotite granite stock and gneiss (AMAX Exploration Inc., 1981a, 1981b). The mineralization consists of thin fractures with molybdenite in the granite and gneiss. The molybdenite is associated with quartz and fluorite in stringers and vugs, sericite-chlorite alteration, and some tungsten in the assays. The four holes that AMAX drilled were oriented to penetrate the granite at depth and three of the holes did so. Mineralization was cut in several of the holes but the best interval contained only 69 parts per million molybdenum. Still and others (2002) examined the area as part of a Bureau of Land Management mineral assessment of the area but their work was confined to a few surface samples.

Alteration:

The molybdenite is associated with quartz and fluorite in stringers and vugs and sericite-chlorite alteration.

Age of mineralization:

Associated with a 16.3 Ma granite.

Generic deposit model:

Deposit model:

Porphyry molybdenum.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

From 1976 to 1981, AMAX Exploration Inc. drilled four holes, 506 to 2,727 feet deep, to test the molybdenum potential of the small biotite granite pluton exposed on the ridge northeast of the drill holes. They also did considerable surface mapping in the area. A few surface samples collected by Still and others (2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

AMAX Exploration Inc., 1981a, Ground Hog Basin project geochemical maps, 2 sheets (Unpublished maps on file at the Minerals Information Center, Bureau of Land Management, Juneau, Alaska).

AMAX Exploration Inc., 1981b, Whistlepig property sample location map, 1 sheet, scale 1:12,000 (Unpublished report on file at the Minerals Information Center, Bureau of Land Management, Juneau, Alaska).

George, R.H., and Wyckoff, B.S., 1973, Whistlepig mineral exploration program, Alaska, Final report 1972 (with attached diamond drill hole logs and analyses): Unpublished El Pas National Gas Company report 109 p. 12 sheets (available at the Bureau of Land Management, Minerals Information Center, Juneau Alaska).

Newberry, R.J., and Brew, D.A., 1989, Epigenetic hydrothermal origin of the Groundhog Basin-Glacier Basin silver-tin-lead-zinc deposits, southeastern Alaska: U.S. Geological Survey Bulletin 1903, p. 113-121.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002 Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Northeast Cliffs

Site type: Prospect

ARDF no.: PE103

Latitude: 56.5164 **Quadrangle:** PE C-1

Longitude: 132.0607

Location description and accuracy:

This prospect represents sampling by an unknown company and by Still and others (2002) on the steep north-trending cliff face east of the middle section of Groundhog Basin. The coordinates are at about the center of the work at an elevation of about 3,400 feet; it is about 0.5 mile south of the center of section 6, T. 62 S., R. 86 E. The general location is accurate but the location of the specific sampling by industry is uncertain.

Commodities:

Main: Cu, Pb, Sn, Zn

Other:

Ore minerals: Chalcopyrite, galena, sphalerite

Gangue minerals:

Geologic description:

The rocks in the prospect area are part of a belt of Mesozoic or Paleozoic sedimentary and volcanic rocks that have been metamorphosed to schist and gneiss. The belt is about 1 1/2 mile wide and strikes northwest (Brew, 1997; George and Wyckoff, 1973). The metamorphic rocks are bounded on the east by a thick, regionally extensive, 60 to 70 Ma tonalite sill and on the west by a 90 Ma granodiorite pluton (Brew, 1997 Still and others, 2002). On the north side of Groundhog Basin just west of the cliff faces, the metamorphic rocks are intruded by a 16.3 Ma biotite 'tin' granite pluton about 1,000 by 2,0000 feet in size. The granite is probably the source of the numerous rhyolite dikes and sills that extend from it and the mineralization in the area (Newberry and Brew, 1989).

Still and others (2002) found fixed climbing ropes at several places along about 0.5 mile on the cliff faces east of Groundhog Basin that probably represent sampling and mapping by AMAX Exploration Inc. between 1976 and 1981. Still and others (2002) collected several samples at the north and south ends of the cliffs. The rocks along the cliffs are mainly silicified gneiss and rhyolite. The mineralization consists of disseminated chalcopyrite, galena, and sphalerite (probably similar in origin to the mineralization at the Groundhog Basin prospect in the valley below (PE040)). Four samples collected by Still and others (2002) contained 112 to 980 parts per million (ppm) copper, 1,569 to 9,559 ppm zinc, and 58 to 1,941 ppm tin.

Alteration:

None specifically noted.

Age of mineralization:

16.3 Ma based on a probable genetic tie to a nearby, zinnwaldite 'tin' granite (Newberry and Brew, 1989).

Generic deposit model:

Deposit model:

Banded Ag-Cu-Sn-Pb-Zn tabular replacement bodies, veins, and stringers.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Still and others (2002) found fixed climbing ropes at several places along about 0.5 mile on the cliff faces east of Groundhog Basin that probably represent sampling and mapping by AMAX Exploration Inc. between 1976 and 1981. Still and others (2002) collected several samples at the north and south ends of the cliffs.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-1 Quadrangle, Southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-H, 23 p., 1 sheet, scale 1:63,360.

Newberry, R.J., and Brew, D.A., 1989, Epigenetic hydrothermal origin of the Groundhog Basin-Glacier Basin silver-tin-lead-zinc deposits, southeastern Alaska: U.S. Geological Survey Bulletin 1903, p. 113-121.3

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): North Silver West

Site type: Prospect

ARDF no.: PE104

Latitude: 56.515 **Quadrangle:** PE C-1

Longitude: 132.0484

Location description and accuracy:

This prospect is about 1.0 mile southwest of Mount Waters at an elevation of about 4,220 feet; it is about 0.5 north-northeast of the center of section 7, T. 62 S., R. 85 E. The location is accurate and it is Map No. 94 of Still and others (2002).

Commodities:

Main: Ag, Pb, Zn

Other:

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks in the prospect area are part of a belt of Mesozoic or Paleozoic sedimentary and volcanic rocks that have been metamorphosed to schist and gneiss. The belt is about 1 1/2 mile wide and strikes northwest (Brew, 1997; George and Wyckoff, 1973). The metamorphic rocks are bounded on the east by a thick, regionally extensive, 60 to 70 Ma tonalite sill and on the west by a 90 Ma granodiorite pluton (Brew, 1997 Still and others, 2002). On the north side of Groundhog Basin about a mile southwest of this prospect, the metamorphic rocks are intruded by a 16.3 Ma biotite 'tin' granite pluton. The granite is probably the source of the numerous rhyolite dikes and sills that extend from it and the mineralization in the area (Newberry and Brew, 1989).

In the late 1950s, Moneta Porcupine Company staked claims in the area but subsequently dropped them. William Huff and James Fucas continued prospecting in the area and Huff discovered the North Silver West prospect in 1963. Their claims were optioned by the Bunker Hill Mining Company in 1965 and they dug several pits on the mineralization. They dropped the claims at the end of the field season and the property was optioned by a succession of companies, Humble Oil and Refining Company, El Paso Natural Gas Company and AMAX Exploration Inc., through 1981. An adit driven early in the history of the prospect extended only a few feet into the rock. Still and others (2002) sampled the prospect during a Bureau of Land Management mineral assessment of the area.

The North Silver West prospect is associated with a fault zone up to 10 feet thick that strikes N20-40E and dips 50-89 degrees southeast. The footwall of the fault schist with 0.5-to-4-foot-thick, irregular lenses and pods of quartz with massive and disseminated pyrite, galena, and sphalerite. The fault zone, as now exposed extends for about 185 feet. Samples collected by Still and others (2002) across 0.5 to 4.9 feet of the mineralization contained 31.3 to 79.46 parts per million (ppm) silver, 1,795 ppm to 33.47 percent lead, and from 2,734 ppm to 9.8 percent zinc.

Alteration:

Age of mineralization:

Probably related to a nearby 16.3 Ma biotite granite pluton.

Generic deposit model:

Deposit model:

Banded Ag-Cu-Sn-Pb-Zn tabular replacement bodies, veins, and stringers.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

In the late 1950s, Moneta Porcupine Company staked claims in the area but subsequently dropped them. William Huff and James Fucas continued prospecting in the area and Huff discovered the North Silver West prospect in 1963. Their claims were optioned by the Bunker Hill Mining Company in 1965 and they dug several pits on the mineralization. Bunker Hill dropped the claims at the end of the field season and the property was optioned by a succession of companies through 1981: Humble Oil and Refining Company, El Paso Natural Gas Company, and AMAX Exploration Inc. Still and others (2002) sampled the prospect during a Bureau of Land Management mineral assessment of the area.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-1 Quadrangle, Southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-H, 23 p., 1 sheet, scale 1:63,360.

Newberry, R.J., and Brew, D.A., 1989, Epigenetic hydrothermal origin of the Groundhog Basin-Glacier Basin silver-tin-lead-zinc deposits, southeastern Alaska: U.S. Geological Survey Bulletin 1903, p. 113-121.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): North Silver Whistlepig Adit

Site type: Prospect

ARDF no.: PE105

Latitude: 56.5116 **Quadrangle:** PE C-1

Longitude: 132.0435

Location description and accuracy:

The North Silver Whistlepig Adit is about 1.0 mile south-southwest of Mount Waters on a steep slope at the head of a cirque. It is at an elevation of about 4,050 feet about 0.5 mile northeast of the center of section 7, T. 62 S., R. 85 E. The location is accurate and is is Map No. 95 of Still and others (2002).

Commodities:

Main: Ag, Au, Pb, Sn, Zn

Other:

Ore minerals: Galena, sphalerite

Gangue minerals: Fluorite, quartz

Geologic description:

In the late 1950s, Moneta Porcupine Company staked claims in the area but subsequently dropped them. William Huff and James Fucas continued prospecting in the area and staked several claims. Their claims were optioned by the Bunker Hill Mining Company in 1965. They dropped the claims at the end of the field season and the property was optioned by a succession of companies through 1981: Humble Oil and Refining Company, El Paso Natural Gas Company, and AMAX Exploration Inc. Sometime in the 1970s, a mine car and track were taken by helicopter to the prospect and an adit was started to intersect a silver vein. However, the adit extended only a few feet into the rock. About 20 feet of trenching was also done at that time. Still and others (2002) sampled the prospect during a Bureau of Land Management mineral assessment of the area.

The rocks in the prospect area are part of a belt of Mesozoic or Paleozoic sedimentary and volcanic rocks that have been metamorphosed to schist and gneiss. The belt is about 1 1/2 mile wide and strikes northwest (Brew, 1997; George and Wyckoff, 1973). The metamorphic rocks are bounded on the east by a thick, regionally extensive, 60 to 70 Ma tonalite sill and on the west by a 90 Ma granodiorite pluton (Brew, 1997 Still and others, 2002). On the north side of Groundhog Basin about a mile northwest of this prospect, the metamorphic rocks are intruded by a 16.3 Ma biotite 'tin' granite pluton. The granite is probably the source of the numerous rhyolite dikes and sills that extend from it and the mineralization in the area (Newberry and Brew, 1989).

The mineralization at the North Silver Whistlepig Adit prospect consists of narrow, argentiferous, galena-bearing quartz veins (Still and others, 2002). The veins are from 0.2 to 1.0 foot thick, pinch and swell, and are exposed for about 50 feet in the steep rock face above a short adit that only extends a few feet into rock and does not intersect the veins. Several samples of the vein material collected by Still and others (2002) contained from less that 5 to 4,345 parts per billion gold, 11.5 parts per million (ppm) to 517.62 ounces of silver per ton, 778 ppm to 39.75 percent lead, 377 ppm to 11.0 percent zinc, and 17 to 1,497 ppm tin. Gneiss at the adit contains small vugs of quartz and fluorite; a sample across 3.6 feet of the gneiss contained 954 ppm lead, 399 ppm zinc, and 11.9 ppm silver.

Alteration:

Age of mineralization:

Probably related to a nearby 16.3 Ma biotite granite.

Generic deposit model:

Deposit model:

Argentiferous, galena-quartz veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

In the late 1950s, Moneta Porcupine Company staked claims in the area but subsequently dropped them. William Huff and James Fucas continued prospecting in the area and staked several claims. Their claims were optioned by the Bunker Hill Mining Company in 1965. They dropped the claims at the end of the field season and the property was optioned by a succession of companies through 1981: Humble Oil and Refining Company, El Paso Natural Gas Company, and AMAX Exploration Inc. In the 1970s, a mine car and track were taken by helicopter to the prospect and an adit was started to intersect a high-grade silver vein at the prospect. However, the adit extended only a few feet into the rock. About 20 feet of trenching was also done about this time. Still and others (2002) sampled the prospect during a Bureau of Land Management mineral assessment of the area.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-1 Quadrangle, Southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-H, 23 p., 1 sheet, scale 1:63,360.

Gault, H.R., Rossman, D.L., Flint, G.M., Jr., and Ray, R.G., 1953, Some lead-zinc deposits of the Wrangell district, Alaska: U.S. Geological Survey Bulletin 998-B, p. 15-58.

Newberry, R.J., and Brew, D.A., 1989, Epigenetic hydrothermal origin of the Groundhog Basin-Glacier Basin silver-tin-lead-zinc deposits, southeastern Alaska: U.S. Geological Survey Bulletin 1903, p. 113-121.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others (2002)

Reporter(s): D. J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): South Silver

Site type: Prospect

ARDF no.: PE106

Latitude: 56.507 **Quadrangle:** PE C-1

Longitude: 132.0416

Location description and accuracy:

El Paso Natural Gas Company collected samples along a line about 1,900 feet long trending south-southwest, beginning near Peak 4326 at the head of Groundhog Basin. They then drilled a 149-foot hole about 0.1 mile southwest of Peak 4326; the coordinates for the prospect are at the drill hole. The prospect is about 0.6 mile east-southeast of the center of section 7, T. 62 S., R. 86 E. The location is accurate.

Commodities:

Main: Ag, Pb, Sn, Zn

Other:

Ore minerals:

Gangue minerals: Quartz

Geologic description:

The rocks in the prospect area are part of a belt of Mesozoic or Paleozoic sedimentary and volcanic rocks that have been metamorphosed to Tertiary or Cretaceous schist and gneiss. The belt is about 1 1/2 mile wide and strikes northwest (Brew, 1997; George and Wyckoff, 1973). The metamorphic rocks are bounded on the east by a thick, regionally extensive, 60 to 70 Ma tonalite sill and on the west by a 90 Ma granodiorite pluton (Brew, 1997 Still and others, 2002). On the north side of Groundhog Basin, the metamorphic rocks are intruded by a 16.3 Ma biotite 'tin' granite pluton about 1,000 by 2,0000 feet in size. The granite is probably the source of the numerous rhyolite dikes and sills that extend from it and the mineralization in the area (Newberry and Brew, 1989).

El Paso Natural Gas Company worked in the area from 1971 to 1976 (George and Wyckoff, 1973). They collected more than 200 surface samples along a line about 1,900 feet long that extended south-southwest from Peak 4326. They also drilled a hole 149 feet deep about 0.1 mile southwest of Peak 4326. Still and others (2002) identified the mineralization as quartz veins and stringers up to 10 feet thick that follows the layering in the gneiss hostrock. Four samples contained up to 63.9 parts per million (ppm) silver, 1,417 ppm lead, and 1,089 ppm tin. In the samples El Paso Natural Gas Company collected, the 6 best surface samples contained 840 to 1,655 ppm zinc, and 320 to 2,720 ppm lead. A 32-foot intercept in the El Paso drill hole consisted of rhyolite and gneiss cut by quartz stringers with sphalerite and galena; the intercept averaged 0.7 percent zinc, 1.0 percent lead, and 0.3 ounce of silver per ton. The mineralization is almost certainly of the same origin and age as that at the nearby Groundhog Basin prospect (PE040).

Alteration:

Age of mineralization:

16.3 Ma based on a genetic tie to a nearby, zinnwaldite 'tin' granite (Newberry and Brew, 1989).

Generic deposit model:

Deposit model:

Banded Ag-Cu-Sn-Pb-Zn tabular replacement bodies, veins, and stringers.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

El Paso Natural Gas Company worked in the area from 1971 to 1976. They collected more than 200 surface samples along a line about 1,900 feet long that extended south-southwest from Peak 4326. They also drilled a hole 149 feet deep about 0.1 mile southwest of Peak 4326.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-1 Quadrangle, Southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-H, 23 p., 1 sheet, scale 1:63,360.

George, R.H., and Wyckoff, B.S., 1973, Whistlepig mineral exploration program, Alaska, Final report 1972 (with attached diamond drill hole logs and analyses): Unpublished El Paso National Gas Company report 109 p. 12 sheets (available at the Bureau of Land Management, Minerals Information Center, Juneau Alaska).

Newberry, R.J., and Brew, D.A., 1989, Epigenetic hydrothermal origin of the Groundhog Basin-Glacier Basin silver-tin-lead-zinc deposits, southeastern Alaska: U.S. Geological Survey Bulletin 1903, p. 113-121.3

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Copper Zone

Site type: Prospect

ARDF no.: PE107

Latitude: 56.5052 **Quadrangle:** PE C-1

Longitude: 132.0504

Location description and accuracy:

The Copper Zone prospect is high on the cirque wall at the head of Groundhog Basin; it is at an elevation of about 3,500 feet, about 0.5 mile west-southwest of the prominent peak 4326. The prospect is about 0.3 mile south-southeast of the center of section 7, T. 62 S., R. 86 E. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Pb, Sn, Zn

Other:

Ore minerals: Chalcopyrite, galena, pyrrhotite, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks in the prospect area are part of a belt of Mesozoic or Paleozoic sedimentary and volcanic rocks that have been metamorphosed to Tertiary or Cretaceous schist and gneiss The belt is about 1 1/2 mile wide and strikes northwest (Brew, 1997; George and Wyckoff, 1973). The metamorphic rocks are bounded on the east by a thick, regionally extensive, 60 to 70 Ma tonalite sill and on the west by a 90 Ma granodiorite pluton (Brew, 1997 Still and others, 2002). On the north side of Groundhog Basin, the metamorphic rocks are intruded by a 16.3 Ma biotite 'tin' granite pluton about 1,000 by 2,0000 feet in size. The granite is probably the source of the numerous rhyolite dikes and sills that extend from it and the mineralization in the area (Newberry and Brew, 1989).

The earliest work reported on this prospect was done by El Paso Natural Gas Company in 1972; they collected 1,044 rock samples and drilled nine holes (George and Wyckoff, 1973; Still and others, 2002) . They defined a mineralized area about 125 feet by 160 feet in size. Still and others (2002) report that the area is notable for rhyolite sills up to 60 feet thick that generally follow the layering in gneiss and schist. Disseminated chalcopyrite occurs along fractures that parallel and crosscut the foliation of the metamorphic rocks. Some lenses and bands of massive chalcopyrite and pyrrhotite up to 0.4 feet thick also occur along the fractures. Chip samples up to 0.7 feet long across the fractures contained up to 4,580 parts per billion gold, 19.65 ounces of silver per ton, 8.1 percent copper, 1.71 percent lead, 2.65 percent zinc, and 1,728 parts per million tin. Only one of the nine holes drilled by El Paso Natural Gas Company intersected mineralization; the best intercept was 70 feet that averaged 0.11 percent copper. The deposit is similar to the mineralization at the nearby Groundhog Basin prospect (PE040) and may be a continuation of it.

Alteration:

None noted specifically.

Age of mineralization:

16.3 Ma based on a probable genetic tie to a nearby, zinnwaldite 'tin' granite (Newberry and Brew, 1989).

Generic deposit model:

Deposit model:

Banded Ag-Cu-Sn-Pb-Zn tabular replacement bodies, veins, and stringers.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

The earliest work reported on this prospect was by El Paso Natural Gas Company in 1972; they collected 1,044 rock samples and drilled nine holes. The prospect was later sampled by Still and others (2002) as part of a BLM mineral assessment.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-1 Quadrangle, Southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-H, 23 p., 1 sheet, scale 1:63,360.

George, R.H., and Wyckoff, B.S., 1973, Whistlepig mineral exploration program, Alaska, Final report 1972 (with attached diamond drill hole logs and analyses): Unpublished El Paso National Gas Company report 109 p. 12 sheets (available at the Bureau of Land Management, Minerals Information Center, Juneau Alaska).

Newberry, R.J., and Brew, D.A., 1989, Epigenetic hydrothermal origin of the Groundhog Basin-Glacier Basin silver-tin-lead-zinc deposits, southeastern Alaska: U.S. Geological Survey Bulletin 1903, p. 113-121.3

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Camp Six

Site type: Prospect

ARDF no.: PE108

Latitude: 56.5032 **Quadrangle:** PE C-1

Longitude: 132.0449

Location description and accuracy:

Camp Six was an exploration camp with two trailers and several smaller buildings that El Paso Natural Gas Company used in the 1970's. Still and others (2002) retained that name for the prospect. It is about 0.4 mile southwest of Peak 4362 at the head of Groundhog Basin. The prospect is about 0.6 mile southeast of the center of section 7, T. 62 S., R. 86 E. The location is accurate.

Commodities:

Main: Ag, Cu, Pb, Sn, Zn

Other:

Ore minerals:

Gangue minerals: Quartz

Geologic description:

The rocks in the prospect area are part of a belt of Mesozoic or Paleozoic sedimentary and volcanic rocks that have been metamorphosed to Tertiary or Cretaceous schist and gneiss. The belt is about 1 1/2 mile wide and strikes northwest (Brew, 1997; George and Wyckoff, 1973). The metamorphic rocks are bounded on the east by a thick, regionally extensive, 60 to 70 Ma tonalite sill and on the west by a 90 Ma granodiorite pluton (Brew, 1997 Still and others, 2002). On the north side of Groundhog Basin, about a mile to the northwest, the metamorphic rocks are intruded by a 16.3 Ma biotite 'tin' granite pluton about 1,000 by 2,0000 feet in size. The granite is probably the source of the numerous rhyolite dikes and sills that extend from it and the mineralization in the area (Newberry and Brew, 1989).

Camp Six was an exploration camp with two trailers and several smaller buildings that El Paso Natural Gas Company used in the 1970s for their work in the area. Still and others (2002) retained that name for the prospect here where El Paso did some surface geology and sampling. As Still and others did later, El Paso identified the mineralization as narrow silicified, sheared zones along the margins of rhyolite sills and in gneiss. The zones contained pyrrhotite, chalcopyrite, galena, and sphalerite. Samples collected by Still and others contained up to 58 parts per million (ppm) silver, 1,976 ppm copper, 1,324 ppm lead, and 9.5 percent zinc. The mineralization is almost certainly of the same origin and age as the nearby Groundhog Basin prospect (PE040).

Alteration:

None specifically mentioned.

Age of mineralization:

Probably 16.3 Ma based on a genetic tie to a nearby, zinnwaldite 'tin' granite (Newberry and Brew, 1989).

Generic deposit model:

Deposit model:

Banded Ag-Cu-Sn-Pb-Zn tabular replacement bodies, veins, and stringers.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Camp Six was an exploration camp with two trailers and several smaller buildings that El Paso Natural Gas Company used in the 1970s. Still and others (2002) retained that name for the prospect here. El Paso did some surface geology and sampling, as did Still and others later.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-1 Quadrangle, Southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-H, 23 p., 1 sheet, scale 1:63,360.

George, R.H., and Wyckoff, B.S., 1973, Whistlepig mineral exploration program, Alaska, Final report 1972 (with attached diamond drill hole logs and analyses): Unpublished El Paso National Gas Company report 109 p. 12 sheets (available at the Bureau of Land Management, Minerals Information Center, Juneau Alaska).

Newberry, R.J., and Brew, D.A., 1989, Epigenetic hydrothermal origin of the Groundhog Basin-Glacier Basin silver-tin-lead-zinc deposits, southeastern Alaska: U.S. Geological Survey Bulletin 1903, p. 113-121.3

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Lake Cirque

Site type: Prospect

ARDF no.: PE109

Latitude: 56.4992 **Quadrangle:** PE B-1

Longitude: 132.052

Location description and accuracy:

The Lake Cirque prospect consists of three areas of mineralization that crop out through patches of ice and snow along a generally north-south trend about 2,000 feet long. The coordinates are at about the center of the mineralization; it is about 0.9 mile north-northwest of Marsha Peak and about 0.4 mile north of the center of section 18, T. 62 S., R. 86 E. The location is accurate. A map of the mineralization is Plate 29 of Still and others (2002).

Commodities:

Main: Ag, Cu, Pb, Sn, Zn

Other:

Ore minerals: Chalcopyrite, galena, pyrite, pyrrhotite, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks in the prospect area are part of a belt of Mesozoic or Paleozoic sedimentary and volcanic rocks that have been metamorphosed to Tertiary or Cretaceous schist and gneiss. The belt is about 1 1/2 mile wide and strikes northwest (Brew, 1997; George and Wyckoff, 1973). The metamorphic rocks are bounded on the east by a thick, regionally extensive, 60 to 70 Ma tonalite sill and on the west by a 90 Ma granodiorite pluton (Brew, 1997 Still and others, 2002). On the north side of Groundhog Basin,. about a mile to the north-northeast of this prospect, the metamorphic rocks are intruded by a 16.3 Ma biotite 'tin' granite pluton about 1,000 by 2,0000 feet in size. The granite is probably the source of the numerous rhyolite dikes and sills that extend from it and the mineralization in the area (Newberry and Brew, 1989).

The mineralization at this prospect and in the surrounding area was described in detail by Gault and others (1953). The prospect area was included in various claims blocks staked in the 50s and 60s but for most of that time, the area was covered by permanent snow and ice. In 1976, Bunker Hill Mining Company was able to trace the ore beds in Groundhog Basin (PE040) into the cirque around this prospect and drilled two holes in the mineralization. Still and others (2002) better defined the and sampled the mineralization in a year when much of the snow had melted off.

The mineralization at the Lake Cirque prospect is a continuation of the ore beds at the better known Groundhog Basin prospect (PE040) to the north. Still and others (2002) identified three zones of mineralization among the snow banks. The mineralization is similar in all three. It consists of layers of gneiss and/or calc-silicate gneiss that contain tabular to layered masses of chalcopyrite, galena, sphalerite, pyrite, and pyrrhotite. In the eastern zone, five samples taken in a tabular body several feet thick averaged 8.2 parts per million (ppm) silver, 752 ppm copper, 8,374 ppm lead, 5.13 percent zinc and 842 ppm tin. The west zone is about 80 feet long and 3 feet wide; samples averaged 36.9 ppm silver, 2.318 ppm copper, 9,223 ppm zinc, and 3,267 ppm tin. The mineralization at the south zone is in sheared gneiss with vuggy quartz veinlets. Samples across 9 feet of this zone's best mineralization averaged 3 ppm silver, 446 ppm copper, 1.68 percent zinc, and 567 ppm tin. Another area of mineralization originally located by Gault and others (1953) is on the south side of the cirque and consists of irregular bands and lenses of massive and disseminated pyrrhotite, galena, and sphalerite in calc-silicate gneiss and along fractures. The best sample

collected in this zone by Still and others (2002) contained 130 ppm silver, 1,057 ppm copper, 1.06 percent led, 2.8 percent zinc, and 757 ppm tin.

Alteration:

None specifically noted.

Age of mineralization:

Probably 16.3 Ma based on a genetic tie to a nearby, zinnwaldite 'tin' granite (Newberry and Brew, 1989).

Generic deposit model:

Deposit model:

Banded Ag-Cu-Sn-Pb-Zn tabular replacement bodies, veins, and stringers.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

The mineralization in this area was first described by Gault and others (1953). The prospect area was included in various claims blocks staked in the 50s and 60s, but for most of that time the area was covered by snow and ice. In 1976, Bunker Hill Mining Company was able to trace the ore beds in Groundhog Basin (PE040) in to the cirque around this prospect and drilled two holes. Still and others (2002) were able to better define and sample the mineralization in a year when much of the snow had melted and the rocks were better exposed.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-1 Quadrangle, Southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-H, 23 p., 1 sheet, scale 1:63,360.

Gault, H.R., Rossman, D.L., Flint, G.M., Jr., and Ray, R.G., 1953, Some lead-zinc deposits of the Wrangell district, Alaska: U.S. Geological Survey Bulletin 998-B, p. 15-58.

Newberry, R.J., and Brew, D.A., 1989, Epigenetic hydrothermal origin of the Groundhog Basin-Glacier Basin silver-tin-lead-zinc deposits, southeastern Alaska: U.S. Geological Survey Bulletin 1903, p. 113-121.3

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): North Marsha Peak

Site type: Prospect

ARDF no.: PE110

Latitude: 56.4934 **Quadrangle:** PE B-1

Longitude: 132.0438

Location description and accuracy:

The North Marsha Peak prospect is about 0.5 mile north of Marsha Peak and about 0.4 mile east of the center of section 18, T. 62 S., R. 86 E. The location is accurate. A map of the prospect is Figure 30 of Still and others (2002).

Commodities:

Main: Ag, Pb, Sn, Zn

Other:

Ore minerals: Chalcopyrite, galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks in the prospect area are part of a belt of Mesozoic or Paleozoic sedimentary and volcanic rocks that have been metamorphosed to Tertiary or Cretaceous schist and gneiss. The belt is about 1 1/2 mile wide and strikes northwest (Brew, 1997; George and Wyckoff, 1973). The metamorphic rocks are bounded on the east by a thick, regionally extensive, 60 to 70 Ma tonalite sill and on the west by a 90 Ma granodiorite pluton (Brew, 1997 Still and others, 2002). On the north side of Groundhog Basin, about 2 miles northwest of this prospect, the metamorphic rocks are intruded by a 16.3 Ma biotite 'tin' granite pluton about 1,000 by 2,0000 feet in size. The granite is probably the source of the numerous rhyolite dikes and sills that extend from it and the mineralization in the area (Newberry and Brew, 1989).

The mineralization at this prospect was described by Gault and others (1953) but little was done on it by industry until the property was optioned by the Bunker Mill Mining Company in 1965. From 1968 to 1970, Humble Oil and Refining Company optioned the property and drilled two holes on it through the Nelson Glacier. El Paso Natural Gas Company optioned the property from 1971 to 1973, collected numerous surface samples, and drilled three holes on it, 116 to 230 feet long (George and Wyckoff, 1973). Still and others (2002) re-examined the property during a mineral assessment of the area by the BLM.

The mineralization here is generally similar to that in Groundhog Basin (PR040) several miles to the north and probably shares the same origin. Here the mineralization is associated with two sheared zones that parallel the foliation of the gneiss and the rhyolite sills in the gneiss; the fault zones strike north and are about 750 feet apart. As reported by Still and others (2002) the western shear zone is 4 to 12 feet thick and about 1,100 feet long. Samples averaged 1.5 ounces of silver per ton, 0.3 percent copper, 0.22 percent lead, and 0.58 percent zinc. The eastern shear zone is about 4 feet thick and can be traced for about 600 feet to where it disappears under the Nelson Glacier. Select samples of thin veinlets along the shear zone contained up to 20.7 ounces of silver per ton, 70 percent lead, and 22 percent zinc. One hole by El Paso Natural Gas Company in the western zone was probably drilled parallel to the mineralized shear zone; it averaged 1.1 percent zinc and 0.25 percent lead over its entire 116 foot length. Another drill hole in the eastern shear zone had a 13-foot interval that averaged 0.87 ounce of silver per ton, 0.08 percent copper, 0.6 percent lead, and 4.3 percent zinc.

Alteration:

Age of mineralization:

Probably 16.3 Ma based on a genetic tie to a nearby, zinnwaldite 'tin' granite (Newberry and Brew, 1989).

Generic deposit model:

Deposit model:

Banded Ag-Cu-Sn-Pb-Zn tabular replacement bodies, veins, and stringers.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

The mineralization at this prospect was described by Gault and others (1953) but little was done on it by industry until the property was optioned by the Bunker Mill Mining Company in 1965. From 1968 to 1970, Humble Oil and Refining Company optioned the property and drilled two holes on it through the Nelson Glacier. El Paso Natural Gas Company optioned the property from 1971 to 1973, collected numerous surface samples, and drilled three holes on it, 116 to 230 feet long (George and Wyckoff, 1973). Still and others (2002) re-examined the property during a mineral assessment of the area by the BLM.

Production notes:

None.

Reserves:

None.

Additional comments:

No claims were active as of 2002 according to Still and others.

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-1 Quadrangle, Southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-H, 23 p., 1 sheet, scale 1:63,360.

Gault, H.R., Rossman, D.L., Flint, G.M., Jr., and Ray, R.G., 1953, Some lead-zinc deposits of the Wrangell district, Alaska: U.S. Geological Survey Bulletin 998-B, p. 15-58.

George, R.H., and Wyckoff, B.S., 1973, Whistlepig mineral exploration program, Alaska, Final report 1972 (with attached diamond drill hole logs and analyses): Unpublished El Paso National Gas Company report 109 p. 12 sheets (available at the Bureau of Land Management, Minerals Information Center, Juneau Alaska).

Newberry, R.J., and Brew, D.A., 1989, Epigenetic hydrothermal origin of the Groundhog Basin-Glacier Basin silver-tin-lead-zinc deposits, southeastern Alaska: U.S. Geological Survey Bulletin 1903, p. 113-121.3

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (on Nelson Glacier)

Site type: Occurrences

ARDF no.: PE111

Latitude: 56.4913 **Quadrangle:** PE B-1

Longitude: 132.015

Location description and accuracy:

These occurrences are in an area that covers most of the center and upper portions of the Nelson Glacier. Much of the glacier was covered by claims from 1964 to 1981, when there was considerable exploration to the west from Marsha Peak to Groundhog Basin. At least one occurrence is on a small nunatak on the glacier, and there is a deep hole in the upper basin of the glacier that went through 621 feet of ice before it struck rock and cut a thin intercept of mineralization (see the Geologic Description for details) This area is essentially Map no. 105 of Still and others (2002) and the coordinates are at about its center.

Commodities:

Main: Ag, Cu, Pb, Sn, Zn

Other:

Ore minerals:

Gangue minerals:

Geologic description:

From about 1964 to 1981 when there was considerable exploration across a wide swatch from from Glacier Basin to Groundhog Basin, a succession of companies considered the potential of the ground under Nelson Glacier. Much if not all of the Glacier were first staked in 1964 and first optioned to Bunker Hill Mining Company. The claims were subsequently optioned to Humble Oil and Refining Company from 1968 to 1970 and they drilled two holes through the ice in the upper part of the glacier. El Paso optioned the claims from 1971 to 1973 and AMAX Exploration Inc. optioned the claims from 1976 to 1981. Still and others (2002) did some limited sampling on or adjacent to the glacier. In 2002. there were no active claims on the glacier.

The rocks west of and under the center of the Nelson Glacier and from Glacier Basin, through Marsha Peak, and along Groundhog Basin consists mainly of Tertiary biotite and hornblende schist and gneiss with local marble interbeds, an assemblage that has been metamorphosed from Mesozoic and/or Paleozoic sedimentary and volcanic protoliths (Gault and others, 1952; George and Wyckoff, 1973; Gehrels and Berg, 1992, Brew, 1997) . The metamorphic rocks are intruded by a small 16.3 Ma stock of tin granite just north of Groundhog Basin that probably is the source of numerous rhyolite dikes and sills that cut the metamorphic rocks around Nelson Glacier as well as the source for the mineralization in the Groundhog Basin area. West of Groundhog Basin, the metamorphic rocks are intruded by several large plutons of Cretaceous tonalite, quartz diorite, and granodiorite. At the east side of the Nelson Glacier, the rocks are dominated by a thick 70-90 Ma Tertiary tonalite sill that forms the west boundary of the Coast Range igneous-metamorphic complex that extends the length of southeastern Alaska. The Tertiary metamorphic rocks and rhyolite in particular probably underlie most of the Nelson Glacier.

Many of the other prospects and occurrences along the ridges between Glacier Basin and Groundhog Basin either border Nelson Glacier or may extend beneath it ; there has been considerable speculation about mineralization under Nelson Glacier and some effort to locate it. Humble drilled two 1,700-foot, vertical holes through the ice (Humble Oil and Refining Company, 1970a and 1970b). One (H1), about 0.6 mile north-northeast of Marsha Peak, went through 491 feet of ice into gneiss but did not intersect

mineralization. The other (H2), went through 621 feet of ice into gneiss; the best intercept in it was 10 feet that averaged 0.5 ounce of silver per ton, 0.4 percent lead, and 1.7 percent zinc. El Paso National Gas (Quigley, 1973) flew an aerial magnetometer survey over the area and traced several faults zones under the glacier. Still and others (2002) found float at several areas on the glacier, most notably on a nunatak about 1.1 mile east-southeast of Marsha Peak. Samples contained up to 8.43 ounces of silver per ton, 1.5 percent copper, 8.21 percent lead, 25.95 percent zinc, and 904 parts per million tin.

Alteration:

Age of mineralization:

Probably related to a 16.9 Ma tin granite pluton near Groundhog Basin and the numerous rhyolite dikes and sills that intrude the metamorphic rocks in the area.

Generic deposit model:

Deposit model:

Banded Ag-Cu-Sn-Pb-Zn tabular replacement bodies, veins, and stringers.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

From about 1964 to 1981, when there was considerable exploration across a wide swath from from Glacier Basin to Groundhog Basin, a succession of companies considered the potential of the ground under Nelson Glacier. Much if not all of Nelson Glacier was first staked in 1964 and first optioned to Bunker Hill Mining Company. The claims were subsequently optioned to Humble Oil and Refining Company from 1968 to 1970 and they drilled two holes through the ice in the upper part of the glacier. El Paso optioned the claims from 1971 to 1973 and AMAX Exploration Inc. optioned the claims from 1976 to 1981. Still and others (2002) did some limited sampling on or adjacent to the glacier.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg B-1 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-C, 20 p., 1 sheet, scale 1:63,360.

Gault, H.R., Rossman, D.L., Flint, G.M., Jr., and Ray, R.G., 1953, Some lead-zinc deposits of the Wrangell district, Alaska: U.S. Geological Survey Bulletin 998-B, p. 15-58.

Gehrels, G.E., and Berg, H.C., 1984, Geologic map of southeastern Alaska: U.S. Geological Survey Open-File Report 84-866, 28 p., 1 sheet, scale 1:600,000.

George, R.H., and Wyckoff, B.S., 1973, Whistlepig mineral exploration program, Alaska, Final report 1972 (with attached diamond drill hole logs and analyses): Unpublished El Pas National Gas Company report 109 p. 12 sheets (on file at the Bureau of Land Management, Minerals Information Center, Juneau Alaska).

Humble Oil and Refining Company, 1970a, Groundhog Basin sample and drill hole location maps, 4 maps. (Unpublished report on file at the Minerals Information Center, Bureau of Land Management, Juneau, Alaska.)

Humble Oil and Refining Company, 1970b, Drill logs and sample analyses, 23 p. (Unpublished report on file at the Minerals Information Center, Bureau of Land Management, Juneau, Alaska.)

Quigley, M.D., 1973, Report (to El Paso Natural Gas Company) on multilevel helium magnetometer survey, Whistlepig mineral prospect, Alaska: Hiroca Corporation, 89 p. (Unpublished report on file at the Minerals Information Center, Bureau of Land Management, Juneau, Alaska.)

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): East Marsha Peak

Site type: Prospect

ARDF no.: PE112

Latitude: 56.491 **Quadrangle:** PE B-1

Longitude: 132.0315

Location description and accuracy:

The East Marsha Peak prospect is about 0.5 mile northeast of Marsha Peak near the edge of the Nelson Glacier. It about 0.3 mile south of the center of section 17, T. 62 S., R. 86 E. The location is accurate. A map of the prospect is Figure 30 of Still and others (2002).

Commodities:

Main: Ag, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, pyrite, pyrrhotite, sphalerite

Gangue minerals: Fluorite, quartz

Geologic description:

The rocks in the prospect area are part of a belt of Mesozoic or Paleozoic sedimentary and volcanic rocks that have been metamorphosed to Tertiary or Cretaceous schist and gneiss. The belt is about 1 1/2 mile wide and strikes northwest (Brew, 1997; George and Wyckoff, 1973). The metamorphic rocks are bounded on the east by a thick, regionally extensive, 60 to 70 Ma tonalite sill and on the west by a 90 Ma granodiorite pluton (Brew, 1997 Still and others, 2002). On the north side of Groundhog Basin, about 2 miles northwest of this prospect, the metamorphic rocks are intruded by a 16.3 Ma biotite 'tin' granite pluton about 1,000 by 2,0000 feet in size. The granite is probably the source of the numerous rhyolite dikes and sills that extend from it and the mineralization in the area (Newberry and Brew, 1989).

The East Marsh Peak prospect was mapped and sampled by El Paso Natural Gas Company in the early 1970s; they dug three, 20- to 60-foot, samples on the property. Several other companies have looked at the property and Still and others (2002) mapped and sampled the prospect as part of a regional mineral assessment for the BLM.

The mineralization here is similar in origin to that at the he well known mineralization at the Groundhog Basin deposit (PE040) to the north and the numerous other base-metal prospect sin the area. The East Marsha Peak prospect is associated with a fault zone that strikes about N 25 E and crosscuts the northwest-trending layering in the gneiss and the rhyolite sills in the gneiss The shear zone is 30 to 40 feet wide and extends for about 2,000 feet. The hanging wall is highly silicified with vugs of quartz and fluorite. Sphalerite, galena, chalcopyrite, and pyrrhotite occur in masses and disseminations in brecciated gneiss along the shear zone and in gouge. The ore minerals also occur in a network of fractures that extend out into the gneiss wallrock for up to 40 feet. El Paso Natural Gas Company (George and Wyckoff, 1973) and Still and others (2002) collected numerous samples in the trenches and in surface outcrops. In one trench at an elevation of about 4,075 feet, El Paso sampled a zone up up 30 feet thick that averaged 3.19 percent zinc, 1.67 percent lead, and 1.99 ounces of silver per ton. Their trench at an elevation of about 4,100 feet exposed a zone 13 feet thick that averaged 1.45 percent zinc, 2.75 percent lead, and 1.23 ounce of silver per ton; an additional 18 feet across the mineralization averaged 1.79 percent zinc with little lead and silver. Other samples gave similar values.

Alteration:

Silicification along a sheared zone.

Age of mineralization:

Probably 16.3 Ma based on a genetic tie to a nearby, zinnwaldite 'tin' granite (Newberry and Brew, 1989).

Generic deposit model:

Deposit model:

Banded Ag-Cu-Sn-Pb-Zn tabular replacement bodies, veins, and stringers.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

The East Marsh Peak prospect was mapped and sampled by El Paso Natural Gas Company in the early 1970s. They dug 3, 20 to 60 foot, samples on the property. Several other companies have looked at the property and Still and others (2002) mapped and sampled the prospect as part of a regional mineral assessment for the BLM.

Production notes:

None.

Reserves:

None.

Additional comments:

No claims were active as of 2002 according to Still and others.

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-1 Quadrangle, Southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-H, 23 p., 1 sheet, scale 1:63,360.

Gault, H.R., Rossman, D.L., Flint, G.M., Jr., and Ray, R.G., 1953, Some lead-zinc deposits of the Wrangell district, Alaska: U.S. Geological Survey Bulletin 998-B, p. 15-58.

George, R.H., and Wyckoff, B.S., 1973, Whistlepig mineral exploration program, Alaska, Final report 1972 (with attached diamond drill hole logs and analyses): Unpublished El Paso National Gas Company report 109 p. 12 sheets (available at the Bureau of Land Management, Minerals Information Center, Juneau Alaska).

Newberry, R.J., and Brew, D.A., 1989, Epigenetic hydrothermal origin of the Groundhog Basin-Glacier Basin silver-tin-lead-zinc deposits, southeastern Alaska: U.S. Geological Survey Bulletin 1903, p. 113-121.3

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference:

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Unnamed (southwest of St. Johns Harbor)

Site type: Occurrence

ARDF no.: PE113

Latitude: 56.424 **Quadrangle:** PE B-3

Longitude: 132.9841

Location description and accuracy:

The occurrence is in fill on Forest Service Road 52009. It is about 0.8 mile southwest of Zarembo Springs at the head of St. Johns Harbor and about 0.2 mile northeast of the center of section 7, T. 63 S., R. 80 E.

Commodities:

Main: As, Au, F

Other:

Ore minerals: Fluorite

Gangue minerals:

Geologic description:

Still and others (2002) found road fill on a logging road southwest of St. Johns Harbor that contained vuggy quartz, purple fluorite, and (unidentified) sulfides. A grab sample of the more sulfide-rich quartz and fluorite in the road fill contained 546 parts per billion gold and 826 parts per million arsenic. They could not locate the source of the fill; it may have come from a fluorite occurrence about 10 miles to the south (PE060) but they felt the source was nearby and it seems unlikely that anyone would truck fill in from the occurrence to the south when there are so many borrow pits nearby. They did not discuss the petrology of the road fill. As mapped by Karl and others (1999), the rocks in the immediate area are sedimentary and volcanic rocks of the Triassic Hyd Group . But there are large areas of Quaternary and Tertiary rhyolite just to the south and there is a borrow pit about a half mile to the west that may be in this rhyolite.

Alteration:

Age of mineralization:

Probably Tertiary based on the age of rhyolite of that age nearby.

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only sampling by government geologists.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near Wedge Point)

Site type: Prospect

ARDF no.: PE114

Latitude: 56.4184 **Quadrangle:** PE B-2

Longitude: 132.5332

Location description and accuracy:

Two placer claims were staked for gold in 1974 near the mouth of the creek that drains Sunrise Lake on Woronkofski Island. The location is about 0.6 mile west-southwest of the center of section 7, T. 63 S., R. 83 E.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Two claims were staked for placer gold in 1974 but apparently have not been active since. Still and others (2002) sampled the creek for placer gold but found none. The rocks in the area are hornfelsed graywacke of the Jurassic and Cretaceous Seymour Canal Formation (Karl and others, 1999).

Alteration:

Age of mineralization:

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Two claims were staked here for placer gold in 1974 but have apparently have not been active since.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-10

Site name(s): Unnamed (northeast of Point Nesbitt)

Site type: Prospect

ARDF no.: PE115

Latitude: 56.2865 **Quadrangle:** PE B-3

Longitude: 132.8148

Location description and accuracy:

This site is at about the center(?) of a block of 242 claims that were first staked in 1978 and were held until 1986. The center is about 4.3 miles northeast of Point Nesbitt at the southern tip of Zarembo Island, in the SW1/4 section 29, T. 64 S., R. 81 E.

Commodities:

Main: Unknown

Other:

Ore minerals:

Gangue minerals:

Geologic description:

A block of 242 claims was staked in 1978 by NERCO Exploration Company who optioned them to Resource Associates of Alaska in 1979 and then to Houston Oil and Minerals in 1981 (Still and others, 2002). The option on the claim block was dropped by NERCO in 1986. The ZF claim block is in a large body of Tertiary or Quaternary rhyolite that makes up much of the south half of Zarembo Island (Karl and others, 1999). Still and others (2002) (briefly?) examined and sampled some of the outcrops in the claim block but did not find any mineralization nor did their only sample contain any metal values.

Alteration:

Age of mineralization:

Tertiary or Quaternary based on the age of the host rock.

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Two-hundred and forty-two claims were staked in 1978 and remained active until at least 1986.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference:

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (on Shrubby Island)

Site type: Occurrence

ARDF no.: PE116

Latitude: 56.2385 **Quadrangle:** PE A-3

Longitude: 132.986

Location description and accuracy:

This occurrence is in a borrow pit about 0.8 mile east-southeast of the northwest tip of Shrubby Island; the pit is shown on the 1:63,360-scale topographic map. It is in the NE1/4, section 14, T. 65 S., R. 80 E.

Commodities:

Main: Pb, Zn

Other: Ag, Au

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals: Calcite

Geologic description:

Still and others (2002) visited the borrow pits on Shubby Island and examined the road cuts on the logging roads of the island to try to discover the source of the strongly anomalous stream sediment samples that were reported earlier by the U.S. Geological Survey. They discovered mineralization in a borrow pit on the northwest end of the island. The mineralization consists of pods of sulfides in blocky, dark gray to white limestone of the Heceta Limestone (Karl and others, 1999). The pods are up to 2 feet long, 1 foot thick, and are mainly of fine grained pyrite with sphalerite and minor galena. The sulfides also occur in a network of thin veinlets that cut the limestone in an area about 10 feet in diameter. A 0.5-foot sample across one of the pods contained 8.1 percent zinc, and 3,646 parts per million (ppm) lead. A sample across 2.1 feet of the sulfide veinlets in the limestone contained 1.3 percent zinc and 476 ppm lead. The highest gold value in the samples Still and others (2002) collected was 19 parts per billion; the highest silver value was 2.6 ppm.

Alteration:

Age of mineralization:

Silurian or younger based on the age of the Heceta Limestone that hosts the mineralization.

Generic deposit model:

Deposit model:

Pb-Zn sulfide pods in limestone.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Only sampling by government engineers and geologists.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D. J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (at head of Mosman Inlet)

Site type:

ARDF no.: PE117

Latitude: 56.1453

Quadrangle: PE A-2

Longitude: 132.5823

Location description and accuracy:

This occurrence is at the head of Mosman Inlet about 0.5 mile southeast of triangulation station 'Moss. It is near the center of section 16, T. 66 S., R. 83 E.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, magnetite, pyrite, sphalerite

Gangue minerals: Calcite, garnet

Geologic description:

This occurrence was first reported by Pittman (1962) as a 3-feet-wide calcite vein exposed for about 10 feet on the beach and below the high-tide line. The vein has abundant garnet, chalcopyrite, pyrite, and light colored sphalerite. A sample across the vein contained 9.5 percent zinc, 0.13 percent copper, 0.41 ounce of silver per ton, and traces of gold and lead. Still and others (2002) examined the area but did not find Pittman's vein. They did find a zone of tactite with calcite, garnet, magnetite, calc-silicate minerals, and chalcopyrite. The tactite is 0.1 to 0.7 foot thick and 3 feet long in a cliff near tidewater. Samples across the tactite contained up to 1,482 parts per billion gold, 35.4 parts per million (ppm) silver, 3,635 ppm copper, and 585 ppm zinc. The area is at or near the contact of Tertiary granite with Triassic and Cretaceous greenstone and Mesozoic or Paleozoic metasedimentary and metavolcanic rocks (Karl and others, 1999).

Alteration:

Occurrence at least in part is a contact metamorphic assemblage with sulfides.

Age of mineralization:

Generic deposit model:

Deposit model:

A calcite vein and/or tactite with silver, gold copper, and zinc minerals.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Apparently only sampling by government engineers and geologists.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,00.0

Pitman, T., 1962, Report of the Mosman Inlet occurrence: Unpublished U.S. Bureau of Mines Report, 6 p. (Copy held by the Bureau of Land Management, Minerals Information Center, Juneau, Alaska).

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): North Silver North

Site type: Prospect

ARDF no.: PE118

Latitude: 56.5239 **Quadrangle:** PE C-1

Longitude: 132.0436

Location description and accuracy:

The North Silver North prospect is about 0.6 mile west of Mount Waters and about 0.4 mile east of the center of section 6, T. 62 S., R. 85 E. The workings are in an area about 400 feet wide and 1,000 feet in length; the location is at about the center of the main exposures of the mineralization. The location is accurate and a map of the workings is Figure 27 of Still and others (2002).

Commodities:

Main: Ag, Pb, Zn

Other:

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks in the prospect area are part of a belt of Mesozoic or Paleozoic sedimentary and volcanic rocks that have been metamorphosed to schist and gneiss. The belt is about 1 1/2 mile wide and strikes northwest (Brew, 1997; George and Wyckoff, 1973). The metamorphic rocks are bounded on the east by a thick, regionally extensive, 60 to 70 Ma tonalite sill and on the west by a 90 Ma granodiorite pluton (Brew, 1997 Still and others, 2002). The metamorphic rocks at the prospect include several prominent thin marble layers and a quartzite layer. On the north side of Groundhog Basin about two miles to the southwest, the metamorphic rocks are intruded by a 16.3 Ma biotite 'tin' granite pluton. The granite is probably the source of the numerous rhyolite dikes and sills that extend from it and the mineralization in the area (Newberry and Brew, 1989).

In the late 1950s, Moneta Porcupine Company staked claims in the area but subsequently dropped them William Huff and James Fucas continued work in the area and Huff discovered the North Silver North prospect in 1963. Their claims were optioned by the Bunker Hill Mining Company in 1965 and they drilled 7 holes, 85 to 224 feet deep, and blasted several pits. Bunker Hill dropped the claims at the end of the field season and the property was optioned by a succession of companies, Humble Oil and Refining Company, El Paso Natural Gas Company and AMAX Exploration Inc., through 1981. Still and others (2002) sampled the prospect during a Bureau of Land Management mineral assessment of the area.

The North Silver North prospect is associated with crosscutting, northeast trending, steeply dipping fault zones that are associated with irregular sulfide-bearing veins and lenses of quartz with sulfides. The quartz veins and lenses make up less than 10 percent of the faults (Still and others, 2002). To the east, the veins extend into limestone beds up to 30 feet thick that contain replacement deposits.

The two most prominent veins are along the Bear and Camp faults which approach to within 80 feet of each other (Still and others, 2002). The Black Bear vein can be traced for about 1,000 feet and consists of scattered lenses of quartz with pyrite, sphalerite, and galena. The best mineralization exposed on the surface of the Black Bear vein was about 4 feet thick and a sample contained 39.1 parts per million (ppm) silver, 3.3 percent lead, and 2.39 percent zinc. A 1-foot sample collected nearby contained 92 ppm silver, 9.9 percent lead, and 4.1 percent zinc. Several drill holes on the vein cut mineralization with lesser values at depth. The Camp vein is about 0.2 to 4 feet thick and can be traced for about 350 feet. It consists of

scattered quartz lenses with pyrite, sphalerite, and galena. The best mineralization exposed at the surface is about 0.4 feet thick and a sample across it contained 119.32 ppm silver. 48.61 percent lead, and 3.6 percent zinc. Two marble beds 4 to 50 feet thick can be traced for several thousand feet. Irregular bands and lenses of disseminated to massive pyrite, sphalerite, and galena are scattered along the marble for about 600 feet. The individual bands and lenses are 0.5 to 9 feet thick and extend from 3 to 100 feet. The best mineralization was a 6-foot-thick layer that contained 58 ppm silver, 5,114 ppm lead, and 12,758 ppm zinc.

Alteration:

None specifically noted.

Age of mineralization:

Probably related to a nearby 16.3 Ma biotite granite pluton.

Generic deposit model:

Deposit model:

Scattered Ag-Pb-Zn quartz veins and lenses along fault zones and Ag-Pb-Zn replacement deposits in marble.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

In the late 1950s, Moneta Porcupine Company staked claims in the area but subsequently dropped them. William Huff and James Fucas continued work in the area and Huff discovered the North Silver North prospect in 1963. Their claims were optioned by the Bunker Hill Mining Company in 1965 and they drilled 7 holes, 85 to 224 feet deep, and blasted several pits. Bunker Hill dropped the claims at the end of the field season and the property was optioned by a succession of companies through 1981: Humble Oil and Refining Company, El Paso Natural Gas Company, and AMAX Exploration Inc. Still and others (2002) sampled the prospect during a Bureau of Land Management mineral assessment of the area.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., 1997, Reconnaissance geologic map of the Petersburg C-1 Quadrangle, Southeastern Alaska: U.S. Geological Survey Open-File Report 97-156-H, 23 p., 1 sheet, scale 1:63,360

George, R.H., and Wyckoff, B.S., 1973, Whistlepig mineral exploration program, Alaska, Final report 1972 (with attached diamond drill hole logs and analyses): Unpublished El Pas National Gas Company report 109 p. 12 sheets (on file at the Bureau of Land Management, Minerals Information Center, Juneau Alaska).

Newberry, R.J., and Brew, D.A., 1989, Epigenetic hydrothermal origin of the Groundhog Basin-Glacier Basin silver-tin-lead-zinc deposits, southeastern Alaska: U.S. Geological Survey Bulletin 1903, p. 113-121.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central southeast Alaska: Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Blue Quartz

Site type: Prospect

ARDF no.: PE119

Latitude: 56.5366 **Quadrangle:** PE C-4

Longitude: 133.054

Location description and accuracy:

The Blue Quartz prospect extends for about 500 yards a short distance inland from the shoreline of Woewodski Island, from opposite the southeast end of Butterworth Island to about the middle of the east side of Krauses Hole. It is near the east boundary of the SE1/4, section 34, T. 61 S., R. 79 E. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

This prospect was discovered about 2004 and was extensively explored in 2006 and 2007 by Bravo Venture Group (2007, 2008). Quartz veins with a distinctive bluish color occurs in widely spaced, east-northeast-trending, sub-parallel zones up to 10 meters wide that extend for at least 500 meters. The veins cut Triassic metamorphic rocks and a Cretaceous diorite stock. The mineralization was hand trenched and sampled in 2006. One grab sample contained 542 grams of gold per tonne and several grab or float samples contained more than 3.0 grams of gold per ton. A channel sample contained 3.0 grams of gold per tonne across 2.0 meters. In 2007, 33 short core holes were drilled that totaled 2,541 meters. Blue quartz veins were intersected in many of these holes; the best intervals were 1.13 meters with a grade of 4.0 grams of gold per tonne and 0.73 meters with a grade of 7.2 grams of gold per tonne.

As mapped by Karl and others (1999), the rocks in the area are part of the Triassic Hyd Group, which consists of greenstone, pillow breccia, and volcanic breccia, with tuff, limestone, chert, conglomerate, sandstone, and argillite, that have been intruded by a Cretaceous diorite stock.

Alteration:

Age of mineralization:

Cretaceous or younger based on the age of the diorite that the veins cut.

Generic deposit model:

Deposit model:

Gold-quartz vein (no sulfide).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

This prospect was discovered about 2004 and was extensively explored in 2006 and 2007 by Bravo Venture Group (2007, 2008). The mineralization was hand trenched and sampled in 2006. In 2007, 33 short core holes were drilled that totaled 2,541 meters.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bravo Venture Group, 2007, S.E, Alaska: http://www.bravoventuregroup.com/en/index.php?page=projects&projectid=14 (as of March 28, 2008)

Bravo Venture Group, 2008, Woewodski program update: http://www.bravoventuregroup.com/en/index.php?page=news&newsid=109, (as of March 17, 2008).

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Primary Reference: Bravo Venture Group, 2007; Bravo Venture Group, 2008

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Red Quartz

Site type: Prospect

ARDF no.: PE120

Latitude: 56.5263 **Quadrangle:** PE C-4

Longitude: 133.0174

Location description and accuracy:

The Red Quartz prospect is centered about 1.3 mile northwest of the south tip of Woewodski Island at an elevation of about 500 feet. It is about 0.2 mile northwest of the center of section 1, T. 62 S., R. 29 E. The location is accurate.

Commodities:

Main: Ag, As, Au, Sb

Other:

Ore minerals:

Gangue minerals: Quartz

Geologic description:

The Red Quartz prospect was discovered in 2005 and was explored in 2006 by Bravo Ventures Group (2207). Distinctly reddish quartz veins occur in float, rubble, and outcrop for about 300 meters in heavy vegetation. Thirteen of the 30 samples that were collected contain more than 1 gram of gold per ton; the best contained 3.8 grams of gold per ton. Eight of the 30 contained 7.8 to 91.3 grams of silver per ton with notable arsenic and antimony values. The mineralization is distinctly different from the massive sulfide mineralization in Brushy Creek just to the south (PE033) and suggests epithermal gold-silver mineralization of a type that has not previously been found on Woewodski Island.

As mapped by Karl and others (1999), the rocks in the area are part of the Triassic Hyd Group which consists of greenstone, pillow breccia, and volcanic breccia, with tuff, limestone, chert, conglomerate, sandstone, and argillite. A Cretaceous diorite stock is nearby.

Alteration:

None specifically mentioned.

Age of mineralization:

Triassic or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Silver-gold quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Numerous samples of float and rubble and from outcrop were collected in 2006.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bravo Venture Group, 2007, S.E, Alaska: http://www.bravoventuregroup.com/en/index.php?page=projects&projectid=14 (as of March 28, 2008)

Karl, S.W., Haeussler, P.J., and McCafferty, A.E., 1999, Reconnaissance geologic map of the Duncan Canal-Zarembo Island area, southeastern Alaska: U.S. Geological Survey Open-File Report 99-0168, 30 p., 1 sheet, scale 1:150,000.

Primary Reference: Bravo Venture Group, 2007

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Raven Zone

Site type: Prospect

ARDF no.: PE121

Latitude: 54.9463 **Quadrangle:** PE D-5

Longitude: 131.4321

Location description and accuracy:

The Raven Zone prospect is on northwest Duke Island about 1.5 mile south-southwest of Form Point and about 2.7 miles east-northeast of Point White. It is in the center of section 8, T. 80 S., R. 93 E. at an elevation of about 450 feet. The location is accurate.

Commodities:

Main: Co, Cu, Ni, Pd, Pt

Other:

Ore minerals: Chalcopyrite, pentlandite, platinum-group minerals, pyrrhotite

Gangue minerals:

Geologic description:

The Raven Zone prospect is on northwestern Duke Island, well known as the type locality of the Alaska-type, Cretaceous zoned ultramafic complex (Irvine, 1974). The ultramafic complex is concentrically zoned outward from a core of dunite and peridotite, succeeded by shells of olivine pyroxenite and hornblende pyroxenite. The complex is distinguished by locally conspicuous graded layering and other cumulate features, especially in the dunite, peridotite, and olivine pyroxenite. It has long been known (Berg and Cobb, 1967) that the dunite contains small lenses and disseminated chromite; the hornblende pyroxenite contains segregations of titaniferous magnetite that have been drilled; and rare specks of pyrrhotite, pyrite, pentlandite, and chalcopyrite occur widely (PR001). However, until recently no deposit of substantial size had been identified on Duke Island.

In 2001 and 2005, Quaterra Resources (2008a) drilled 11 holes totaling 5,971 feet in two area: 8 holes in the the Maquis Zone (PR New C110) and 3 in the Raven Zone, on mineralization they consider unlike anything that had previously been identified on Duke Island. They interpret the mineralization as possibly related to a layered mafic complex.

The Raven Zone is in a plug of gabbro and pyroxenite about a half mile in diameter surrounded by quartz diorite, granodiorite , and quartz monzonite (Quaterra Resources Inc., 2008b). The best intercept in the three holes drilled in 2005 was 387 feet that contained 2,035 parts per million ppm copper, 56 parts per billion (ppb) platinum, and 59 ppb palladium. The mineralization consists of disseminated and net-textured chalcopyrite and pyrrhotite in coarse-grained pyroxenite. The ore textures suggest sulfide-silicate immiscibility during sulfide deposition.

No drilling was done in 2007. However, the data were reviewed and several other areas of interest were identified. In February, 2008, Quaterra had a 388-line-mile airborne geophysical survey flown over the area. Quaterra's work suggest that the mineralization extends for 14.5 kilometers along strike and is 3.8 kilometers wide.

Alteration:

Age of mineralization:

The Duke Island complex is about 110 Ma; this mineralization is probably genetically related to it.

Generic deposit model:

Deposit model:

Disseminated copper and platinum-group elements in a layered mafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

In 2005, Quaterra Resources Ltd., drilled 3 holes on the Raven Zone. No drilling was done in 2007. However, the data was reviewed and several others areas of interest were identified. In February, 2008, Quaterra had a 388-line-mile airborne geophysical survey flown over the area.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Irvine, T.N., 1974, Petrology of the Duke Island ultramafic complex, southeastern Alaska: Geological Society of America Memoir 138, 240 p.

Quaterra Resources Inc., 2005, Drilling intersects new copper-PGE zone at Duke Island: http://www.quaterraresources.com/index.php?page=news&newsid=9 (News Release, December 10, 2005).

Quaterra Resources Inc., 2008, Duke Island Cu-NipOGE project Alaska: http://www.quaterraresources.com/index.php?page=projects&projectid=6 (as of May 5, 2008)

Quaterra Resources Inc., 2008, Duke Island NiS project: http://www.quaterraresources.com/uploads/projects/Duke%20Island%20NiS%20Prospect.pdf (as of May 5,

Primary Reference: Quaterra Resources Inc., 2008 (Duke Island Cu-NipOGE project); Quaterra Resources Inc., 2008 (Duke Island NiS project)

Reporter(s):

D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Unnamed (on Stikine River)

Site type: Mines(?)

ARDF no.: PE122

Latitude: 56.7051 **Quadrangle:** PE C-1

Longitude: 132.1682

Location description and accuracy:

Fine placer gold was mined on bars of the Stikine River in the 1860's but it is unclear if any gold was produced along the Alaskan portion of the Stikine and if so, there are several opinions where in Alaska that might have taken place. Roppel (2005) concluded that most if not all of this early mining on the Stikine took place across the border in Canada. The only reference she could find to gold mining along the Alaskan portion of the Stikine River in the 1860's was to passing interest in fine flour gold near the mouth of what is now called 'Dry Wash' below the Popof Glacier. ('Dry Wash' is identified on the USGS 1:250,000-scale topographic map but not on the more detailed 1:63,360-scale topographic map.) Roppel's location in about the middle of the north side of section 3, T. 60 S., R.85 E. is considered the most likely site of this early mining in Alaska, even if it is uncertain. (But see the Geologic Description for addition information.)

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Fine placer gold was found on bars of the Stikine River in the 1860s when Russia still owned Alaska. However, the boundary between Russian America and Canada was not delineated then and the location of this placer mining is uncertain (Blake, 1868; Spurr, 1898). Still and others (2002) conclude that this early placer mining was at 'Buck Bar' and place it between Shakes Slough and the mouth of the Ketili River in about the middle of section 31, T. 59 S., R.85 E. Roppel (2005), however, in her considerable research into early gold mining in southeastern Alaska found little evidence that Bucks Bar and the other auriferous bars being mining on the Stikine River or its tributaries were in Alaska but instead were probably across the border in Canada. The only reference she could find to gold mining on the Alaskan portion of Stikine River in the 1860s was to passing interest in fine flour gold near the mouth of what is now called 'Dry Wash' below the Popof Glacier. ('Dry Wash' is labeled on the USGS 1:250,000-scale topographic map but not on the more detailed 1:63,360-scale topographic map.) Roppel's location is used here. In any event, the amount of gold that was mined along the Stikine in Alaska was probably small at best. Brooks (1923) noted that this may have been the first gold mined in Alaska.

Alteration:

Age of mineralization:

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer gold (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

Fine placer gold was found on bars of the Stikine River in the 1860s during early exploration for gold; some of it may have been mined in Alaska, although most was probably mined in Canada.

Production notes:

Probably trivial.

Reserves:

None.

Additional comments:

In view of the many generations of prospectors and others who for more than 140 years have passed along the natural corridor of the Stikine River into the interior of Canada without any further mention of placer gold on the Stikine River in Alaska, this site should now be considered to be little more than a historic point of interest.

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Primary Reference: Roppel, 2005

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Pyramid

Site type: Prospect

ARDF no.: PM023

Latitude: 55.6298 **Quadrangle:** PM C-3

Longitude: 160.6753

Location description and accuracy:

The Pyramid prospect is on the south flank of Pyramid Mountain, about 3.3 miles northwest of the mouth of Bishop Creek near the head of Albatross Anchorage. It is centered about 0.3 mile southeast of the center of section 35, T. 53 S., R. 75 W., of the Seward Meridian. The location is accurate to within 1000 feet.

Commodities:

Main: Cu, Mo

Other: Ag, Au, Pb, Sb, Zn

Ore minerals: Chalcocite, chalcopyrite, covellite, molybdenite, pyrite

Gangue minerals: Quartz

Geologic description:

The Pyramid copper-molybdenum deposit is associated with a quartz diorite pluton that cuts Paleocene to Eocene sedimentary rock of the Tolstoy Formation (Wilson and others, 1995). The stock has been dated at 6 million years (Wilson and others, 1996). The molybdenum mineralization has also been dated at 6 million years by Re-Os methods (Wilkins, 2011).

The prospect is a classic copper-molybdenum deposit having a potassic core surrounded by a phyllic zone and an outer propylitic zone. The central potassic core contains secondary biotite after mafic minerals and 2 to 10 percent magnetite as fracture fillings and disseminated clots and grains. The potassic alteration core in the intrusive, is roughly 800 by 1,700 feet in plan. It is essentially barren with less than 0.25 percent sulfides and copper and molybdenum in the 0.001 to 0.01 percent range (Christie, 1975). The phyllic zone is characterized by sericite, quartz, and andalusite in a zone surrounding the potassic core. It occurs mostly in the intrusive rocks and measures 700 to 2,500 feet in width. The propylitic zone is characterized by chlorite, magnetite, epidote, and calcite.

The highest total sulfide content, 5 to 10 percent, occurs in the inner part of the propylitic zone and outer part of the quartz-sericite zone. Pyrite:chalcopyrite ratios are 50:1 or greater and are associated with copper grades of 0.15 percent or less (Christie, 1975). Toward the inner part of the phyllic zone, pyrite-chalcopyrite ratios decrease and copper grades increase to 0.3 to 0.4 percent; molybdenum grades are 0.03 to 0.04 percent. In the copper-rich part of the system, the sulfides occur as disseminations and thin fracture fillings.

The deposit has been oxidized to depths of 0 to 450 feet and exhibits a supergene blanket of secondary copper enrichment as much as 300 feet thick. The enriched zone contains chalcocite, covellite, and bornite, as well as some chalcopyrite. The best grades of copper, as much as 0.8 percent, occur in the upper 100 feet of the supergene blanket. The thickest enrichment zones are not necessarily associated with the thickest zones of oxidation. Lead, antimony, and zinc are also reported in some assays. The supergene blanket is overlain by a leached capping up to 100 meters thick.

A Quintana-Duval-Aleut joint venture mapped, sampled, and drilled this deposit in 1974 and 1975. They diamond-drilled 19 holes for a total of 5,565 feet. As a result of this work they outlined an estimated resource of 126,000,000 tons of with a grade of 0.403 percent copper and 0.025 percent molybdenum, with potential for another 49 million tons of chalcocite-enriched ore (Christie, 1975).

Pyramid was drilled By Battle Mountain in the late 1980s and they identified gold values that improved

the economics of the deposit. Metallica Resources did additional surface sampling in 2005 and 2006 that reinforced the added gold value of Pyramid.

Full Metal Minerals in a joint venture with Antotagasta Minerals S.A. drilled 5 core holes at Pyramid in 2010 to test the lateral and vertical extent of the mineralization (Full Metal Minerals, 2010 and 2011). The mineralization and alteration persisted to the bottom of these holes. Some notable intercepts were: 1) 468 meters that contained 0.272 percent copper, 0.058 gram of gold per tonne, and 0.019 percent molybdenum; 2) 356 meters that contained 0.343 percent copper, 0.078 gram of gold per tonne, and 0.008 percent molybdenum; 3) 289 meters that contained 0.299 percent copper, 0.082 gram of gold per ton, and 0.032 percent molybdenum; and 4) 195 meters that contained 0.63 percent copper, 0.141 gram of gold per tonne, and 0.018 percent molybdenum.

In 2011, the joint venture of Full Metal Minerals of Antofagasta Minerals drilled 12 more core holes that totaled 2,576 meters with results that expanded the mineralization (Wilkins, 2011; Full Metal Minerals, 2012). Including these holes, the mineralization covers an area about 1,100 meters by 900 meters in size and is open in all directions and at depth. The best intercept in the 2011 drilling was 155.9 meters with 0.709 percent copper, 0.024 percent molybdenum, and 0.18 gram of gold per tonne. Most of the drilling through 2011 has been relatively shallow to identify the zone of supergene enrichment and most of the holes have bottomed in mineralized rock.

Alteration:

The alteration consists of a barren, potassically-altered core zone, an intermediate zone characterized by pervasive quartz and sericite, and a propylitic outer zone (Christie, 1975).

Age of mineralization:

The stock that hosts the mineralization has been dated at 6 Ma by K/Ar methods; molybdenite has also been dated at 6 Ma by Re-Os methods (Wilkins, 2011).

Generic deposit model:

Deposit model:

Porphyry Cu, Porphyry Cu-Mo-Au (Cox and Singer, 1986; models 17, 21a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

17, 21a

Production Status: None

Site Status: Active

Workings/exploration:

In 1975-1975, Quintana-Duval mapped, sampled, and diamond-drilled 19 holes totaling 5,565 feet. The U.S. Geological Survey sampled the deposit in the 1980s. Battle Mountain drilled in the 1980s and Metallica Resources collected surface samples in 2005 and 2006. In 2010, Full Metal Minerals in a joint venture with Antotagasta Minerals S.A. drilled 5 core holes at Pyramid to test the lateral and vertical extent of the mineralization. They drilled 12 more holes in 2011 that totaled 2,576 meters.

In 2012, Full Metal Minerals (FMM) drilled 13 diamond core holes with a total drilled depth of 3,241 meters (Farrow and Arseneau, 2013).

Production notes:

None.

Reserves:

In 2013, a 43-101 Technical report, including mineral resource estimate, was published (Full Metal Minerals, 2014). These are: an inferred resource of 94,000,000 tonnes with a grade of 0.092 gram of gold per tonne, 823,000,000 pounds with a grade of 0.40 percent copper, and 40,000,000 pounds with a grade of

0.02 percent molybdenum in the supergene part of deposit, plus an inferred resource of 79,000,000 tonnes with a grade of 0.083 gram of gold per tonne, 515,000,000 pounds with a grade of 0.30 percent copper, and 34,000,000 pounds with a grade of 0.02 percent molybdenum in the hypogene part of the deposit, for a total inferred resource of 173,000,000 tonnes with a grade of 0.088 gram of gold per tonne, 1,338,000,000 pounds with a grade of 0.088 percent copper, and 74,000,000 pounds with a grade of 0.02 percent molybdenum (Farrow and Arseneau, 2013). (Conversion Note: 10,000 pounds = 4.54 tonnes)

Additional comments:

The subsurface of the property is controlled by the Aleut Corporation; the surface is controlled by the Shumigan and the TDX (St Paul) native corporations.

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Primary Reference: Farrow and Arseneau, 2013

Reporter(s): S.H. Pilcher (Anchorage, Alaska); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-11

Site name(s): Zachary Bay; Unga

Site type: Prospect

ARDF no.: PM054

Latitude: 55.2729 **Quadrangle:** PM B-2

Longitude: 160.6628

Location description and accuracy:

The Zachary Bay is prospect is is about 2.0 miles south of the south end of Zachary Bay and about 4.9 miles northwest of the seaplane anchorage at Squaw Harbor on Baralof Bay. It is near the center of section 3, T. 57 S., R. 74 W. The location is probably accurate to within a half mile.

Commodities:

Main: Ag, Pb, Zn

Other: Cu

Ore minerals: Chalcopyrite, galena, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks around the Zachary Bay prospect are part of the Eocene to Oligocene, Popof volcanic unit (Wilson and others, 1995). The deposit is in the northeast section of the Aquila-Shumagin fault system, which strikes northeast across Unga Island.

Rock-chip samples taken at the surface in 1974 across 46 meters averaged 0.36 percent copper and 0.550 gram of gold per tonne (Redstar Gold Corp., 2012, January 18]; 2012 [March 20]) . Four holes less than 20 meters deep drilled in 1975 by Quintana Minerals Corp. and Duval Corp. cut disseminated copper-gold mineralization in intrusive rocks. The deepest hole, 17 meters deep, was mineralized over its entire length; 10.7 meters averaged 0.11 percent copper and 0.280 gram of gold per tonne.

The core was reanalyzed and reexamined by Resource Associates of Alaska in 1981. They also located a 50-foot-wide zone of brecciated, silicified, pyritic andesite that may be a breccia pipe (Trujillo and others, 1981). The breccia fragments are filled in by a matrix of chalcopyrite, sphalerite, and galena over a 35-foot width of the zone. One sample of mineralized rock assayed 1.09 ounces of silver per ton, 2.07 percent zinc, and 0.58 percent lead.

In 2011, Redstar Gold Corp. (2012, January 18]; 2012 [March 20]) began work in the area in a joint venture with Full Metal Minerals Inc. on land they were purchasing and land leased from the Aleut Native Corporation. They proposed that the deposit is a classic porphyry copper-gold deposit with abundant disseminated hydrothermal biotite, magnetite and chalcopyrite in a quartz-diorite porphyry with pink potassium feldspar phenocrysts.

Alteration:

The mineralization is accompanied by strong silicification and hydrothermal biotite.

Age of mineralization:

Eocene or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Copper-gold porphyry (Cox and Singer, 1986, model 20c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c

Production Status: None

Site Status: Active

Workings/exploration:

Surface rock-chip samples were taken in 1974 and four holes less than 20 meters deep were drilled in 1975 by Quintana Minerals Corp. and Duval Corp. The core was reanalyzed and reexamined by Resource Associates of Alaska in 1981 and they sampled the surface. In 2011, Redstar Gold Corp. (2012, January 18]; 2012 [March 20]) began work in the area in a joint venture with Full Metal Minerals Inc.

Redstar Gold Corp. conducted two phases of exploration in 2016 on their Unga project, which includes the Shumagin (PM064), Apollo (PM079; PM084), Centennial, Orange Mountain (PM067), Zachary Bay (PM054), Amethyst (PM092), and Aquila (PM086) epithermal gold-silver prospects. The Shumagin trend parallels the historically mined Apollo–Sitka vein system (PM079; PM084; PM076), which between 1886 and 1922 produced approximately 150,000 ounces of gold at a grade of approximately 0.292 ounce of gold per ton (Athey and Werdon, 2017).

In June 2016, Redstar Gold Corp.’s Phase I surface program included classifying alteration assemblages and conducting other geologic work to identify drill targets. From October through November, Phase II’s drilling program tested the down-dip and along-strike expansion potential of high-grade vein/breccia mineralization within the Shumigan Gold Zone (PM064). A total of 1,505 meters were drilled in 7 holes spaced over ~750 meters of strike length. All drill holes intersected the target structure, which includes multi-generational phreatomagmatic breccias, hydrothermal breccias, and late breccias and veins with colloform-crustiform- to cockade-textured quartz-adularia-carbonate (± rhodochrosite, ± green clay). Select intervals from drill holes 16SH019 and 16SH020 include 0.9 meter at 14.95 grams of gold per tonne and 1.15 meters at 11.3 grams of gold per tonne; release of full assay results is planned for late January 2017 (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

The land belongs to the Aleut Native Corporation; in early 2012, the property was being explored under lease by a joint venture of Redstar Gold Corp. and Full Metals Inc.

References:

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Primary Reference: Redstar Gold Corp., 2012 [Growth]

Reporter(s): S.H. Pilcher (Anchorage, Alaska); D.J. Grybeck (Contractor, USGS); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Shumagin; Choumagin; Unga

Site type: Prospect

ARDF no.: PM064

Latitude: 55.2253 **Quadrangle:** PM A-2

Longitude: 160.5737

Location description and accuracy:

The Shumagin prospect is a southwest-trending mineralized zone approximately 1.4 miles southwest of the seaplane anchorage at Squaw Harbor on Baralof Bay. It is about 0.4 mile southeast of the center of section 19, T. 57 S., R. 74 W. of the Seward Meridian. The location is near the northeast end of drilling that has been completed along the strike of mineralization and is accurate to within 500 feet.

Commodities:

Main: Ag, Au

Other: As, Cu, Hg, Pb, Te, Zn

Ore minerals: Arsenopyrite, galena, gold, pyrite, sphalerite

Gangue minerals: Calcite, quartz

Geologic description:

The host rock of the Shumagin deposit is Eocene to Oligocene (Popof) volcanic rocks (Wilson and others, 1995). The deposit is in the northeast section of the Aquila-Shumagin fault system, which strikes southwest across Unga Island.

The deposit consists of auriferous, sulfide-bearing quartz-calcite veins in a fault that trends N 60 E and dips 80 to 85 SE. The veins and fault can be traced approximately 4,000 feet along strike over a vertical distance of 765 feet. The mineralization is interpreted as a fault-controlled epithermal, volcanic-hosted vein deposit (White and Queen, 1989). The hanging wall is tuff and the footwall is andesite. Movement on the fault is probably high-angle reverse.

The deposit consists of four veins, two vein systems, and two fault breccias. Within the fault, the mapped units from oldest to youngest are pyrite-rich cataclastic, clast-supported fault breccia, the Union vein, and matrix-supported quartz breccia (White and Queen, 1989). The total thickness of these units averages about 40 feet. Veins that are peripheral to or cut the main vein-fault system include the Lucky Friday and Greenbaum veins, the Vuggy Watercourse vein, and several carbonate veins. Gold is most abundant in the Union vein, which generally is considered to be the principal gold deposit.

The Union vein is a composite vein consisting of a 10-foot-wide zone of closely-spaced quartz veins in the hanging wall tuff. Individual veins are sinuous, vuggy, and generally less than 30 inches wide. Native gold occurs, with finely crystalline arsenopyrite, pyrite, galena, and sphalerite. Precious-metal grades range from a trace in wide zones to more than 10 ounces of gold and 150 ounces of silver per ton in narrow zones. There is a strong correlation between gold, silver, and tellurium, indicating that some of the precious metals probably occur as tellurides (White and Queen, 1989). Singer (1999) suggests that this is a Sado-type gold deposit.

In 2014 after a detailed review of the existing drill core, Redstar Gold Corp. (Redstar) observed evidence of a phreatomagmatic (hydrothermal-magmatic) breccia system interpreted to be intimately associated with a nearby dacitic, hypabyssal dome mapped along Bloomer Ridge to the southeast. The phreatomagmatic breccia phases are interpreted to be pre- to syn-mineralization. A protracted multi-phase, anastomosing and bifurcating, precious metal-bearing quartz ± carbonate (rhodochrosite) + adularia hydrothermal system is part of, and is superimposed upon the breccia phases. The hydrothermal system either intensely replaced

and/or re-brecciated the phreatomagmatic breccias evident by open space veins, vein breccias and stockwork zones exhibiting crustiform, cockade and banded textures. At depths of between 30 meters to 105 meters below sea level, the hydrothermal system (as well as the breccia bodies) widens and bifurcates exhibiting an increase in stockwork veining within the hanging wall to the breccia system. Above this level, the hydrothermal system narrows and has been telescoped up section along the footwall and along specific breccia phases (Redstar Gold Corp., 2014b).

Sulfide minerals when present occur as very fine-grained pyrite, sphalerite, galena, visible gold and blue-grey metallic sulfides locally within crustiform layers or in stockwork and crackle breccia systems. Pervasive phyllic alteration (quartz-sericite-pyrite), zones of variable silicification, quartz-adularia-carbonate stockworks and patchy disseminated pyrite occurs throughout the breccia and outbound into the hanging wall overprinting epiclastic sediments and dacite (Redstar Gold Corp., 2014b).

After drilling several holes in 2015, Redstar discovered an older, Ginguro-style (crustiform-colloform pyrite +/- marcasite) epithermal breccia vein system in the footwall below the younger Shumagin-style quartz veining. This new vein system is anomalous in gold and silver (1 to 4 grams per tonne gold) where Ginguro-sulfides are encountered (both veins and clasts) and exhibits contrasting epithermal geochemical signatures to Shumagin-style breccia veins with distinctly higher levels of arsenic, antimony, and mercury (Redstar Gold Corp., 2015a).

Alteration:

Strong argillic alteration is present as much as 148 feet from the Shumagin deposit. Quartz-sericite-pyrite alteration extends outward from Union vein and the matrix-supported quartz breccia (White and Queen, 1989). Zones of variable silicification, quartz-adularia-carbonate stockworks and patchy disseminated pyrite occurs throughout the breccia and outbound into the hanging wall overprinting epiclastic sediments and dacite (Redstar Gold Corp., 2014b).

Age of mineralization:

Eocene or younger, based on the age of the host rock (Wilson and others, 1995).

Generic deposit model:

Deposit model:

Sado-type epithermal gold vein (Cox and Singer, 1986; model 25d).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

25d

Production Status: None

Site Status: Active

Workings/exploration:

Atwood (1909) first described the prospect, whose workings at that time consisted of two tunnels 150 feet apart vertically. The lower one was 365 feet in length with a 75-foot crosscut. The upper tunnel was 79 feet in length with a 169-foot crosscut.

From 1983 to 1987, Alaska Apollo Gold Mines diamond drilled 23 holes totaling 9,269 feet, drilled 44 percussion holes, and cut 13 trenches through the vein and fault. At that time the deposit was estimated to contain 300,000 tons of ore grading 0.5 ounce of gold per ton. In 1989 Ballatar Exploration core-drilled approximately 6,000 feet.

In 1986 Battle Mountain Exploration Company mapped and sampled the deposit and relogged the core. The data indicated that an ore shoot approximately 400 feet long, 5 to 30 feet thick, plunging 45 degrees to the northeast in the plane of the fault (Ellis and Apel, 1990). A deep hole drilled by Alaska Apollo Gold Mines 600 feet down the dip of the vein intersected 27 feet of rock that averaged 0.46 ounce of gold per ton. The deposit was estimated by Battle Mountain to contain 352,000 tons of ore with an average grade of 0.299 ounce of gold per ton. In 1990 Battle Mountain Exploration Company drilled a 1,022-foot core hole

collared on Aleut Corporation land that was inclined to hit the deposit at depth. At a depth of 900 feet, the hole cut 18 feet of rock that averaged 0.47 ounce of gold per ton.

In 1987 during road building, a 500-foot-long, faulted eastern extension of the Shumagin vein was uncovered, mostly on Aleut Corporation land. Battle Mountain Exploration Company mapped and sampled this section of vein. It was found to be a large, weakly mineralized, south-dipping veined structure, locally as much as 50 feet thick. Samples contained up to 680 parts per billion (ppb) gold, 12.1 parts per million (ppm) silver, 234 ppm arsenic and 2,000 ppb mercury (Ellis and Apel, 1990).

In 2011, Redstar Gold Corp. (Redstar) (2012a; 2012b) began work in the area in a joint venture with Full Metal Minerals Inc. on land they were purchasing and on land leased from the Aleut Native Corporation. They drilled 10 holes and did extensive surface sampling. Some notable intercepts in the holes were: 1) 21 meters that averaged 4.02 grams of gold per tonne, this included a 1 meter interval with 43.90 grams of gold per tonne; and 2) 30 meters that averaged 14.98 grams of gold per tonne, this included 0.55 meter with 738 grams of gold per tonne.

In 2014 Redstar completed a soil sample grid of approximately 750 m by 200 m at Shumagin to test the western extension of known surface and sub-surface mineralization along inferred structures, as documented by historic geological maps and trench data. Results from the survey showed a gold and silver geochemical soil signature that averaged 20 to 50 parts per billion (ppb) gold with up to 615 ppb gold and averaged over 0.5 grams per tonne (g/t) silver with up to 6.8 g/t silver over areas of historical trenching. This anomaly has been extended to the southwest by approximately 400 meters, where anomalous values occur along the southwestern flank of a low lying ridge that abuts against an active, north draining flood plain (Redstar Gold Corp., 2014a). Rock chip sampling collected from quartz vein breccias and stockwork found in surface outcrops produced results of up to 9.93 g/t gold and 74.4 g/t silver (Redstar Gold Corp., 2014b).

Redstar drilled eight holes along the Shumagin vein system in May 2015. The first four drill holes were infill holes across an area of historic drilling used in a non-43-101 compliant resource estimation. The last four drill holes target high-grade mineralization down plunge and along strike of the known Shumagin vein system. These drill holes revealed an older, Ginguro-sulfide textured epithermal breccia vein that was not destroyed by late-stage Shumagin-style vein breccias. Notable intercepts from this drilling were: 1) 1.9 meters that averaged 202 g/t gold and 82 g/t silver; 2) 6.35 meters that averaged 9.45 g/t gold and 103 g/t silver, including 3.0 meters with 16.95 g/t gold and 183 g/t silver; 3) 4 meters that averaged 11.62 g/t gold and 95.6 g/t silver, including 1.0 meter with 20.90 g/t gold and 232 g/t silver; and 4) 5 meters that averaged 9.35 g/t gold and 27.62 g/t silver, including 1.0 meter with 41.2 g/t gold and 130 g/t silver (Redstar Gold Corp., 2015a).

Redstar Gold Corp. conducted two phases of exploration in 2016 on their Unga project, which includes the Shumagin (PM064), Apollo (PM079; PM084), Centennial, Orange Mountain (PM067), Zachary Bay (PM054), Amethyst (PM092), and Aquila (PM086) epithermal gold-silver prospects. The Shumagin trend parallels the historically mined Apollo–Sitka vein system (PM079; PM084; PM076), which between 1886 and 1922 produced approximately 150,000 ounces of gold at a grade of approximately 0.292 ounce of gold per ton (Athey and Werdon, 2017).

In June 2016, Redstar Gold Corp.'s Phase I surface program included classifying alteration assemblages and conducting other geologic work to identify drill targets. From October through November, Phase II's drilling program tested the down-dip and along-strike expansion potential of high-grade vein/breccia mineralization within the Shumigan Gold Zone (PM064). A total of 1,505 meters were drilled in 7 holes spaced over ~750 meters of strike length. All drill holes intersected the target structure, which includes multi-generational phreatomagmatic breccias, hydrothermal breccias, and late breccias and veins with colloform-crustiform- to cockade-textured quartz-adularia-carbonate (± rhodochrosite, ± green clay). Select intervals from drill holes 16SH019 and 16SH020 include 0.9 meter at 14.95 grams of gold per tonne and 1.15 meters at 11.3 grams of gold per tonne; release of full assay results is planned for late January 2017 (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

A resource of 300,000 tons grading 0.5 ounce of gold per ton was estimated from the exploration work done by Alaska Apollo Gold Mines in 1983 to 1987. In 1986, Battle Mountain Exploration Company

estimated that the deposit contained 352,000 tons of material that averages 0.299 ounce of gold per ton. Queen (1988) estimated a resource of 270,000 tons that averages 0.49 ounce of gold per ton and 1.97 ounces of silver per ton.

Additional comments:

The Shumagin prospect lies on state mining claims however the surrounding surface rights belong to the Unga Corporation and the subsurface rights belong to the Aleut Corporation (Redstar Gold Corp., 2015b).

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Redstar Gold Corp., 2014b, Redstar extends known surface mineralization along the Shumagin Trend at its 100%-owned Unga Gold Project, Alaska, Evidence of a larger, district-scale epithermal and magmatic-related gold system: http://www.redstargold.com/s/NewsReleases.asp?ReportID=688794 (News release, December 22, 2014, as of July 23, 2015).

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Primary Reference: White and Queen, 1989

Reporter(s): S.H. Pilcher (Anchorage, Alaska); D.J. Grybeck (Contractor, USGS); N.V. King (Alaska Earth Sciences); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Orange Mountain; Unga

Site type: Prospect

ARDF no.: PM067

Latitude: 55.209 **Quadrangle:** PM A-2

Longitude: 160.621

Location description and accuracy:

This prospect is on southeastern Unga Island approximately 4,000 feet southwest of Red Mountain (Wilson and others, 1988, locality 29). The map site is at an elevation of 1,060 feet, at the top of a hill marked by a large color anomaly. Orange Mountain is informally named for the color anomaly; it is not named on the topographic map. The location is accurate.

Commodities:

Main: Ag, Au

Other:

Ore minerals: Gold, pyrite, tetrahedrite

Gangue minerals: Barite, quartz

Geologic description:

This prospect, marked by a 2.7-square-mile color anomaly, is the largest single area of alteration on Unga Island. It is in rocks mapped as the late Eocene to early Oligocene Popof volcanic rocks (Wilson and others, 1995). From 1979 to 1983, it was explored first by Resource Associates of Alaska and then by UNC Teton Exploration Drilling Company (Peterson and others, 1983).

The prospect consists of a gently-dipping, interbedded sequence of silica-replaced felsic tuffs and argillically altered andesite tuffs and flows. The alteration extends over a vertical range of at least 500 feet (Ellis and Apel, 1990). Numerous shears, faults, fracture zones, and breccias result in structural complexities (Peterson and others, 1983).

The silica-replaced tuffs contain 5 percent disseminated pyrite. They also contain veins, disseminations, and pods of barite, and veinlets and pods of quartz. In brecciated areas, the quartz and barite veins locally occur together, and some of the quartz is replaced by barite. The argillically altered andesite contains 25 percent pyrite as veinlets and disseminations. Tetrahedrite has also been reported.

There is a positive correlation between precious metal values and the silicified rock; the highest values are associated with shears and breccias. The highest precious metal values obtained from surface samples were 2.85 ppm gold and 26 ppm silver; their mean value was 0.045 ppm gold and 0.4 ppm silver (Peterson and others, 1983). Detectable and weakly anomalous gold values occur in drill holes in sections 100 or more feet thick (115 feet in OM-2 and 370 feet in OM-3). The highest subsurface precious metal values were 0.41 ppm gold and 3.4 ppm silver. Mean values of base metals were at 40 ppm copper, 20 ppm lead, 20 ppm zinc, and 50 ppm arsenic. The entire area is enriched in mercury, and values of as much as 107 ppm of mercury occur in silicified tuffs. The mean mercury value is 1.6 ppm. Thallium, tellurium, antimony, and bismuth were also detected.

In 1990 Battle Mountain Exploration Company mapped the site and collected approximately 117 rock chip samples. Their mapping indicated that the silicified rock forms a cap overlying argillically altered tuffs containing as much as 70 percent pyrite (Ellis and Apel, 1990). Gold values in quartz veins cutting the silicified tuffs ranged from 0.05 to 0.25 ppm.

Alteration:

The alteration consists of as pervasive argillization and pyritization of andesite tuffs and silicification of felsic tuffs.

Age of mineralization:

Eocene or younger.

Generic deposit model:

Deposit model:

Epithermal gold veins

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

During the period 1979 to 1983 Resource Associates of Alaska and UNC Teton Exploration Drilling Company conducted 8.5 miles of grid mapping, collected and analyzed 750 rock and soil samples, conducted 1.4 miles of VLF-EM survey, and drilled 3 core holes for a total of 2,453 feet. The highest metal values of surface samples were 2.85 ppm gold and 26 ppm silver. The mean values were 0.045 ppm gold and 0.4 ppm silver. The highest subsurface values were 0.41 ppm gold and 3.4 ppm silver.

In 1990 Battle Mountain Exploration mapped the site in detail and collected approximately 150 rock samples. A cluster of low-level gold anomalies was outlined at the top of Orange Mountain. Individual quartz veinlets assayed 0.05 to 0.25 ppm gold.

Redstar Gold Corp. conducted two phases of exploration in 2016 on their Unga project, which includes the Shumagin (PM064), Apollo (PM079; PM084), Centennial, Orange Mountain (PM067), Zachary Bay (PM054), Amethyst (PM092), and Aquila (PM086) epithermal gold-silver prospects. The Shumagin trend parallels the historically mined Apollo–Sitka vein system (PM079; PM084; PM076), which between 1886 and 1922 produced approximately 150,000 ounces of gold at a grade of approximately 0.292 ounce of gold per ton (Athey and Werdon, 2017).

In June 2016, Redstar Gold Corp.'s Phase I surface program included classifying alteration assemblages and conducting other geologic work to identify drill targets. From October through November, Phase II's drilling program tested the down-dip and along-strike expansion potential of high-grade vein/breccia mineralization within the Shumigan Gold Zone (PM064). A total of 1,505 meters were drilled in 7 holes spaced over ~750 meters of strike length. All drill holes intersected the target structure, which includes multi-generational phreatomagmatic breccias, hydrothermal breccias, and late breccias and veins with colloform-crustiform- to cockade-textured quartz-adularia-carbonate (± rhodochrosite, ± green clay). Select intervals from drill holes 16SH019 and 16SH020 include 0.9 meter at 14.95 grams of gold per tonne and 1.15 meters at 11.3 grams of gold per tonne; release of full assay results is planned for late January 2017 (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

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Primary Reference: Peterson and others, 1983

Reporter(s): S.H. Pilcher; M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Sitka; Sitka Gold Mine; Unga

Site type: Mine

ARDF no.: PM076

Latitude: 55.194 **Quadrangle:** PM A-2

Longitude: 160.554

Location description and accuracy:

This mine is located on the southeast part of Unga Island approximately 2,600 feet northwest of the head of Delarof Harbor and 1,500 feet northeast of the Apollo mine (Berg and Cobb, 1967, locality 7; Cobb, 1972, locality 5; MacKevett and Holloway, 1977, locality 5; Nokleberg and others, 1987, locality AP4; Wilson and others, 1988, locality 4). The mine is near the north edge of section 5, T. 58 S., R. 74 W. of the Seward Meridian. The location is based on aerial photographs showing where the entrance to the adit is and is accurate to 100 feet.

Commodities:

Main: Ag, Au

Other: Cu, Pb, Zn

Ore minerals: Chalcopyrite, galena, gold, pyrite, sphalerite

Gangue minerals: Adularia, calcite, quartz

Geologic description:

The Sitka deposit is a 5- to 10-foot-wide zone of auriferous quartz-sulfide veins in an east-west-striking shear that cuts rocks mapped as andesite of the Eocene to Oligocene Popof volcanic rocks (Wilson and others, 1995). The shear zone dips 65 to 80 degrees to the south. The Sitka gold vein system is part of the northeast mineralized Apollo-Sitka trend which extends over 5,000 feet across Unga Island. Anomalous gold and silver values in rock, soil, and talus samples correlate to zones of pervasive silicification and quartz-adularia-carbonate veins within an envelope of intense argillic alteration (Redstar Gold Corp., 2014b).

Mineralization is found in stockwork quartz veins containing pyrite and as much as 5 percent chalcopyrite and galena, along with lesser amounts of sphalerite. They are vuggy and show evidence of open-space filling, resulting in inward-facing euhedral quartz crystals. The sulfides occur mostly at the base of the quartz crystals. The stockwork quartz veins are within volcanic rocks and appears to be extensive though the width of mineralization is not known. Trenches expose some of the stockwork quartz veining indicating a minimum width of 50 meters (Redstar Gold Corp., 2012).

Alteration:

Anomalous gold and silver values in rock, soil, and talus samples correlate to zones of pervasive silicification and quartz-adularia-carbonate veins within an envelope of intense argillic alteration (Redstar Gold Corp., 2014b).

Age of mineralization:

Eocene or younger, based on age of host rocks (Wilson and others, 1995).

Generic deposit model:

Deposit model:

Sado epithermal gold veins (Cox and Singer, 1986; model 25d).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

25d

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The Sitka mine was operated in conjunction with the Apollo mine (PM079) from 1900 until about 1915. Workings at that time consisted in part of a 400-foot shaft, a 360-foot adit, stopes as much as 150 feet long and 15 feet wide on the 55-foot level, and numerous crosscuts (Wilson and others, 1988). Production to that time was estimated at 15,000 tons of unknown grade (Brown, 1947). The gold, where mined, was free-milling (Atwood, 1911). In 1983 Alaska Apollo Mines cut six trenches and drilled three core holes for a total of 1,571 feet. The remaining resource is said to be 140,000 tons (Wilson and others, 1996).

In 2011 Redstar Gold Corp. (Redstar) collected several rock samples from the Sitka mine shaft across the gold-silver vein that contained 13.2 grams per tonne (g/t) gold and 398 g/t silver over 2 meters. Vein material sampled from the mine dump returned 15.2 g/t gold and 316 g/t silver (Redstar Gold Corp., 2012).

Redstar remapped and collected continuous chip and select rock samples in 2014 from 235 meters of the historic trenches at Sitka to better understand the characteristics of historic mining activities (Redstar Gold Corp., 2014a). Continuous rock chip trench sampling of intense quartz-adularia-carbonate stockwork veins within a stope at Sitka contained up to 30.5 g/t gold and 128 g/t silver. Sampling along the Apollo-Sitka trend showed a continuous gold and silver soil anomaly of over 100 parts per billion (ppb) gold and over 1.3 g/t silver, extending 1,300 meters to the southwest of Apollo (PM079) (Redstar Gold Corp., 2014b).

Redstar Gold Corp. conducted two phases of exploration in 2016 on their Unga project, which includes the Shumagin (PM064), Apollo (PM079; PM084), Centennial, Orange Mountain (PM067), Zachary Bay (PM054), Amethyst (PM092), and Aquila (PM086) epithermal gold-silver prospects. The Shumagin trend parallels the historically mined Apollo–Sitka vein system (PM079; PM084; PM076), which between 1886 and 1922 produced approximately 150,000 ounces of gold at a grade of approximately 0.292 ounce of gold per ton (Athey and Werdon, 2017).

In June 2016, Redstar Gold Corp.'s Phase I surface program included classifying alteration assemblages and conducting other geologic work to identify drill targets. From October through November, Phase II's drilling program tested the down-dip and along-strike expansion potential of high-grade vein/breccia mineralization within the Shumigan Gold Zone (PM064). A total of 1,505 meters were drilled in 7 holes spaced over ~750 meters of strike length. All drill holes intersected the target structure, which includes multi-generational phreatomagmatic breccias, hydrothermal breccias, and late breccias and veins with colloform-crustiform- to cockade-textured quartz-adularia-carbonate (± rhodochrosite, ± green clay). Select intervals from drill holes 16SH019 and 16SH020 include 0.9 meter at 14.95 grams of gold per tonne and 1.15 meters at 11.3 grams of gold per tonne; release of full assay results is planned for late January 2017 (Athey and Werdon, 2017).

Production notes:

The estimated production is about 15,000 tons of unknown grade (Brown, 1947).

Reserves:

The resource is estimated 140,000 tons (reported in Alaska Construction and Oil, 1984). The grade is not available.

Additional comments:

The Sitka mine is located on patented mining claims owned by Redstar Gold Corp. (Redstar Gold Corp., 2015).

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Primary Reference: Wilson and others, 1988

Reporter(s): S.H. Pilcher; N.V. King (Alaska Earth Sciences); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Apollo; Unga

Site type: Mine

ARDF no.: PM079

Latitude: 55.1905 **Quadrangle:** PM A-2

Longitude: 160.5642

Location description and accuracy:

The Apollo Mine is shown by mine adit symbol on the 1:63,360-scale topographic map. It is about 0.6 mile northwest of the head of Delarof Bay on Unga Island and about 0.4 mile northwest of the center of section 5, T. 58 S., R. 74 W. of the Seward Meridian. The location is well known and accurate.

Commodities:

Main: Ag, Au

Other: Cu, Pb, Zn

Ore minerals: Chalcopyrite, galena, gold, native copper, pyrite, sphalerite

Gangue minerals: Adularia, calcite, chlorite, quartz

Geologic description:

The host rock of the Apollo Mine veins are the Eocene to Oligocene Popof volcanic rocks, which are equivalent to the Meshik Volcanics (Wilson and others, 1995). The deposit was discovered in 1891. It was first described by Becker (1897) as a steeply-dipping, reticulated vein zone at the northeast end of the northeast-striking 'Apollo trend', which is a system of faults and linears that cuts across the Unga Island.

Three subparallel veins were mined. The veins cut altered andesite, strike N 20 E and dip steeply south. Riehle (1999), however, reports that they strike N 43 E. The veins are generally less than 60 feet apart. They tend to be vuggy and contain euhedral quartz crystals, indicating deposition in open spaces. Other minerals in the veins include gold, chalcopyrite, sphalerite, galena, pyrite, native copper, calcite, chlorite, and rare adularia. Singer (1999) suggests that this is a Sado-type gold deposit. Anomalous gold and silver values in rock, soil, and talus samples correlate to zones of pervasive silicification and quartz-adularia-carbonate veins within an envelope of intense argillic alteration (Redstar Gold Corp., 2014b).

An anonymous review written in 1935 and included in Brown (1947) suggested that there were four ore shoots 400 to 800 feet long that were spread along strike for over 5,000 feet and extend to a depth of 1,400 feet. Most of the ore mined apparently came from two shoots, the largest of which was 800 feet long, 8 to 16 feet wide, and extended down dip for 500 feet (Wilson and others, 1996). The shoots plunged 60 to 70 degrees to the northeast (Butherus and others, 1979).

Alteration:

The wall rock exhibits extensive propylitization. According to Butherus and others (1979), some silicification is also present. Anomalous gold and silver values in rock, soil, and talus samples correlate to zones of pervasive silicification and quartz-adularia-carbonate veins within an envelope of intense argillic alteration (Redstar Gold Corp., 2014b).

Age of mineralization:

Eocene or younger, based on the age of the host rock (Wilson and others, 1995).

Generic deposit model:

Deposit model:

Sado-type epithermal gold veins (Cox and singer, 1986; model 25d).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

25d

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The Apollo mine was in production from 1892 to 1904 and from 1908 to 1913. By 1913, the workings consisted of two tunnels, one 1,200 feet and the other 3,200 feet in length; two shafts, 450 and 811 feet deep; and numerous subsidiary crosscuts (Wilson and others, 1988). A 60-stamp mill was in operation in the 1890s and early 1900s. Small amounts of ore were mined in 1916 and 1922. Most of the ore was free milling; however, at depth most of the gold was apparently in the sulfides and could not be recovered in the old mill. Some of this ore was concentrated and sent to the Tacoma smelter in Washington. A small cyanide plant was installed at the mine in 1916 to process the tailings.

In 1983, the Alaska-Apollo Gold mines did extensively trenching, sampled the underground workings, and drilled nine core holes that totaled 9,483 feet. Based on this data, the deposit was estimated to have inferred reserves of 748,000 tons that average 0.76 ounce of gold and 2.16 ounces of silver per ton (Bundtzen and others, 1991).

In 2014 Redstar Gold Corp. (Redstar) completed a surface sampling program collecting 405 rock samples and 670 soil and fine talus samples covering over 3 kilometers along the Apollo-Sitka trend (Redstar Gold Corp., 2014a). Rock chip samples collected from bedrock exposures of quartz-adularia-carbonate stockwork veins returned gold and silver values up to 401 grams per tonne (g/t) gold and 266 g/t silver. Sampling along the Apollo-Sitka trend showed a continuous gold and silver soil anomaly of over 100 parts per billion (ppb) gold and over 1.3 g/t silver, extending 1,300 meters to the southwest of Apollo (Redstar Gold Corp., 2014b).

Redstar Gold Corp. conducted two phases of exploration in 2016 on their Unga project, which includes the Shumagin (PM064), Apollo (PM079; PM084), Centennial, Orange Mountain (PM067), Zachary Bay (PM054), Amethyst (PM092), and Aquila (PM086) epithermal gold-silver prospects. The Shumagin trend parallels the historically mined Apollo–Sitka vein system (PM079; PM084; PM076), which between 1886 and 1922 produced approximately 150,000 ounces of gold at a grade of approximately 0.292 ounce of gold per ton (Athey and Werdon, 2017).

In June 2016, Redstar Gold Corp.'s Phase I surface program included classifying alteration assemblages and conducting other geologic work to identify drill targets. From October through November, Phase II's drilling program tested the down-dip and along-strike expansion potential of high-grade vein/breccia mineralization within the Shumigan Gold Zone (PM064). A total of 1,505 meters were drilled in 7 holes spaced over ~750 meters of strike length. All drill holes intersected the target structure, which includes multi-generational phreatomagmatic breccias, hydrothermal breccias, and late breccias and veins with colloform-crustiform- to cockade-textured quartz-adularia-carbonate (± rhodochrosite, ± green clay). Select intervals from drill holes 16SH019 and 16SH020 include 0.9 meter at 14.95 grams of gold per tonne and 1.15 meters at 11.3 grams of gold per tonne; release of full assay results is planned for late January 2017 (Athey and Werdon, 2017).

Production notes:

Estimates of the total production are: 1) 500,000 tons that averaged 0.25 ounce of gold per ton (Wilson and others, 1996); 2) 490,000 tons that averaged 0.22 ounce of gold per ton (Bundtzen and others, 1987); and 3)242,000 tons that averaged 0.4 ounce of gold per ton (Berg and Cobb, 1967).

Reserves:

In the early 1980s, the mine was estimated to have 748,000 tons of inferred reserves with an average grade of 0.76 ounce gold per ton and 2.16 ounces of silver per ton (Bundtzen and others, 1991).

Additional comments:

The Apollo mine is located on patented mining claims owned by Redstar Gold Corp. (Redstar Gold Corp., 2015).

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Primary Reference: Wilson and others, 1988

Reporter(s): S.H. Pilcher (Anchorage, Alaska), D.J. Grybeck (Contractor, USGS); N.V. King (Alaska Earth Sciences); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Apollo Mountain; Unga

Site type: Occurrence

ARDF no.: PM084

Latitude: 55.18 **Quadrangle:** PM A-2

Longitude: 160.61

Location description and accuracy:

This occurrence is approximately located. The map site is at an elevation of about 700 feet, due south of 1,630 foot peak of Apollo Mountain on southeastern Unga Island (MacKevett and Holloway, 1977, locality 13; Wilson and others, 1988, locality 13). The location is accurate to within 2 miles.

Commodities:

Main: Au, Cu

Other:

Ore minerals:

Gangue minerals: Quartz

Geologic description:

This occurrence consists of quartz veins less than 12 inches thick that crop out discontinuously along stike for 2,500 feet. It also includes a knoblike, 100- by 1,000-foot area of brecciated and silicified andesite containing numerous quartz-filled vugs and limonitic shears. The vein system cuts rocks mapped as Popof volcanic rocks of late Eocene to early Oligocene age (Wilson and others, 1995). Grab samples of the quartz contained as much as 0.23 ppm gold and 10 ppm silver (Wilson and others, 1988). Base metal values are low.

Alteration:

Age of mineralization:

Eocene or younger.

Generic deposit model:

Deposit model:

Epithermal gold veins

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Some evaluation work may have been done by UNC Teton Exploration Drilling Company for the Aleut Corporation in 1979, 1981, and 1982 (Wilson and others, 1988). Grab samples contained as much as 0.23 ppm gold and 10 ppm silver. Base metal values were low.

Redstar Gold Corp. conducted two phases of exploration in 2016 on their Unga project, which includes the Shumagin (PM064), Apollo (PM079; PM084), Centennial, Orange Mountain (PM067), Zachary Bay (PM054), Amethyst (PM092), and Aquila (PM086) epithermal gold-silver prospects. The Shumagin trend parallels the historically mined Apollo–Sitka vein system (PM079; PM084; PM076), which between 1886 and 1922 produced approximately 150,000 ounces of gold at a grade of approximately 0.292 ounce of gold per ton (Athey and Werdon, 2017).

In June 2016, Redstar Gold Corp.'s Phase I surface program included classifying alteration assemblages and conducting other geologic work to identify drill targets. From October through November, Phase II's drilling program tested the down-dip and along-strike expansion potential of high-grade vein/breccia mineralization within the Shumigan Gold Zone (PM064). A total of 1,505 meters were drilled in 7 holes spaced over ~750 meters of strike length. All drill holes intersected the target structure, which includes multi-generational phreatomagmatic breccias, hydrothermal breccias, and late breccias and veins with colloform-crustiform- to cockade-textured quartz-adularia-carbonate (± rhodochrosite, ± green clay). Select intervals from drill holes 16SH019 and 16SH020 include 0.9 meter at 14.95 grams of gold per tonne and 1.15 meters at 11.3 grams of gold per tonne; release of full assay results is planned for late January 2017 (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

This site is located on land patented by, or interim-conveyed to, the Aleut Corporation.

References:

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Primary Reference: Wilson and others, 1988

Reporter(s): S.H. Pilcher; M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Aquila; Unga

Site type: Prospect

ARDF no.: PM086

Latitude: 55.19 **Quadrangle:** PM A-2

Longitude: 160.654

Location description and accuracy:

The Aquila prospect is located on southeastern Unga Island one mile east of Acheredin Bay (Nokleberg and others, 1987, locality AP3; Wilson and others, 1988, locality 37). The map site is at an elevation just over 700 feet, 0.25 mile north of the center of sec. 3, T. 58 S., R. 75 W. of the Seward Meridian. The location is accurate.

Commodities:

Main: Ag, Au

Other: As, Cu, Hg, Pb, Sb, Zn

Ore minerals: Chalcopyrite, galena, gold, galena, sphalerite

Gangue minerals: Quartz

Geologic description:

The Aquila prospect is one of several northeast-striking epithermal vein systems in an area approximately 1,000 by 2,000 feet. The systems include veins on the Origin (PM087), Freds (PM088), Surprise (PM089), Ankle Creek (PM090), Altair (PM091), and Amethyst (PM092) prospects.

The Aquila vein system cuts andesite flows and tuffs of the late Eocene to early Oligocene Popof volcanic rocks (Wilson and others, 1995). It is as much as 100 feet in width and can be traced along strike for as much as 2,000 feet. It exhibits evidence of open-space filling and repeated phases of fracturing and deposition, resulting in vein breccias and quartz stockworks (Peterson and others, 1982). The veins contain pyrite, and, locally free gold, along with trace amounts of chalcopyrite, galena, and sphalerite.

Many sets of lineaments characterize the prospect area. The widest and richest zones of veins seem to occur at the intersection of these lineaments with northwest-striking faults. Higher gold values are also associated with zones of multiple brecciation. The gold is free-milling and ranges in size from 20 to 40 microns (Peterson and others, 1982).

Alteration:

The alteration is zoned outward from the veins from silicification to argillization to propylitization (source unknown, from previous reporting).

Age of mineralization:

Eocene or younger, based on the age of the host rock (Wilson and others, 1995).

Generic deposit model:

Deposit model:

Sado-type epithermal gold vein (Cox and Singer, 1986; model 25d).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

25d

Production Status: None

Site Status: Active

Workings/exploration:

This prospect was explored by Resource Associates of Alaska and UNC Teton Exploration Drilling Company during the period 1979 to 1982. During that time they mapped the area; conducted magnetometer, Very Low Frequency Electromagnetic (VLF-EM) and Induced Polarization (IP) surveys; drilled 12 core holes for a total of 4,446 feet; collected 675 rock samples; cut 17 trenches for a total of 3,310 feet; and took 472 trench samples. Precious metal values in trench samples include 0.335 ounce per ton (oz/t) gold and 1.56 oz/t silver over 12 feet, 0.242 oz/t gold and 0.68 oz/t silver over 12 feet, 0.105 oz/t gold and 0.17 oz/t silver 12 feet, and 0.165 oz/t gold and 0.18 oz/t silver 10 feet. Selected drill core assays include 0.20 oz/t gold and 0.4 oz/t silver over 31.2 feet, 0.19 oz/t gold and 0.51 oz/t silver over 17.5 feet, and 3.31 oz/t gold and 3.2 oz/t silver over 1.4 feet (Peterson and others, 1982).

In 1986 Battle Mountain Exploration Company examined the vein systems and later mapped and sampled some of them. In 1990 they explored the area looking for large zones of argillic and silicic alteration having potential for disseminated gold mineralization. Argillically altered and silicified tuffs were found to be anomalous in arsenic and mercury and had spotty gold values as much as 0.025 parts per million (ppm) (Ellis and Apel, 1990).

In 2014 Redstar Gold Corp. collected approximately 150 soil and fine talus samples and over 50 rock samples covering the Aquila prospect (Redstar Gold Corp., 2014a). The soil and fine talus samples returned gold values ranging from 50 parts per billion (ppb) to 197 ppb and silver values from 0.5 grams per tonne (g/t) to 1.3 g/t. A rock sample from a narrow breccia vein with strong argillic alteration contained 90.2 g/t silver (Redstar Gold Corp., 2014b).

Redstar Gold Corp. conducted two phases of exploration in 2016 on their Unga project, which includes the Shumagin (PM064), Apollo (PM079; PM084), Centennial, Orange Mountain (PM067), Zachary Bay (PM054), Amethyst (PM092), and Aquila (PM086) epithermal gold-silver prospects. The Shumagin trend parallels the historically mined Apollo–Sitka vein system (PM079; PM084; PM076), which between 1886 and 1922 produced approximately 150,000 ounces of gold at a grade of approximately 0.292 ounce of gold per ton (Athey and Werdon, 2017).

In June 2016, Redstar Gold Corp.'s Phase I surface program included classifying alteration assemblages and conducting other geologic work to identify drill targets. From October through November, Phase II's drilling program tested the down-dip and along-strike expansion potential of high-grade vein/breccia mineralization within the Shumigan Gold Zone (PM064). A total of 1,505 meters were drilled in 7 holes spaced over ~750 meters of strike length. All drill holes intersected the target structure, which includes multi-generational phreatomagmatic breccias, hydrothermal breccias, and late breccias and veins with colloform-crustiform- to cockade-textured quartz-adularia-carbonate (± rhodochrosite, ± green clay). Select intervals from drill holes 16SH019 and 16SH020 include 0.9 meter at 14.95 grams of gold per tonne and 1.15 meters at 11.3 grams of gold per tonne; release of full assay results is planned for late January 2017 (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

The Aquila prospect lies land where the surface rights belong to the Unga Corporation and the subsurface rights belong to the Aleut Corporation (Redstar Gold Corp., 2015).

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Redstar Gold Corp., 2014b, Redstar extends known surface mineralization along the Shumagin Trend at its 100%-owned Unga Gold Project, Alaska, Evidence of a larger, district-scale epithermal and magmatic-related gold system: http://www.redstargold.com/s/NewsReleases.asp?ReportID=688794 (News release, December 22, 2014, as of July 23, 2015).

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Primary Reference: Peterson and others, 1982

Reporter(s): S.H. Pilcher; N.V. King (Alaska Earth Sciences); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Amethyst; Unga

Site type: Prospect

ARDF no.: PM092

Latitude: 55.188

Quadrangle: PM A-2

Longitude: 160.654

Location description and accuracy:

The map site of the Amethyst prospect is at an elevation of 500 feet, 500 feet northwest of the center of sec 3, T. 58 S., R. 75 W., Seward Meridian. The location is accurate to within 1,200 feet.

Commodities:

Main: Ag, Au

Other: As, Cu, Hg, Pb, Zn

Ore minerals: Chalcopyrite, galena, gold, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The northeast-striking Amethyst vein at its westernmost end is located approximately 200 feet south of the Altair vein (PM091); however, it has a more northerly strike, and farther to the northeast it intersects both the Altair (PM091) and the Ankle Creek (PM090) veins (Peterson and others, 1982, figure 11). The Amethyst vein has been traced for approximately 2,000 feet on strike. The vein is a braided system, generally 15 to 20 feet in width, composed of numerous quartz veins of varying widths. Individual veins in the system branch, interweave, pinch, and swell (Trujillo and others, 1982). It exhibits evidence of crushing, brecciation, and partial rehealing. Vein quartz generally makes up 20 to 50 percent of the system. Sulfide minerals include pyrite, chalcopyrite, galena, and sphalerite. The host rocks are propylitized and argillized, pyritic andesite flows and tuffs of the late Eocene to early Oligocene Popof volcanic rocks (Wilson and others, 1995).

An ore shoot at the intersection of the Amethyst and Ankle Creek veins has been drilled and trenched It is approximately 300 feet long, 12 feet wide, and extends to a depth of 100 feet. Ore intercepts of three core holes include 16.3 feet grading 0.20 ounce of gold and 0.6 ounce of silver per ton, 31 feet grading 0.20 ounce of gold and 0.4 ounce of silver per ton, and 10 feet grading 0.08 ounce of gold and 0.6 ounce of silver per ton (Anderson and others, 1980). The assays also show up to 1,120 ppm copper, 2,300 ppm lead, 670 ppm zinc, 1,100 ppm arsenic, and 0.64 ppm mercury. Trench samples include 12 feet grading 0.105 ounce of gold and 0.17 ounce of silver per ton, 12 feet grading 0.242 ounce of gold and 0.68 ounce of silver per ton, and 12 feet grading 0.335 ounce of gold and 1.56 ounces of silver per ton (Trujillo and others, 1981). The resource is estimated to be 30,000 tons of ore grading 0.23 ounce of gold and 0.8 ounce of silver per ton.

Other trenches and drill holes along the system indicate anomalous, but not sub-ore-grade precious metal values.

Alteration:

The host rocks exhibit weak to strong propylitic and argillic alteration. The propylitic alteration is accompanied by 2 to 5 percent disseminated pyrite.

Age of mineralization:

Eocene or younger.

Generic deposit model:

Deposit model:

Epithermal gold vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

During the period 1980 to 1982 Resource Associates of Alaska and UNC Teton Exploration Drilling Company mapped and sampled the prospect conducted VLF-EM, IP, and magnetometer surveys, core drilled 11 holes for a total of 4,446 feet, and cut 11 trenches. One ore shoot was outlined and evaluated at 30,000 tons grading 0.23 ounce of gold and 0.8 ounce of silver per ton (Trujillo and others, 1981).

In 1986 Battle Mountain Exploration Company carried out orientation soil, magnetometer, and VLF surveys over the prospect.

Redstar Gold Corp. conducted two phases of exploration in 2016 on their Unga project, which includes the Shumagin (PM064), Apollo (PM079; PM084), Centennial, Orange Mountain (PM067), Zachary Bay (PM054), Amethyst (PM092), and Aquila (PM086) epithermal gold-silver prospects. The Shumagin trend parallels the historically mined Apollo–Sitka vein system (PM079; PM084; PM076), which between 1886 and 1922 produced approximately 150,000 ounces of gold at a grade of approximately 0.292 ounce of gold per ton (Athey and Werdon, 2017).

In June 2016, Redstar Gold Corp.’s Phase I surface program included classifying alteration assemblages and conducting other geologic work to identify drill targets. From October through November, Phase II’s drilling program tested the down-dip and along-strike expansion potential of high-grade vein/breccia mineralization within the Shumigan Gold Zone (PM064). A total of 1,505 meters were drilled in 7 holes spaced over ~750 meters of strike length. All drill holes intersected the target structure, which includes multi-generational phreatomagmatic breccias, hydrothermal breccias, and late breccias and veins with colloform-crustiform- to cockade-textured quartz-adularia-carbonate (± rhodochrosite, ± green clay). Select intervals from drill holes 16SH019 and 16SH020 include 0.9 meter at 14.95 grams of gold per tonne and 1.15 meters at 11.3 grams of gold per tonne; release of full assay results is planned for late January 2017 (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

An ore shoot on the prospect contains an estimated 30,000 tons grading 0.23 ounce of gold and 0.8 ounce of silver per ton.

Additional comments:

This prospect is located on land patented by, or interim-conveyed to, the Aleut Corporation.

References:

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Primary Reference: Trujillo and others, 1981

Reporter(s): S.H. Pilcher; M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Centennial; Herman Lode; Trench; Popof Island Gold

Site type: Prospect

ARDF no.: PM096

Latitude: 55.308 **Quadrangle:** PM B-2

Longitude: 160.4975

Location description and accuracy:

The Centennial prospect is at an elevation of about 300 feet, approximately 2 miles south of the town of Sand Point. It is in the upper half of section 29, T. 56 S., R. 73 W. The location is accurate.

Commodities:

Main: Ag, Au

Other: As, Cu, Hg, Pb, Zn

Ore minerals:

Gangue minerals: Calcite, quartz

Geologic description:

The host rock at the Centennial prospect is Eocene to Oligocene Popof volcanic rocks (Wilson and others, 1995). At this locality they consist mostly of basalt flows and tuffs.

The names Herman Lode and Trench refer to prospects explored by several adits, pits, and a trench in the early 1900s. A mineralized zone 5 to 10 feet wide was reported to contain free gold (Atwood, 1909). The name Centennial was given to a gold deposit discovered in the same area in 1987 by Battle Mountain Exploration Company. Battle Mountain evaluated the property by detailed mapping and sampling, 484 auger holes, 59 diamond drill holes, 7,275 feet of trenching, and magnetic and VLF-EM geophysical surveys. Battle Mountain estimated that within 175 of the surface, the deposit has a resource of 4.8 million tons with an average grade of 0.042 ounce of gold per ton (Ellis and Harris, 1989).

The Centennial deposit is a large, low grade, disseminated gold lode. The country rocks consist of basalt flows, plugs, dikes, tuffs, and epiclastic deposits that overlie a sedimentary complex. The main mineralized zone occurs in a window eroded through a basalt flow. The mineralization is thought to be controlled in part by a plug margin, and in part by north-northeast-trending high-angle faults and fracture zones from which mineralizing fluids spread out into surrounding permeable rock (Ellis and Harris, 1989). The gold is disseminated in the matrix of the basaltic tuffs and also occurs in fractures and veins that cut the flows. The mineralization seems to have a lower limit at 240 to 400 feet above the sedimentary rocks that are beneath the volcanic rocks. The gold is free and occurs in the plus-25-micron range (Ellis and Harris, 1989). Silver, mercury, and arsenic are associated with the gold in analyses of the samples. Quartz and quartz-calcite veins and veinlets containing galena, sphalerite, pyrite, and some chalcopyrite were cut in some of the drill holes. Their relationship to the gold mineralization is not known. The rocks exhibit pervasive propylitic alteration. The mineralization is accompanied by enrichment in silica and potassium, resulting in deposition of adularia, sericite, and quartz. Argillic alteration is locally present. Calcite stockwork veining is widespread.

Alteration:

The host rocks in the area exhibit pervasive propylitic alteration. The mineralization is accompanied by enrichment in silica and potassium, resulting in deposition of adularia, sericite, and quartz. Argillic alteration is locally present. Calcite stockwork veining is widespread.

Age of mineralization:

Eocene or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Volcanic-hosted disseminated gold deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

In the early 1900s the prospect area was explored by tunnels, trenches, and pits. In the late 1980s, Battle Mountain Exploration Company evaluated the property by detailed mapping and sampling, 484 auger holes, 59 diamond drill holes, 7,275 feet of trenching, and magnetic and VLF-EM geophysical surveys.

Production notes:

None.

Reserves:

Battle Mountain Exploration Company estimated that within 175 of the surface, the deposit has a resource of 4.8 million tons with an average grade of 0.042 ounce of gold per ton (Ellis and Harris, 1989).

Additional comments:

This prospect is on land owned by the Aleut Native Corporation.

References:

Angeloni, L.M., Wilson, F.H., and Sutley, Stephen, 1985, Map and tables showing preliminary rock geochemical data, Port Moller, Stepovak Bay, and Simeonof Island quadrangles, Alaska: U.S. Geological Survey Open-File Report 85-470, 179 p., 1 sheet, scale 1:250,000.

Atwood, W.W., 1909, Mineral resources of southwest Alaska, in Brooks, A.H., and others, Mineral resources of Alaska in 1908: U.S. Geological Survey Bulletin 379, p. 108-152.

Atwood, W.W., 1911, Geology and mineral resources of parts of the Alaska Peninsula: U.S. Geological Survey Bulletin 467, 137 p.

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Ellis, W.T., and Harris, D.E., 1989, Centennial prospect 1989 final report: Battle Mountain Exploration Company report, 48 p., 41 map sheets of various scales. (Report held by the Aleut Corporation, Anchorage, Alaska.)

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Smith, P.S., 1932, Mineral industry of Alaska in 1929, in Smith, P.S., and others Mineral resources of Alaska, report on progress of investigations in 1929: U.S. Geological Survey Bulletin 824-A, p. 1-81.

Webber, B.S., Moss, J.M., Rutledge, F.A., and Sanford, R.S., 1946, Reconnaissance examinations of parts of the Alaska Peninsula and Aleutian Islands southwestern Alaska: U.S. Bureau of Mines, unpublished report of investigations, 40 p. (Report held by the U.S. Geological Survey, Anchorage.)

Wedow, Helmuth, Jr., White, M.G., and Moxham, R.M., 1952, Interim report on an appraisal of the uranium possibilities of Alaska: U.S. Geological Survey Open-File Report 52-165, 124 p.

Wilson, F.H., Detterman, R.L., Miller, J. W., and Case, J.E., 1995, Geologic map of the Port Moller, Stepovak Bay, and Simeonof Island quadrangles, Alaska: U.S. Geological Survey Miscellaneous Investigation Series Map I-2272, 1 sheet, scale 1:250,000.

Wilson, F.H., White, W.H., and DuBois, G.D., 1988, Brief descriptions of mines, prospects, and mineral occurrences in the Port Moller and Stepovak Bay quadrangles, Alaska Peninsula: U.S. Geological Survey Open-File Report 88-666, 128 p., 1 plate, scale 1:250,000.

Primary Reference: Ellis and Harris, 1989

Reporter(s): S.H. Pilcher (Anchorage, Alaska); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Propolov

Site type: Prospect

ARDF no.: PM110

Latitude: 55.2942 **Quadrangle:** PM B-2

Longitude: 160.4851

Location description and accuracy:

This prospect is exposed in the beach cliffs about 2.4 miles southeast of the Sand Point light; it is near the southeast corner of section 29, T. 56 S., R. 73 W. The location is accurate. It is at the southwest end of what Redstar Gold Corp. calls the Propolov prospect.

Commodities:

Main: Ag, Au

Other:

Ore minerals:

Gangue minerals: Quartz

Geologic description:

A zone of north-striking quartz-sulfide veins cuts tuffs and overlying flows in the sea cliffs south of the Centennial deposit (PM096) (Ellis and Harris, 1989). The host rocks are Eocene to Oligocene Popof volcanic rocks (Wilson and others, 1995). At the base of the cliff, a veined structure 10.5 feet wide, consists of five sulfide-bearing veins. At 175 feet above the base of the cliff, the zone is 50 feet wide and consists of 12 narrow, poorly mineralized veins (Redstar Gold Corp., 2002 [high-grade]). In the early 1900s a short adit was driven at the base of the zone. Samples taken in 1982 across 0.6 meter contained 21.39 grams of gold per tonne across 0.6 meters and 16.11 grams of gold per tonne. These veins have variously been seen as the feeder system to the Centennial deposit (Ellis and Harris, 1989) or as the southwest end of a northeast-trending belt of gold mineralization that Redstar calls the Propolov prospect (2012 [Growth]).

Alteration:

Not specified but probably associated with altered rocks.

Age of mineralization:

Eocene or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Sado-type epithermal gold vein? (Cox and Singer, 1986; model 25d).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

25d

Production Status: None

Site Status: Active

Workings/exploration:

A short adit was driven about 1900. Probably repeatedly examined if not sampled from the 1980s to the present (early 2012) in conjunction with work at the Centennial prospect (PM096) about 2 kilometers to the northwest.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Ellis, W.T., and Harris, D.E., 1989, Centennial prospect 1989 final report: Battle Mountain Exploration Company report, 48 p., 41 map sheets at various scales. (Report held by the Aleut Corporation, Anchorage, Alaska.)

Peterson, R.J., Lemmers, J., Handverger, P., Gallagher, J., Pilcher, R., East, J., Macleod, T., Bartels. E., 1982, Geology and precious metals potential Unga, Popof, and Korovin Islands, Shumagin Group, Aleutian Chain, Alaska: UNC Teton Exploration Drilling Company report, 127 p., 5 map sheets, various scales. (Report held by the Aleut Corporation, Anchorage, Alaska.)

Redstar Gold Corp., 2012, Redstar identified new high-grade gold vein system with 94.7 g/t and 1840 g/t Ag at surface, Unga project, Alaska: http://www.redstargold.com/s/NewsReleases.asp?ReportID=502474 (News release, January 18, 2012).

Redstar Gold Corp., 2012, Growth through discovery: http://www.redstargold.com/in/pdf/RGC-Presentation.pdf (corporate presentation current as as of March 20, 2012).

Wilson, F.H., Detterman, R.L., Miller, J. W., and Case, J.E., 1995, Geologic map of the Port Moller, Stepovak Bay, and Simeonof Island quadrangles, Alaska: U.S. Geological Survey Miscellaneous Investigation Series Map I-2272, 1 sheet, scale 1:250,000.

Wilson, F.H., White, W.H., and DuBois, G.D., 1988, Brief descriptions of mines, prospects, and mineral occurrences in the Port Moller and Stepovak Bay quadrangles, Alaska Peninsula: U.S. Geological Survey Open-File Report 88-666, 128 p., 1 plate, scale 1:250,000.

Primary Reference: Redstar Gold Corp., 2012 [high grade]

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Nelson and Tift

Site type: Mine

ARDF no.: PR005

Latitude: 54.8017 **Quadrangle:** PR D-6

Longitude: 131.9743

Location description and accuracy:

The Nelson and Tift Mine is on the north shore of McLean Arm, 0.8 mile west of Island Point at the entrance to the arm; it is in Sec. 33, T. 81 S., R. 90 E., of the Copper River Meridian. The location is accurate and the mine is shown by symbol on the current US Geological Survey 1:63,360-scale topographic map.

Commodities:

Main: Ag, Au, Cu, Pb

Other:

Ore minerals: Bornite, chalcopyrite, galena?, gold, magnetite, pyrite

Gangue minerals: Calc-silicate minerals, quartz

Geologic description:

The Nelson and Tift Mine was unusual in that it was found by two prospectors, mostly mined by them at low cost, and returned a profit with little legal or operational complications (Wilcox, 1937; Roehm, 1939, Roehm, 1942,; Roppel, 2005). The deposit was found in 1935 by two fishermen, Otto Nelson and R.C. Tiff along the exposed shoreline in an area that previously had been prospected for many years. A 2,150-pound test shipment was sent to the Tacoma smelter and assayed 0.785 ounce of gold per ton. Nelson and Tift then proceeded to mine in a pit just above sea level with a small compressor and jackhammer and sent a 50-ton ore shipment to the smelter in 1936. They then leased the property to the Anaconda Copper Company who mined for a year, periodically sending out barges of sulfide rich ore that proved to be worth $50 to $770 a ton. Anaconda drilled four holes on the deposit and concluded that while rich, it was small. At the end of the year, the property reverted to Nelson and Tift who continued to mine. In 1938, they shipped 1,076 tons of ore to the smelter with a return of $34,000 in gold and silver. A small flotation mill was set up to concentrate the sulfides in the ore and a search continued into the 40s for more mineralization with no success. Nelson reported that about 1,300 tons of ore was mined and that the total return was about $111,000 in gold and silver with some copper and lead.

The rocks in the area of the Nelson and Tift mine (MacKevett, 1963, pl. 1) consist of a Cretaceous quartz diorite stock; thin roof pendants of Devonian (?) marble and calc-silicate rock; and numerous Tertiary andesite or dacite dikes that cut both the stock and the roof pendants.

The deposit (MacKevett, 1963, p. 99-100) consisted of a sulfide lens 75 feet long, 30 feet deep, and 9 feet wide, in a steeply dipping, 20- to 40-ft wide roof pendant of marble that has been intruded by quartz diorite. Near the intrusive contacts, parts of the pendant have been converted to calc-hornfels. The ore consisted largely of auriferous pyrite, accompanied by small amounts of chalcopyrite and bornite. A few pyrite-bearing quartz veins up to 6 inches thick that cut the pendant contain gold. Pyrite and a little magnetite are disseminated in parts of the marble.

Alteration:

Age of mineralization:

Probably Cretaceous or younger.

Generic deposit model:

Deposit model:

Au skarn (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

The Nelson and Tift Mine was unusual in that it was found by two prospectors, mostly mined by them at low cost, and returned a profit with little legal or operational complications (Wilcox, 1937; Roehm, 1939, Roehm, 1942; Roppel, 2005). The deposit was found in 1935 by two fishermen, Otto Nelson and R.C. Tiff along the exposed shoreline in an area that previously had been prospected for many years. A 2,150-pound test shipment was sent to the Tacoma smelter and assayed 0.785 ounce of gold per ton. Nelson and Tift then proceeded to mine in a pit just above sea level with a small compressor and jackhammer and sent a 50-ton ore shipment to the smelter in 1936. They then leased the property to the Anaconda Copper Company who mined for a year, periodically sending out barges of sulfide rich ore that proved to be worth $50 to $770 a ton. Anaconda drilled four holes on the deposit and concluded that while rich, it was small. At the end of the year, the property reverted to Nelson and Tift who continued to mine it. In 1938, they shipped 1,076 tons of ore to the smelter with a return of $34,000 in gold and silver. A small floatation mill was set up to concentrate the sulfides in the ore and a search continued into the 40s for more mineralization with no success.

Production notes:

Nelson (Roehm, 1942) reported that about 1,300 tons of ore was mined and the total return was about $111,000 in gold and silver with some copper and lead.

Reserves:

The ore body was apparently mined out.

Additional comments:

References:

Cobb, E.H., and Elliott, R.L., 1980, Summaries of data on and lists of references to metallic and selected nonmetallic mineral deposits in the Ketchikan and Prince Rupert quadrangles, Alaska: U.S. Geological Survey Open-File Report 80-1053, 157 p.

MacKevett, E.M., Jr., 1963, Geology and ore deposits of the Bokan Mountain uranium-thorium area, southeastern Alaska: U.S. Geological Survey Bulletin 1154, 125 p.

Roehm, J.C., 1939, Summary report of mining investigations in the Ketchikan district: Alaska Territorial Department of Mines Itinerary Report 195-24, 14 p.

Roehm, J.C., 1942, Summary report of mining investigations and itinerary of J. C. Roehm in the Ketchikan, Wrangell, Petersburg and Juneau mining precincts: Alaska Territorial Department of Mines Itinerary Report 195-33, 23 p.

Roppel, Patricia, 2005, Striking it rich! Gold mining in southern Southeastern Alaska: Greenwich, Connecticut, Coachlamp Productions, 286 p

Wilcox, H. G., 1937, Report on miscellaneous properties at McLean Arm and Kasaan Bay: Alaska Territorial Department of Mines, Itinerary Report 119-2, 8 p.

Primary Reference: MacKevett, 1963

Reporter(s): H.C. Berg (USGS); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Maquis Zone; Potato Patch

Site type: Prospects

ARDF no.: PR007

Latitude: 54.9397 **Quadrangle:** PR D-5

Longitude: 131.3961

Location description and accuracy:

The Maquis Zone prospect is about 1.8 miles northwest of the north end of Hall Cove on Duke Island. It is at the northeast corner of section 16, T. 80 S., R. 93 E. at an elevation of about 450 feet. The location is accurate.

Commodities:

Main: Co, Cu, Ni, Pd, Pt

Other:

Ore minerals: Chalcopyrite, pentlandite, platinum-group minerals, pyrrhotite

Gangue minerals:

Geologic description:

The Maquis Zone prospect is on northwestern Duke Island, well known as the type locality of the Alaska-type, Cretaceous zoned ultramafic complex (Irvine, 1974). The ultramafic complex is concentrically zoned outward from a core of dunite and peridotite, succeeded by shells of olivine pyroxenite and hornblende pyroxenite. The complex is distinguished by locally conspicuous graded layering and other cumulate features, especially in the dunite, peridotite, and olivine pyroxenite. It has long been known (Berg and Cobb, 1967) that the dunite contains small lenses and disseminated chromite; the hornblende pyroxenite contained segregations of titaniferous magnetite that have been drilled; and rare specks of pyrrhotite, pyrite, pentlandite, and chalcopyrite occur widely (PR001). However, until recently no deposit of substantial size had been identified on Duke Island.

In 2001 and 2005, Quaterra Resources (2011) drilled 11 holes totaling 5,971 feet in two area: 8 holes in the the Maquis Zone and 3 in the Raven Zone (PE121) on mineralization they consider unlike anything that had previously been identified on Duke Island (Freeman, 2006). They interpret the mineralization as possibly related to the layered mafic complex.

The Maquis Zone mineralization is in a small plug of dunite about a half mile in diameter between hornblende-magnetite pyroxenite and gabbro (Freeman, 2006; Quaterra Resources, Inc., 2011). The best intercept in the 2001 drilling at the Maquis Zone was 99.5 feet that averaged 2,230 parts per million (ppm) copper and 140 parts per billion platinum and palladium, 40 to 608 ppm cobalt, and 102 to 2,730 ppm nickel (Quaterra Resources, 2005). The mineralization consists of disseminated chalcopyrite, pyrrhotite, and pentlandite in serpentinized clinopyroxenite and olivine pyroxenite. Rounded and tear-drop-shaped sulfide blebs suggest sulfide-silicate immiscibility during sulfide deposition. Additional drilling was done on the Maquis Zone in 2005 and also at the Potato Patch area about 1.1 kilometer to the west. The best intercept in the drilling was 149 feet that contained 2,086 ppm copper.

No drilling was done in 2007. However, the data was reviewed and several other areas of interest were identified. In February, 2008, Quaterra had a 388-line-mile airborne geophysical survey flown over the area. Quaterra's work suggest that the mineralization extends for 14.5 kilometers along strike and is 3.8 kilometers wide.

In 2010, Quaterra optioned the property to Copper Ridge Explorations Inc. (2010 [News, June 16]) and they drilled five holes that totaled 1,537 meters (Copper Ridge Explorations Inc., 2010 [News, Sept. 10]).

The drilling was designed to test mineralization along the basal contact of the mafic-ultramafic complex or within the feeder of the Maquis zone. The drill targets were based on geologic mapping, historical drilling, and three-dimensional modeling from several geophysical surveys. No significant mineralization was intersected in 4 of the holes. However one hole intersected 4.9 meters with 0.294 percent copper and 0.075 percent nickel, and 13.4 meters with 0.148 percent copper and 0.039 percent nickel. That hole collared in pyroxenite and was in gabbro for about 48 meters at the bottom of the hole. The gabbro contained 1-15 percent pyrrhotite and masses of graphitic country rock. The drilling indicated that the zoning within the complex is more complicated than was expected and what had been thought to be the basal contact of the complex from geophysical interpretations was in fact a contact with disseminated sulfides and sedimentary rocks with a high graphite content.

Alteration:

The host rocks are serpentinized.

Age of mineralization:

The Duke Island complex is about 110 Ma; this mineralization is probably genetically related to it.

Generic deposit model:

Deposit model:

Disseminated copper, nickel, and platinum-group elements in a layered mafic complex.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

In 2001 and 2005, Quaterra Resources (2011) drilled 11 holes totaling 5,971 feet in two area: 8 holes in the the Maquis Zone and 3 in the Raven Zone (PE121) on mineralization they consist unlike anything that had previously been identified on Duke Island (Freeman, 2006). No drilling was done in 2007. However, the data were reviewed and several other areas of interest were identified. In February, 2008, Quaterra had a 388-line-mile airborne geophysical survey flown over the area. In 2010, Copper Ridge Explorations Inc. drilled 5 holes on the Maquis zone.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Irvine, T.N., 1974, Petrology of the Duke Island ultramafic complex, southeastern Alaska: Geological Society of America Memoir 138, 240 p.

Freeman, 2006, Summary report for the Duke Island Cu-Ni-PGE property, Ketchikan Mining District, Alaska: Unpublished report for Quaterra Resources Inc., 46 p. (posted on www.sedar.com, Sept 7, 2006).

Quaterra Resources Inc., 2005, Drilling intersects new copper-PGE zone at Duke Island: http://www.quaterraresources.com/index.php?page=news&newsid=9 (News Release, December 10, 2005).

Quaterra Resources Inc., 2008a, Duke Island Cu-NipOGE project Alaska: http://www.quaterraresources.com/index.php?page=projects&projectid=6 (as of May 5, 2008).

Quaterra Resources Inc., 2008b, Duke Island NiS project: http://www.quaterraresources.com/uploads/projects/Duke%20Island%20NiS%20Prospect.pdf (as of May 5, 2008)

Quaterra Resources, Inc., 2011, Duke Island project, Alaska (copper-nickel-PGE):

Primary Reference: Freeman, 2006; Quaterra Resources, 2011

Reporter(s): D.J. Grybeck (Port Ludlow, WA); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Owhat (Cobalt Creek)

Site type: Prospect

ARDF no.: RM016

Latitude: 61.6622 **Quadrangle:** RM C-1

Longitude: 159.1114

Location description and accuracy:

The Owhat prospect is in the Russian Mountains in the cirque valley at the head of Cobalt Creek. The map site is at the approximate center of sec. 8, T. 18 N., R. 54 W., of the Seward Meridian.

Commodities:

Main: Ag, Au, Cu, Sb, Sn

Other: Bi, Co, Pb, Zn

Ore minerals: Arsenopyrite, aramayoite, bismuth, bismuthinite, bornite, chalcopyrite, galena, gold, marcasite, pekoite or gladite, pyrite, sphalerite, stephanite, stetefeldtite, tetrahedrite

Gangue minerals: Axinite, quartz, tourmaline

Geologic description:

The Owhat, or Cobalt Creek prospect was discovered by Native prospectors before 1900 (Maddren, 1915; Holzheimer, 1926). The deposits include 8 to 10 sulfide-tourmaline-axinite-quartz veins or greisens in syeno-monzonite (Bundtzen and Laird, 1991). The individual greisens are several inches to more than 3 feet thick in a zone that is 5 to 26 feet thick; the average width of the zone is about 8 feet and it has been traced more than 280 feet vertically. The greisens trend northwest and dip steeply northeast near a contact with an axinite-bearing andesite porphyry dike. The mineralized zone has been traced on the surface for a distance of 870 feet, and extensions totaling 650 feet in both directions are indicated by the distribution of mineralized float. The deposit is mineralogically complex and includes arsenopyrite, aramayoite, bismuth, bismuthinite, bornite, chalcopyrite, galena, gold, marcasite, pekoite or gladite, pyrite, sphalerite, stephanite, stetefeldite and tetrahedrite in the sulfide-rich material in the quartz-tourmaline-axinite greisen. Multiple episodes of mineralization are indicated by cross-cutting relations among the veins. Late-forming minerals include arsenopyrite, chalcopyrite, and pyrite, but the youngest cross-cutting assemblages include bornite, stephanite, tetrahedrite, sphalerite, and lead-bismuth sulfides (Bundtzen and Laird, 1991). Microprobe analyses indicate that arsenopyrite contains 0.1 to 0.2 weight percent gold in its lattice structures. Bundtzen and Laird (1991) collected 16 chip-channel samples averaging 4.4 feet wide, along 860 feet of the greisen zone. The samples average 5.3 parts per million (ppm) gold, 13.4 percent arsenic, 0.21 percent antimony, 0.39 percent copper, 0.07 percent tin, 0.05 percent zinc, and 0.017 percent cobalt. Assuming dimensions, in feet, of 4.4 x 280 x 870, Bundtzen and Laird (1991) estimated that the resource at this prospect is 63,000 tons of material with the stated average grades. The syeno-monzonite host rocks are part of the Upper Cretaceous intrusive complex of the Russian Mountains (Bundtzen and Laird, 1991).

In August, 2009, Full Metal Minerals Corp. and Kinross Gold formed an alliance to explore properties in the Russian Mountains, northwest of Aniak (Full Metal Minerals Corp., 2009b, 2010). Six holes were drilled at the Owhat prospect to test a structure more than 200 meters long. Gold-silver-copper mineralization associated with quartz-tourmaline veining was cut in all the holes. The best intercepts are 1.1 meters with 8.59 grams of gold per tonne, 185.6 grams of silver per tonne, and 6.03 percent copper; 0.94 meters with 5.35 grams of gold per tonne, 150.0 grams of silver per tonne, and 9.97 percent copper; and 0.52 meters with 8.59 grams of gold per tonne, 680.0 grams of silver per tonne, and 10.35 percent copper.

Alteration:

Silicification and tourmalinization.

Age of mineralization:

Late Cretaceous or Tertiary. The veins crosscut part of the intrusive complex of the Russian Mountains; quartz monzonite from this complex has a K/Ar age of 70.3 +/- 2.1 Ma (Bundtzen and Laird, 1991).

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

Prior to 2009, the only workings were three shallow shafts as much as 40 feet deep and several surface trenches and pits, along about 800 feet of the deposit. Full Metal Minerals drilled 6 holes in late 2009.

Production notes:

None.

Reserves:

Assuming the deposit is 4.4 feet deep, 280 feet wide, and 870 feet long, Bundtzen and Laird (1991) estimate that the resource at this prospect is 63,000 tons of material with average grades of 5.3 ppm gold, 13.4 percent arsenic, 0.21 percent antimony, 0.39 percent copper, 0.07 percent tin, 0.05 percent zinc, and 0.017 percent cobalt.

Additional comments:

References:

Bundtzen, T. K., and Laird, G.M., 1991, Geology and mineral resources of the Russian Mission C-1 Quadrangle, southwest Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 109, 24 p.

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Primary Reference: Bundtzen and Laird, 1991; Full Metal Minerals, 2010b

Reporter(s): Travis L. Hudson and Madelyn A. Millholland (Applied Geology and Millholland & Associates); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Wallace

Site type: Prospect

ARDF no.: RM025

Latitude: 61.0559 **Quadrangle:** RM A-3

Longitude: 159.928

Location description and accuracy:

The Wallace prospect is on the crest of the ridge along the northwest side of lower California Creek near its junction with the Tuluksak River. It is at an elevation of about 1,000 feet about 0.2 mile southeast of the center of section 9, T. 11 N., R. 60 W., of the Seward Meridian. It is accurately located.

Commodities:

Main: Au

Other: Bi, Cu, Te, Zn

Ore minerals: Chalcopyrite, gold, pyrrhotite, sphalerite, tellurobismuthite, tetradymite

Gangue minerals: Calcite, chlorite, quartz

Geologic description:

In 1945, R. E. Wallace of the U.S. Geological Survey discovered free gold in quartz veins cutting a granitic dike at this site. He described the deposit in unpublished notes and memoranda and the U.S. Geological Survey announced the discovery in a press release on August 4, 1945. The steeply dipping or vertical, granitic dike is about 40 feet wide and trends N 20 E, subparallel to the ridge. Wallace traced it along strike for about 300 feet. He noted that quartz veinlets were localized in the southeastern half of the dike and that the gold occupied open spaces in the interior of the veinlets. He collected two samples. One contained 0.59 ounce of gold per ton and the other 1.3 ounces of gold per ton. The gold was associated with a slightly more abundant, soft (hardness of 2 to 3), silvery-white mineral with laminar cleavage. This mineral was tentatively identified as a telluride. Limonite and traces of sphalerite, chlorite, and amphibole were also present in the veins. The dike, which may be an apophysis of a nearby mid-Cretaceous pluton, intrudes Jurassic volcanic rocks (Box and others, 1993).

Frost (1990) described gold- and pyrite-bearing quartz veins at this site as cutting sericitized andesite and volcaniclastic hornfels. The veins are vuggy and contain euhedral quartz prisms extending into open spaces. Other gangue minerals in the iron oxide-stained veins are commonly calcite and sprays of chlorite. A sample from a quartz vein contained 4.5 parts per million (ppm) gold (Frost, 1990, sample locality 3). Bedrock in the area includes thermally metamorphosed Jurassic volcanic or volcaniclastic rocks and a small granitic stock or dike (Box and others, 1993).

Wenz (2004, 2005) reported tellurobismuthite , gold, tetradymite, and very minor amounts of chalcopyrite in quartz veins at the Wallace prospect. Alteration was not present next to the veins.

In 2005, Tonogold Resources, Inc. negotiated a mining lease agreement with Calista Corporation covering the general Nyac area. They completed detailed soil geochemical surveys in several areas including the Wallace prospect in the summer of 2005. A rock chip sample from the Wallace prospect contained 7.2 ppm gold. Strachan (2005) shows a map of soil sample sites in the general area of the Wallace prospect; several samples contained a few hundred parts per billion gold.

Tonogold (2007) drilled two holes on the Wallace prospect in the summer of 2006 and did considerable trenching Both holes cut quartz-calcite-pyrrhotite-chalcopyrite veins at depth that are unlike other mineralization in the area. The veins are in Jurassic andesitic volcanic rocks and have narrow chalcedonic envelopes surrounded by wide propylitic zones.

Alteration:

Chalcedonic and propylitic.

Age of mineralization:

Cretaceous or Tertiary. The gold-bearing quartz veins crosscut a granitic dike that may be mid-Cretaceous in age. The dike intrudes Jurassic volcanic rocks.

Generic deposit model:

Deposit model:

Au-Bi-Te veins; pyrrhotite-chalcopyrite-pyrite veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

As of 2005, Tonogold Resources, Inc. has a mining lease agreement with Calista Corporation covering the general Nyac area. They completed detailed soil geochemical surveys in several areas including the Wallace prospect in the summer of 2005. Strachan (2005) shows a map of soil sample sites in the general area of the Wallace prospect; two or three samples contained a few hundred parts per billion gold. Tonogold drilled two holes on the Wallace prospect in 2006 and did considerable trenching.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Primary Reference: Wenz, 2005; this record

Reporter(s): Travis L. Hudson (Applied Geology, Inc.); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Unnamed (near California Creek)

Site type:

ARDF no.: RM026

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

Several reports from the 1990s assumed that this prospect was different from the Wallace prospect (WI025) and two records were compiled for nearby prospects. More recent work from 2004 to 2008 substantiates that the prospect described in this record is the Wallace prospect. The information originally in this record as well as much new information, including drilling, on the Wallace prospect has been used to update the record for it. This site number is only retained for accounting purposes.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:
None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-03-04

Site name(s): Tuluksak River

Site type: Mine

ARDF no.: RM028

Latitude: 61.0039 **Quadrangle:** RM A-3

Longitude: 159.9304

Location description and accuracy:

The Tuluksak River has been almost continuously mined by dredge and mechanized equipment for more than 8 miles downstream from the mouth of California Creek to about a mile upstream from the mouth of Granite Creek. Somewhat arbitrarily, the coordinates for the mine are placed near the center of the mining on the river near Nyac, which was the location of the town headquarters of the New York-Alaska Company that mined the Tuluksak River for many years and remains the headquarters camp for current mining. The town is in the northwest corner of section 33, T. 11 N., R. 60 W., of the Seward Meridian. The mine is locality 17 of Hoare and Cobb (1972, 1977). The location is probably accurate within 1000 feet.

Commodities:

Main: Au

Other: Pt

Ore minerals: Gold

Gangue minerals:

Geologic description:

Gold was first discovered in the Nyac district on Bear Creek (RM032), a tributary of the Tuluksak River, near the mouth of Bonanza Creek in 1907 or 1908 and soon after gold was discovered on the Tuluksak River. Dredging began on the Tuluksak River in 1936 and for many years the mining in the district, which was mainly on the Tuluksak River, was carried out by the New York-Alaska Company and its successor the New York-Alaska Gold Dredging Company. The company built a company town, Nyac and an extensive physical plant and community facilities including a hydroelectric power station to power the dredges, the town, and other mining in the district. In 1965, the property was taken over by the Tuluksak Dredging Company and since 1990, the Nyac Mining Company has been actively mining in the area under an agreement with the Calista Native Corporation, which now owns most of the placer claims in the district.

Parts from a small wood-hulled dredge that had operated on Bear Creek between 1928 and 1935 were used to build a steel-hulled dredge on the Tuluksak River in 1936. In 1937, another steel-hulled dredge was built and began mining (Mining World, 1941). Dredging continued in the 1960s by the New York-Alaska Dredging Company. There has also been extensive mechanized mining using draglines, tractors, and non-floating washing plants over the years along the Tuluksak. As of 2006, the Tuluksak River is marked by dredge tailings a thousand feet or more wide that extend almost continuously from the mouth of California Creek to about five miles below Nyac. In recent years, there apparently has been little mining along the Tuluksak River itself. However in the early 1980s, Tuluksak Dredging and Northland Dredging rebuilt the steel-hulled dredge about 5 miles downstream from Nyac; they operated it for a year or more until they shut down as a result of a water-quality dispute. There apparently is no public record of it but the conventional wisdom in 2006 among those familiar with the district was that Northland Dredging had drilled out reserves that contained (still contain?) about 37,000 ounces of gold in the vicinity of their dredge above the mouth of Granite Creek (D.J. Grybeck, conversations with miners and knowledgeable individuals during field work, 2006).

There is no public record of the production specifically from the Tuluksak River. But the district

produced a minimum of 600,000 ounces of gold (Calista Corp, 2008), all from placers, and a large part of that, perhaps more than half, came from the Tuluksak River judging on the extent of the tailings.
Joesting (1942) reported that some platinum was produced with the gold and that asbestos and graphite were dredged from bedrock. There is no evidence that a any significant amount of platinum was produced. Inquiries in 2006 about platinum (D.J. Grybeck, conversations with local miners) at best indicated a vague knowledge that someone may have found some platinum in the gold placers but it has not been a component of placer concentrates in recent years.
Most of the rocks in the drainage basin of the Tuluksak River are hornfelsed or metamorphosed Jurassic volcanic and sedimentary rocks cut by mid-Cretaceous granitic plutons and Jurassic gabbro (Box and others, 1993; Wenz, 2005).
Historic field work at Tuluksak River included rock and soil sampling (Calista Corp., 2000).
In 2012, the property was operated by Nyac Gold LLC. Work performed at Tuluksak River includes magnetic susceptibility readings on outcrops (Flanders and others, 2012).

Alteration:

Not reported.

Age of mineralization:

Quaternary (Wenz, 2005).

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; medium

Site Status: Undetermined

Workings/exploration:

Gold was first discovered in the Nyac district on Bear Creek (RM032), a tributary of the Tuluksak River, near the mouth of Bonanza Creek in 1907 or 1908 and soon after gold was discovered on the Tuluksak River. Dredging began on the Tuluksak River in 1936 and for many years the mining in the district, which was mainly on the Tuluksak River, was carried out by the New York-Alaska Company and its successor the New York-Alaska Gold Dredging Company. The company built a company town, Nyac and an extensive physical plant and community facilities including a hydroelectric power station to power the dredges, the town, and other mining in the district. In 1965, the property was taken over by the Tuluksak Dredging Company and since 1990, the Nyac Mining Company has been actively mining in the area under an agreement with the Calista Native Corporation, which now owns most of the placer claims in the district.
Parts from a small wood-hulled dredge that had operated on Bear Creek between 1928 and 1935 were used to build a steel-hulled dredge on the Tuluksak River in 1936. In 1937, another steel-hulled dredge was built and began mining (Mining World, 1941). Dredging continued in the 1960's by the New York-Alaska Dredging Company. There has also been extensive mechanized mining using draglines, tractors, and non-floating washing plants over the years along the Tuluksak. As of 2006, the Tuluksak River is marked by dredge tailings a thousand feet or more wide that extend almost continuously from the mouth of California Creek to about five miles below Nyac. In recent years, there apparently has been little mining along the Tuluksak River itself. However in the early 1980's, Tuluksak Dredging and Northland Dredging rebuilt the steel-hulled dredge about 5 miles downstream from Nyac; they operated it for a year or more until they shut down as a result of a water-quality dispute.
Historic field work at Tuluksak River included rock and soil sampling (Calista Corp., 2000).
In 2012, the property was operated by Nyac Gold LLC. Work performed at Tuluksak River includes

magnetic susceptibility readings on outcrops (Flanders and others, 2012).

Production notes:

There is no public record of the production specifically from the Tuluksak River. But the district produced a minimum of 600,000 ounces of gold (Calista Corp, 2008), all from placers, and a large part of that, perhaps more than half, came from the Tuluksak River judging on the extent of the tailings.

Joesting (1942) reported that some platinum was produced with the gold and that asbestos and graphite were dredged from bedrock. There is no evidence that a any significant amount of platinum was produced. Inquiries in 2006 about platinum (D.J. Grybeck, conversations with local miners) at best indicated a vague knowledge that someone may have found some platinum in the gold placers but it has not been a component of placer concentrates in recent years.

Reserves:

There apparently is no public record of it but the conventional wisdom in 2006 among those familiar with the district was that Northland Dredging had drilled out reserves that contained (still contain?) about 37,000 ounces of gold in the vicinity of their dredge above the mouth of Granite Creek (D.J. Grybeck, conversations with miners and knowledgeable individuals during field work, 2006).

Additional comments:

References:

Box, S. E, Moll-Stalcup, E. J., Frost, T. P., and Murphy, J. M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., scale 1:250,000.

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Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

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Joesting, H.R., 1942, Strategic mineral occurrences in interior Alaska: Alaska Territorial Department of Mines Pamphlet 1, 46 p.

Mining World, 1941, Nyac, Sub-arctic gold dredging makes unusual demands upon men and equipment: Mining World, v. 3, no. 6, p. 3-8.

Wenz, J.J. 2005, An investigation of the geology and gold mineralization in the Nyac district, Southwest Alaska: Bureau of Land Management Open-File Report 103, 156 p.

Primary Reference: Wenz, 2005

Reporter(s): Travis L. Hudson (Applied Geology) and Madelyn A. Millholland (Millholland & Associates); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2014-12-11

Site name(s): Saddle Mountain

Site type: Prospect

ARDF no.: RM030

Latitude: 61.0972 **Quadrangle:** RM A-3

Longitude: 159.7768

Location description and accuracy:

The Saddle prospect is at an elevation of about 2,440 feet on the crest of a ridge east of upper Bonanza Creek. It is about 0.5 mile south-southwest of hill 2765 and about 0.3 mile east-southeast of the center of section 29, T. 12 N., R. 59 W., of the Seward Meridian. The location is probably accurate to within 1,000 feet.

Commodities:

Main: Au

Other: Cu

Ore minerals: Chalcopyrite, gold, magnetite, pyrite

Gangue minerals: Calcite, chalcedony, chlorite, quartz

Geologic description:

Frost (1990) describes gold- and pyrite-bearing quartz veins cutting sericitized andesite and volcaniclastic hornfels at this site. The veins are vuggy and contain euhedral quartz prisms extending into open spaces. The other common gangue minerals in the iron-oxide stained veins are calcite and chlorite. A quartz vein at this prospect contained 20 parts per million (ppm) gold (Frost, 1990, sample locality 2). The rocks in the area include thermally metamorphosed Jurassic volcanic or volcaniclastic rocks near the contact with a small granitic stock (Box and others, 1993). The thermal metamorphism is caused by a large mid-Cretaceous granitic pluton exposed to the the north in the headwaters of the Tuluksak River.

Wenz (2004, 2005) describes both high and low temperature mineralization at this prospect. Quartz-chlorite-calcite veins with magnetite, chalcopyrite, and native gold are part of the higher temperature suite. Fluid inclusions in these veins have first homogenization temperatures of 282 to 557 degrees centigrade and salinities of 17 to 57 weight percent NaCl. Samples of this mineralization contain up to 10.9 ppm gold. The lower temperature mineralization includes vuggy chalcedony-bearing veins that are known to contain up to 723 parts per billion (ppb) gold, 9.88 ppm silver, and 280 ppb mercury. Sericite-altered dikes and carbonate-replaced fault breccia are also considered part of the lower temperature mineralization. Altered fault breccia contains up to 15.1 ppm gold and 1.6 ppm mercury.

In 2005, Tonogold Resources, Inc. (2006) negotiated a mining lease agreement with Calista Corporation covering the Nyac area. They completed detailed soil geochemical surveys in several areas including this prospect in the summer of 2005. Strachan (2005) shows a map of soil samples in the area of this prospect. He reported that 58 of 518 surface samples contained 0.105 to 2.86 ppm gold. Seven rock chip samples contained 0.121 to 15.1 ppm gold.

In 2006, Tonogold (2007) expanded their geochemical coverage of the area considerably, did surface mapping and sampling, and cut several trenches. Some outcrop and float samples which had visible gold contained more than 1,000 ppm gold. Wenz (2004, 2005) also maps a large area of gaudy, orange-weathering altered volcanic rocks with anomalous gold values in the flat saddle between this prospect and hill 2046 to the southeast and on the hillside between that saddle and this prospect.

In 2010, Nyac Mining LLC, drilled several hole near the Saddle prospect (Flanders, 2010). The holes penetrated 1,500 feet of intensely quartz-sericite-pyrite-magnetite-gypsum-anhydrite-biotite altered Jurassic

andesite with large intervals of hydrothermal breccia and some porphyry and granite dikes Some notable intercepts were 18 feet with 1.88 grams of gold per tonne, 3.7 feet with 5.89 grams of gold per ton, and 24.9 feet with 1.21 grams of gold per ton. Flanders suggest that the rocks overlay a buried intrusive that is the source of the gold.

In 2011, Nyac Gold LLC performed prospecting and diamond drilling at Saddle Mountain to test a mineralized breccia pipe with deep holes. Reconnaissance mapping was conducted, in addition to magnetic susceptibility readings at outcrops and talus exposures (Flanders and others, 2011).

In 2012, Nyac Gold LLC completed prospecting activities, reconnaissance mapping, in addition to diamond drilling at Saddle Mountain to test a mineralized breccia pipe with deep holes (Flanders and others, 2012).

In 2013, Nyac Gold LLC completed prospecting activities and seven diamond drill holes totaling 8,248 feet. Major oxide and trace element analyses were conducted on plutonic rocks but the results were not available as of the revision date of this report (Flanders, 2013).

Alteration:

Silicification, sericitization, and carbonate replacement (Wenz 2004, 2005).

Age of mineralization:

Wenz (2004) reports Ar-Ar ages of 113 +/- 1 Ma of intrusive rocks near this prospect.

Generic deposit model:

Deposit model:

Gold-quartz veins over a possible intrusion-related-gold deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

In 2005, Tonogold Resources, Inc. (2006) negotiated a mining lease agreement with Calista Corporation covering the Nyac area. They completed detailed soil geochemical surveys in several areas including this prospect in the summer of 2005. In 2006, they markedly expanded the soil survey around this prospect, mapped the surface in the vicinity, and cut several trenches. In 2010, Nyac Mining LLC, drilled several hole near the Saddle prospect (Flanders, 2010).

In 2011, Nyac Gold LLC performed prospecting and diamond drilling at Saddle Mountain to test a mineralized breccia pipe with deep holes. Reconnaissance mapping was conducted, in addition to magnetic susceptibility readings at outcrops and talus exposures (Flanders and others, 2011).

In 2012, Nyac Gold LLC completed prospecting activities, reconnaissance mapping, in addition to diamond drilling at Saddle Mountain to test a mineralized breccia pipe with deep holes (Flanders and others, 2012).

In 2013, Nyac Gold LLC completed prospecting activities and seven diamond drill holes totaling 8,248 feet. Major oxide and trace element analyses were conducted on plutonic rocks but the results were not available as of the revision date of this report (Flanders, 2013).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Box, S. E, Moll-Stalcup, E. J., Frost, T. P., and Murphy, J. M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., scale 1:250,000.

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Wenz, Z. J., 2005, An investigation of the geology and gold mineralization in the Nyac district, southwest Alaska: Bureau of Mines Open File Report 103, 156 p.

Primary Reference: Wenz, 2005

Reporter(s): Travis L. Hudson (Applied Geology, Inc.); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-20

Site name(s): Bonanza Creek

Site type: Mine

ARDF no.: RM031

Latitude: 61.0704 **Quadrangle:** RM A-3

Longitude: 159.7587

Location description and accuracy:

Bonanza Creek is a southeast-flowing. tributary to upper Bear Creek. The coordinates are at about the center of the tailings on lower Bonanza Creek in about the center of section 4, T. 11 N., R. 59 W., of the Seward Meridian.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Most of the early placer mining on Bonanza Creek was near the mouth of the creek where it cuts through bench and flood-plain deposits of Bear Creek (Maddren, (1915). It is not well documented but there was some mechanized mining for about a half mile up from the mouth of the creek in the 1980s or 1990s (?) based on the presence of tailings, the abandoned heavy equipment, and a small camp in the NW1/4 of section 4 (D.J. Grybeck, field work, 2006). There does not appear to be any significant dredging on Bonanza Creek above its mouth. In 2006, the local miners considered upper Bonanza Creek as too deep and wet to placer mine (personal communications to D.J. Grybeck, 2006).

The bedrock on Bonanza Creek includes granitic rock with malachite-bearing quartz stringers (Maddren, 1915), but most of the bedrock in the Bonanza Creek drainage is Jurassic volcanic rocks locally intruded and thermally metamorphosed by mid-Cretaceous granitic rocks (Box and others, 1993; Wenz, 2005).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

There was at least some mining near the mouth of Bonanza Creek prior to 1915. There was also considerable mechanized mining for about a half mile above its mouth in the 1980s or 1990s (?) but apparently there has been no significant dredging on Bonanza Creek.

Production notes:

Some unrecorded production into the 1990s but probably not large.

Reserves:

None.

Additional comments:

References:

Box, S. E, Moll-Stalcup, E. J., Frost, T. P., and Murphy, J. M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., scale 1:250,000.

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Wenz, J.J., 2005, An investigation of the geology and gold mineralization in the Nyac district, Southwest Alaska: Bureau of Land Management Open-File Report 103, 156 p.

Primary Reference: This record

Reporter(s): Travis L. Hudson (Applied Geology) and Madelyn A. Millholland (Millholland & Associates); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Bear Creek

Site type: Mine

ARDF no.: RM032

Latitude: 61.0513 **Quadrangle:** RM A-3

Longitude: 159.7887

Location description and accuracy:

Bear Creek is a large, northeast headwater tributary to the Tuluksak River. Bear Creek has been mined extensively by dredge and mechanized equipment for about 7 miles from about 2 miles above the mouth of Bonanza Creek, downstream to just below the mouth of Shamrock Creek. The coordinates are at about the midpoint of the productive part of the creek, about 0.5 mile south of the center of section 8, T. 11 N., R. 59 W., of the Seward Meridian. This is locality 20 of Hoare and Cobb (1972, 1977). The location is probably accurate to within 1,000 feet.

Commodities:

Main: Au

Other: Hg, Pt

Ore minerals: Cinnabar, gold, platinum

Gangue minerals:

Geologic description:

Gold was first discovered in the Nyac district on Bear Creek near the mouth of Bonanza Creek in 1907 or 1908 (Maddren (1915; Mining World, 1941) and gold was discovered soon after on the Tuluksak River (RM028). For many years thereafter the mining in the district, including on Bear Creek, was carried out by the New York-Alaska Company and its successor the New York Gold Dredging Company, which built a company town at Nyac on the Tuluksak River. In 1990, Nyac Mining Company began mining in the area, primarily on Spruce Creek and Bear Creek under an agreement with the Calista Native Corporation which owns most of the placer claims in the district.

A small wood-hulled dredge mined on Bear Creek from 1926 to 1936 when its parts were used to build another dredge on the Tuluksak River (Mining World, 1941). Another steel-hulled dredge operated from at least 1973(?) to 1991 on upper Bear Creek; it mined to about a mile above the mouth of Bonanza Creek where it remained in 2006 (Bundtzen and others, 1991; Tom Ratledge, personal communication, 2006). In addition to dredging there has been extensive mining using various mechanized equipment from soon after gold was discovered to as late as 2004 or 2005. In many places the workings extend for a thousand feet or more across the creek. A year or more prior to 2006, the Nyac Mining Company mined a cut with mechanized equipment about 2 miles above the mouth of Bonanza Creek; the area has now been reclaimed (D.J. Grybeck, personal observation, 2006).

There seems to be little indication of mining on Bear Creek from below the mouth of Shamrock Creek to the Tuluksak River. The reasons are unclear and several explanations are currently held among the miners in the area (D.J. Grybeck, personal conversations during field work, 2006). One is that the area was drilled and the gold values were not encouraging; another is that the ground is too deep and/or too wet to dredge.

Production figures are not available for the long history of mining on Bear Creek but the district as a whole has produced more than 600,000 ounces of gold and a significant portion of that came from Bear Creek (Calista Corporation, 2008).

Joesting (1942) reported that some platinum was produced with the gold and that asbestos and graphite were dredged from bedrock. There is little evidence that a significant amount of platinum was produced.

Cinnabar is common in placer concentrates from Bear Creek (Jim Anderson, personal communication, 2006) and quartz veins with cinnabar that cut boulders can be found in the tailings along Bear Creek (Melanie Werdon, personal communication, 2006).

Most of the rocks in the drainage basin of Bear Creek are hornfelsed or regionally metamorphosed Jurassic volcanic and sedimentary rocks cut by mid-Cretaceous granitic plutons and Jurassic gabbro (Box and others, 1993; Wenz, 2005).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au-PGE (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; medium

Site Status: Active

Workings/exploration:

Gold was first discovered in the Nyac district on Bear Creek near the mouth of Bonanza Creek in 1907 or 1908 (Maddren (1915; Mining World, 1941) and gold was discovered soon after on the Tuluksak River (RM028). For many years thereafter the mining in the district, including on Bear Creek, was carried out by the New York-Alaska Company and its successor the New York Gold Dredging Company, which built a company town at Nyac on the Tuluksak River. In 1990, Nyac Mining Company began mining in the area, primarily on Spruce Creek and Bear Creek under an agreement with the Calista Native Corporation which owns most of the placer claims in the district.

A small wood-hulled dredge mined on Bear Creek from 1926 to 1936 when its parts were used to build another dredge on the Tuluksak River (Mining World, 1941). Another steel-hulled dredge operated from at least 1973(?) to 1991 on upper Bear Creek; it mined to about a mile above the mouth of Bonanza Creek where it remained in 2006 (Bundtzen and others, 1991; Tom Ratledge, personal communication, 2006). In addition to dredging there has been extensive mining using various mechanized equipment from soon after gold was discovered to as late as 2004 or 2005. In many places the workings extend for a thousand feet or more across the creek. A year or more prior to 2006, the Nyac Mining Company mined a cut with mechanized equipment about 2 miles above the mouth of Bonanza Creek; the area has now been reclaimed (D.J. Grybeck, personal observation, 2006).

There seems to be little indication of mining on Bear Creek from below the mouth of Shamrock Creek to the Tuluksak River. The reasons are unclear and several explanations are currently held among the miners in the area (D.J. Grybeck, personal conversations during field work, 2006). One is that the area was drilled and the gold values were not encouraging; another is that the ground is too deep and/or too wet to dredge.

The first hardrock exploration holes at Nyac were drilled by Placer Dome Exploration Inc. in 1996. Placer Dome drilled eleven reverse circulation holes through the gold-bearing valley gravels of Bear Creek (Strachan, 2008). Placer Dome’s drill holes were restricted to the valleys in the apparent belief that Nyac’s placers were derived directly from the underlying bedrock (Wenz, 2005).

Production notes:

Production figures are not available for the long history of mining on Bear Creek but the district as a whole has more than 600,000 ounces of gold; a significant portion of that came from Bear Creek (Calista,

2008).

Reserves:

None a matter of public record but some gold probably remains to be mined.

Additional comments:

References:

Box, S. E, Moll-Stalcup, E. J., Frost, T. P., and Murphy, J. M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., scale 1:250,000.

Bundtzen, T.K., Swainbank, R.C., Wood, J.E., Clough, A.H., 1991 (1992), Alaska's Mineral Industry 1991: Alaska Division of Geological & Geophysical Surveys, Special Report 46, 89 p.

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Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

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Hoare, J M., and Cobb, E.H., 1972, Metallic mineral resources map of the Russian Mission quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-444, 1 sheet, scale 1:250,000.

Hoare, J.M., and Cobb, E.H., 1977, Mineral occurrences (other than mineral fuels and construction materials) in the Bethel, Goodnews, and Russian Mission quadrangles, Alaska: U.S. Geological Survey Open-File Report 77-156, 98 p.

Joesting, H.R., 1942, Strategic mineral occurrences in interior Alaska: Alaska Territorial Department of Mines Pamphlet 1, 46 p.

Maddren, A.G., 1915, Gold placers of the lower Kuskokwim, with a note on copper in the Russian Mountains: U.S. Geological Survey Bulletin 622-H, p. 292-360.

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Wenz, Z. J., 2005, An investigation of the geology and gold mineralization in the Nyac district, Southwest

Primary Reference: Maddren, 1915

Reporter(s): Travis L. Hudson (Applied Geology) and Madelyn A. Millholland (Millholland & Associates); D.J. Grybeck (Port Ludlow, WA); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-02-25

Site name(s): Spruce Creek

Site type: Mine

ARDF no.: RM033

Latitude: 61.0671 **Quadrangle:** RM A-3

Longitude: 159.7804

Location description and accuracy:

The location of Spruce Creek is probably incorrect on the USGS 1:63,360 topographic map. It is probably the first creek southwest of Bonanza Creek (RM031); both are east-flowing tributaries of upper Bear Creek. In 2006, the local miners place Spruce Creek in sections 5 and 8, T. 11 N., R. 59 W., of the Seward Meridian (D.J. Grybeck, field work and discussions with miners in the area, 2006).

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Early reports indicated that the lower part of Spruce Creek was placer mined where it crosses bench deposits along Bear Creek. As described by Maddren (1915), gravel deposits at the mouth of the creek are as much as 400 feet thick. Gravels along the active drainage are 20 to 30 feet thick 1,500 feet upstream of the mouth, and the headwaters of the creek cut into bedrock. Where the alluvial deposits are 20 to 30 feet thick, they consist of 2 to 4 feet of muck, 2 to 3 feet of coarse gravel with boulders as much as 1 foot in diameter, 1 to 1.5 feet of blue clay, and brown sandy and pebbly clay to bedrock. Most of the gold occurred in the blue and brown pebbly clays and on bedrock. Some of the gold was coarse and attached to quartz. Maddren (1915) thought that the gold could have been derived from the contact zone around an intrusion at the head of the creek. Bedrock in the Spruce Creek drainage includes thermally metamorphosed Jurassic volcanic rocks developed around a mid-Cretaceous granitic stock (Box and others, 1993; Wenz, 2005).

The location of the Spruce Creek that Maddren (1915) described is somewhat uncertain. The Spruce Creek labeled on the current USGS 1:63,360-scale topographic map is not in the same location as the Spruce Creek known to the miners working in the area in 2006. The Spruce Creek on the topographic map is generally parallel to and about two miles to the southwest of Bonanza Creek. The local miners consider Spruce Creek to be the creek generally parallel to and about 1 mile southwest of Bonanza Creek in sections 5 and 8.

In the late 1990s Nyac Mining Company mined extensively on the Spruce Creek about a mile southwest of Bonanza Creek and produced a minimum of 25,000 ounces of gold (Wenz, 2005). The area has now been reclaimed. It is uncertain whether the mining prior to 1915 was on the Spruce Creek as labeled on the current topographic maps or on the parallel nearby creek about a mile southwest of Bonanza Creek that was mined by Nyac Mining Company in the 1990s.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

Open-cut placer mining took place along lower Spruce Creek until about 1920. Some of this work included a 280-foot long, 15- to 20-foot wide, and 10-foot-deep trench built as a bedrock drain. In the 1990s, Nyac Mining Company mined extensively on Spruce Creek from surface cuts. (But see the location and geologic description for the uncertainty of the location of Spruce Creek.)

Production notes:

In the 1990s, Nyac Mining Company produced a minimum of 25,000 ounces of gold from Spruce Creek. (But see the location and geologic description for the uncertainty of the location of Spruce Creek.)

Reserves:

None.

Additional comments:

References:

Box, S. E, Moll-Stalcup, E. J., Frost, T. P., and Murphy, J. M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., scale 1:250,000.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

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Maddren, A.G., 1915, Gold placers of the lower Kuskokwim, with a note on copper in the Russian Mountains: U.S. Geological Survey Bulletin 622-H, p. 292-360.

Wenz, J.J., 2005, An investigation of the geology and gold mineralization in the Nyac district, Southwest Alaska: Bureau of Land Management Open-File Report 103, 156 p.

Primary Reference: This record

Reporter(s): Travis L. Hudson (Applied Geology) and Madelyn A. Millholland (Millholland & Associates); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Pipe

Site type: Prospect

ARDF no.: RM035

Latitude: 61.0764 **Quadrangle:** RM A-3

Longitude: 159.8952

Location description and accuracy:

This prospect is on the east flank of the ridge on the west side of California Creek. It is about 0.4 mile northeast of the center of section 3, T. 11 N., R. 60 W., of the Seward Meridian. The prospect occupies most of this NE 1/4 section. The location is probably accurate to within 1,000 feet.

Commodities:

Main: Au

Other:

Ore minerals: Gold, magnetite, pyrite

Gangue minerals: Anhydrite, biotite, quartz, sericite

Geologic description:

The Pipe prospect was identified by a soil sample survey completed by Tonogold Resources, Inc. in the summer of 2005 (Strachan, 2005). Regional mapping by Box and others (1993) was supplemented by more detailed mapping by Wenz (2005) who inferred presence of Jurassic plutons not recognized by Box and others (1993).

The rocks at the Pipe prospect are Jurassic volcanic rocks that have been hornfelsed by inferred Jurassic diorite sills intruding them (Wenz, 2004, 2005). The Pipe prospect lies west of Rocky Ridge (RM036) along a structural strike which intersects a northeast structural trend. This northeast structural trend is marked by magnetics, dacite dikes, veins, and geochemistry at Wallace (RM025) (Strachan, 2005).

As of 2009, Nyac Gold LLC has a mining lease agreement with Calista Corporation covering the Nyac area, which includes this prospect (Flanders and others, 2009).

Alteration:

Hornfels of sedimentary rocks by intruding Jurassic diorite sills and Cretaceous intermediate composition plutons (Wenz, 2004, 2005).

Age of mineralization:

Probably mid-Cretaceous as at the Bonanza Ridge prospect, ARDF number RM037 (Wenz, 2004, 2005).

Generic deposit model:

Deposit model:

Low-sulfide gold-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

Tonogold completed detailed soil geochemical surveys in several areas in 2005 and the Pipe prospect was identified by that survey (Strachan, 2005).

As of 2009, Nyac Gold LLC has a mining lease agreement with Calista Corporation covering the Nyac area, which includes this prospect (Flanders and others, 2009).

Production notes:

None.

Reserves:

None.

Additional comments:

Tonogold Resources, Inc. (2006) has a mining lease agreement with Calista Corporation covering the Nyac area, which includes this prospect.

References:

Box, S. E, Moll-Stalcup, E. J., Frost, T. P., and Murphy, J. M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., scale 1:250,000.

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Flanders, Richard, Hall, Wesley, Wilkinson, Stanley, 2009, 2009 Drilling and Exploration for Lode Gold Deposits in the Nyac District, Southwest Alaska, 37 p. (Report held by Calista Corporation, Anchorage, Alaska).

Strachan, D. G., 2005, A summary and interim status report on Tonogold's 2005 geochemical exploration of the Nyac gold district, southwest Alaska: Private report for Tonogold Resources, 20 p. (Available online at: http://www.tonogold.com/i/pdf/2005_Final_Report_5m[1].pdf).

Tonogold Resources, Inc., 2006: www.tonogold.com/s/Nyac.asp (as of April, 2007).

Wenz, Z. J., 2004, Geology and gold mineralization of the Nyac district, southwest Alaska: MS thesis, University of Alaska, Fairbanks, 133 p.

Wenz, Z. J., 2005, An investigation of the geology and gold mineralization in the Nyac district, southwest Alaska: Bureau of Mines Open File Report 103, 156 p.

Primary Reference: Strachan, 2005

Reporter(s): Travis L. Hudson (Applied Geology, Inc.); V.C. Zinno (Alaska Earth Sciences, Inc.); F.H. Wilson (USGS)

Last report date: 2016-03-15

Site name(s): Rocky Ridge

Site type: Prospect

ARDF no.: RM036

Latitude: 61.0753

Quadrangle: RM A-3

Longitude: 159.8733

Location description and accuracy:

The Rocky Ridge prospect is on the ridge between Rocky Creek and California Creek, about 1.0 mile southwest of triangulation station Bonanza. It is about 0.2 mile north of the center of section 2, T. 11 N., R. 60 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

The Rocky Ridge prospect is an area of anomalous soil and rock samples on the ridge between Rocky Creek and California Creek. Bedrock in the area is Jurassic sedimentary and volcanic rocks (Box and others, 1993; Wenz, 2004, 2005; Strachan, 2005). Tonogold Resources, Inc. (2006) has a mining lease agreement with Calista Corporation covering the Nyac area. They completed detailed soil geochemical surveys in several areas including this prospect in the summer of 2005. Strachan (2005) shows a map of soil sample sites in the area of this prospect; several samples contain several hundred parts per billion gold.

Alteration:

Age of mineralization:

Probably mid-Cretaceous as at the Bonanza Ridge prospect (RM037).

Generic deposit model:

Deposit model:

Low-sulfide Au-Bi-Te-quartz veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Tonogold Resources, Inc. has a mining lease agreement with Calista Corporation covering the Nyac area (http://www.tonogold.com/s/Nyac.asp; Apr. 2006). They completed detailed soil geochemical surveys in several areas including this prospect in the summer of 2005 and 2006.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Box, S. E, Moll-Stalcup, E. J., Frost, T. P., and Murphy, J. M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., scale 1:250,000.

Strachan, D. G., 2005, A summary and interim status report on Tonogold's 2005 geochemical exploration of the Nyac gold district, southwest Alaska: Private report for Tonogold Resources, 20 p. (Available online at: http://www.tonogold.com/i/pdf/2005_Final_Report_5m[1].pdf.)

Tonogold Resources, Inc., 2006: www.tonogold.com/s/Nyac.asp (as of April, 2007)

Wenz, Z.. J., 2004, Geology and gold mineralization of the Nyac district, southwest Alaska: MS thesis, University of Alaska, Fairbanks, 133 p.

Wenz, Z.J., 2005, An investigation of the geology and gold mineralization in the Nyac district, southwest Alaska: Bureau of Mines Open File Report 103, 156 p.

Primary Reference: Strachan, 2005

Reporter(s): Travis L. Hudson (Applied Geology, Inc.)

Last report date: 2007-04-08

Site name(s): VABM Bonanza; Bonanza Ridge

Site type: Prospect

ARDF no.: RM037

Latitude: 61.0729 **Quadrangle:** RM A-3

Longitude: 159.8453

Location description and accuracy:

This prospect about a half mile east of the head of Rocky Creek in the Nyac district. It is at an elevation of about 2650 feet, about 0.3 mile southwest of triangulation station Bonanza near the center of section 1, T. 11 N., R. 60 W., of the Seward Meridian. This location is accurate to within 1000 feet of the center of the prospect.

Commodities:

Main: Au

Other:

Ore minerals: Bismuthinite, chalcopyrite, gold, magnetite, molybdenite, pyrite

Gangue minerals: Carbonate, chlorite, quartz, sericite

Geologic description:

At this prospect, gold-bearing quartz veins cut granitic rocks of the Bonanza pluton (Wenz, 2004, 2005). The Bonanza pluton is a composite intrusion; it has a margin of diorite, quartz diorite, tonalite, and monzodiorite around a core of granodiorite and granite. Mafic minerals make up 10 to 25 percent of the intrusive; they include biotite, hornblende, and minor pyroxene. The more mafic parts of the pluton can have up to one percent apatite. Argon-argon radiometric ages reported by Wenz (2004, 2005) for this pluton are 109 +/- 1 Ma, 113 +/- 0.4 Ma, and 113 +/- 1 Ma.

As described by Wenz, quartz veining makes up to one to two percent of the more strongly mineralized rocks. Potassic alteration includes narrow K-feldspar-bearing selvages along barren quartz veins. Gold-bearing veins with sericite-chlorite-carbonate alteration overprint the potassic alteration. Ore minerals in the gold-bearing veins include pyrite, chalcopyrite, magnetite, bismuthinite, molybdenite, and native gold; pyrite and chalcopyrite are the most abundant. The highest gold value reported by Wenz (2004, 2005) is 20.8 parts per million (ppm). Both bismuth and tellurium correlate closely with gold. Primary fluid inclusions indicate a wide range of homogenization temperatures of from 221 to 486 degrees centigrade and the salinities vary from 21.3 to 54.7 weight percent NaCl.

Tonogold Resources, Inc. has a mining lease agreement with Calista Corporation covering the Nyac area (Tonogold Resources, Inc., 2006). They completed detailed soil geochemical surveys in several areas including this prospect in the summer of 2005. Tonogold reported that 58 of 518 surface samples contained 0.105 to 2.86 ppm gold. Seven rock chip samples contained 0.121 to 15.1 ppm gold. There is a strong correlation of bismuth and gold values in these samples. Arsenic values are low.

Tonogold (2007) drilled 4 holes at the Bonanza prospect in the summer of 2006. The drilling encountered a series of quartz-calcite-pyrite-chalcopyrite veinlets associated with an aplite dike in sericitically-altered granodiorite. The alteration increases downward in each of the holes. Numerous veinlets and mineralized fractures were cut; there were several 2-meter intercepts with up to 1.0 gram of gold per ton and the best intercept was 0.6 meter with 8.6 gram of gold per ton.

Since at least as early as 2009, Nyac Gold LLC has been operating summer exploration programs on behalf of Calista Corporation (Flanders and others, 2009).

In 2009, Nyac Gold LLC completed prospecting and drilling at VABM Bonanza. This work resulted in

identifying various mineralized breccias that were tentatively interpreted to result from breccia-hosted or porphyry-style gold mineralization (Flanders and others, 2009). In 2010, Nyac performed reconnaissance prospecting and drilling at VABM Bonanza. The prospecting generated additional understanding of the plutonic rocks and their contacts in the areas, while the drilling resulted in identification of gold mineralization subsurface (Flanders and others, 2010).

Alteration:

The gold-bearing quartz veins are accompanied by envelopes of sericite-chlorite-carbonate alteration. These veins and alteration overprint earlier quartz veins with some narrow K-feldspar-bearing alteration selvages (Wenz, 2005).

Age of mineralization:

The Bonanza pluton that hosts the deposit is 109 to 113 Ma (Wenz, 2004, 2005). Wenz also reports a Ar-Ar age of 111 +/- 1 Ma for muscovite from a gold-bearing quartz vein in the Bonanza pluton.

Generic deposit model:

Deposit model:

Low-sulfide Au-Bi-Te-quartz veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Tonogold Resources, Inc. has a mining lease agreement with Calista Corporation covering the Nyac area. They completed detailed soil geochemical surveys in several areas including this prospect in the summer of 2005. Tonogold drilled 4 holes on this prospect in 2006.

Since at least as early as 2009, Nyac Gold LLC has been operating summer exploration programs on behalf of Calista Corporation (Flanders and others, 2009).

In 2009, Nyac Gold LLC completed prospecting and drilling at VABM Bonanza(Flanders and others, 2009). In 2010, Nyac performed reconnaissance prospecting and drilling at VABM Bonanza (Flanders and others, 2010).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Flanders, R., Hall, W., Wilkinson, S., 2009, 2009 Drilling and Exploration for Lode Gold Deposits in the Nyac District, Southwest Alaska, Private Report.

Flanders, R., Hernandez, D., Seals, J., Proffett, J., Van der Poel, W.I., Minehane, D., 2010, 2010 Drilling and Exploration for Lode Gold Deposits in the Nyac District, Southwest Alaska, 123 p. (Report held by Calista Corporation, Anchorage, Alaska).

Strachan, D. G., 2005, A summary and interim status report on Tonogold's 2005 geochemical exploration of the Nyac gold district, southwest Alaska: Private report for Tonogold Resources, 20 p. (Available online at: http://www.tonogold.com/i/pdf/2005_Final_Report_5m[1].pdf).

Tonogold Resources, Inc., 2006: http://www.tonogold.com/s/Nyac.asp (as of April, 2007).

Tonogold Resources, Inc., 2007: http://www.tonogold.com/s/Nyac.asp (as of April, 2007).

Wenz, Z. J., 2004, Geology and gold mineralization of the Nyac district, southwest Alaska: MS thesis, University of Alaska, Fairbanks, 133 p.

Wenz, Z. J., 2005, An investigation of the geology and gold mineralization in the Nyac district, southwest Alaska: Bureau of Mines Open File Report 103, 156 p.

Primary Reference: Wenz, 2005

Reporter(s): Travis L. Hudson (Applied Geology, Inc.); D.J. Grybeck (Port Ludlow, WA); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-20

Site name(s): Shamrock Head

Site type: Prospect

ARDF no.: RM038

Latitude: 61.065 **Quadrangle:** RM A-3

Longitude: 159.8508

Location description and accuracy:

The Shamrock Head prospect is a drill site at an elevation of about 2,240 feet on a west-trending ridge about 1.0 mile south of triangulation station Bonanza. There are several other drill sites about a half mile to the west along Rocky Creek. The geochemical anomaly that defines this prospect extends west for about 1,500 feet and east for about a mile. The prospect is about 0.5 mile north-northwest of the center of section 12, T. 11 S., R. 60 W. The location is accurate.

Commodities:

Main: As, Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

The Shamrock Head prospect is outlined by a soil-geochemistry survey completed for Tonogold Resources, Inc. during the summer of 2005 (Strachan, 2005). Several samples contained a few hundred to several hundred parts per billion gold. The anomalous samples suggest a general east-west trend to the mineralized zone. At this prospect elevated arsenic correlates with gold in contrast to the high bismuth as at the Bonanza Ridge prospect about one mile to the north (RM037). Arsenic values in soils reach 1,390 parts per million. The rocks in the prospect area consist of Jurassic volcanic and intrusive rocks (Box and others, 1993; Wenz, 2004, 2005).

Tonogold (2007) drilled two holes at an elevation of about 2,240 feet on a west-trending ridge about 1 mile south of triangulation station Bonanza and three holes along Rocky Creek to the west.

Alteration:

Age of mineralization:

Probably mid-Cretaceous as at the Bonanza Ridge prospect (RM New A1014).

Generic deposit model:

Deposit model:

Low-sulfide Au-Bi-Te-quartz veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The Shamrock Head prospect is defined by a soil geochemistry survey completed by Tonogold Resources, Inc. during the summer of 2005 (Strachan, 2005). Five holes were drilled on this prospect in 2006.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Box, S. E, Moll-Stalcup, E. J., Frost, T. P., and Murphy, J. M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., scale 1:250,000.

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Tonogold Resources, Inc., 2006: www.tonogold.com/s/Nyac.asp (as of April, 2007)

Wenz, Z.. J., 2004, Geology and gold mineralization of the Nyac district, southwest Alaska: MS thesis, University of Alaska, Fairbanks, 133 p.

Wenz, Z.J., 2005, An investigation of the geology and gold mineralization in the Nyac district, southwest Alaska: Bureau of Mines Open File Report 103, 156 p.

Primary Reference: Strachan, 2005

Reporter(s): Travis L. Hudson (Applied Geology, Inc.)

Last report date: 2007-04-08

Site name(s): Shamrock Creek

Site type: Mine

ARDF no.: RM039

Latitude: 61.0364 **Quadrangle:** RM

Longitude: 159.8621

Location description and accuracy:

Shamrock Creek is a south-flowing tributary to Bear Creek in the Nyac area. The coordinates are at about the center of the area that was drilled in 2005 and 2006; the site is about 0.6 mile northeast of section 23, T. 11 N., R. 60 W. It is unclear how much of the creek will be mined but the drilling continued for about 0.8 mile above and below this point on the creek. Mining began near the upper end of the drilling in August 2006 but more drilling is likely or has already been done above the mining. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

There apparently is no public record of early mining or even prospecting on Shamrock Creek although it probably was at least prospected in view of the rich placers nearby that have been known for many years (D.J. Grybeck, personal observation, 2006). Nyac Mining Company mined a cut near the mouth of Shamrock Creek a few years prior to 2006. In 2005 and 2006, they churn drilled rows of holes across the creek from near its mouth to the northeast corner of section 14, i.e., about 1.6 miles above its mouth. The drill results were encouraging and in August, 2006, they began mining with mechanized equipment about 1.6 miles above the mouth of the creek and continued churn drilling above that. The gravel is fairly thin but contains much clay and Nyac Mining Company built a new washing plant in 2006 to deal with the clay.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer gold (Cox and Singer, 1986, model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Active

Workings/exploration:

There apparently is no public record of early mining or even prospecting on Shamrock Creek although it probably was at least prospected in view of the rich placers nearby that have been known for many years (D.J. Grybeck, personal observation, 2006). Nyac Mining Company mined a cut near the mouth of Shamrock Creek a few years prior to 2006. In 2005 and 2006, they churn drilled rows of holes across the creek from near its mouth to the northeast corner of section 14, i.e., about 1.6 miles above its mouth. The drill results were encouraging and in August, 2006, they began mining with mechanized equipment about 1.6 miles above the mouth of the creek and continued churn drilling above that. The gravel is fairly thin but contains much clay and Nyac Mining Company built a new washing plant in 2006 to deal with the clay.

Production notes:

Mining began in August 2006.

Reserves:

Unknown.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Primary Reference: This record

Reporter(s): D.J. Grybeck (Port Ludlow, WA).

Last report date: 2008-03-04

Site name(s): Blueberry

Site type: Prospect

ARDF no.: RM040

Latitude: 61.0691 **Quadrangle:** RM A-5

Longitude: 160.0637

Location description and accuracy:

This prospect is on the southwest flank of the ridge on the west side of Sabula Creek. It is located about 0.1 mile northeast of peak 'Granite', about 0.5 mile west-southwest of the center of section 2, T. 11 N., R. 60 W., of the Seward Meridian. This location is accurate to within 1000 feet of the center of the prospect.

Commodities:

Main: Cu

Other: Mo

Ore minerals: Chalcopyrite, molybdenite, pyrite

Gangue minerals: Biotite, chlorite, hornblende, sericite

Geologic description:

The Blueberry prospect comprises disseminated sulfide minerals in sericite- and chlorite-altered hornblende-biotite granite intruded into Cretaceous hornblende-biotite granodiorite of the Nyac Batholith. Mineralized rock has dominantly coarse-grained seriate to porphyritic textures and less abundant fine grained granular to quartz phyric (porphyry) and aplite. Distinctive features of the mineralized rock include common aquamarine-colored (blue-green) sericite-altered plagioclase phenocrysts in coarse-grained seriate and porphyritic varieties and chlorite alteration of biotite and hornblende. Sulfide minerals include pyrite, chalcopyrite and molybdenite. Chalcopyrite is far more abundant than molybdenite, but the fine-grained textural variety tends to be enriched in molybdenite relative to chalcopyrite. Molybdenite also appears to be more abundant in weakly altered coarse-grained granite distal from the more strongly altered and mineralized core. In some cases, the disseminated sulfide minerals are concentrated in altered hornblende crystals. These rocks and the finer aplite and quartz porphyry tend to be unusually hard and difficult to break, even with sledge hammers. The finer-grained varieties are commonly found at the margins of the mineralized surface exposure (Foley, 2011).

Soil samples collected and assayed in 2010 from several sites adjacent the Blueberry prospect have elevated copper and molybdenum values. It is anticipated that additional concentrations of sulfide minerals might be found in this area with additional prospecting (Foley, 2011).

Preliminary IP and resistivity plots show anomalies in the vicinity of the Blueberry prospect. Where shallow, these anomalies are coincident with observed sulfide minerals in altered rocks similar to those described in the core of the prospect. Furthermore, the preliminary plots indicate that the feature plunges to the east, and extends for approximately 1600 meters east to west (Foley, 2011).

It has been suggested that the physical properties of the mineralized rock, perhaps because of silicification that causes the unusual hardness, may explain the resistive characteristics as indicated by the preliminary data. It is further surmised that the relatively low sulfide content may account for the low to moderate IP signature of the feature (Foley, 2011).

Alteration:

Sericite-altered plagioclase, chlorite-altered biotite and hornblende. Molybdenite appears more abundant in the weakly altered zones (Foley, 2011).

Age of mineralization:

Younger than the Cretaceous host granodiorite of the Nyac Batholith that the mineralized granite is intruded into (Foley, 2011).

Generic deposit model:

Deposit model:

Unknown.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Undetermined

Site Status: Active

Workings/exploration:

Nyac Gold LLC operated summer exploration programs in 2010 and 2011 at Blueberry Prospect on behalf of Calista Corporation focused on prospecting and sampling (Foley, 2011; Flanders and others, 2011). In 2011, Zonge International conducted a geophysical field survey including acquisition of both gradient and pole-dipole array resistivity and induced polarization (IP) data. The objective of the geophysical program was to provide information on the distribution and occurrence of sulfides associated with poly-metallic mineral deposits (Zonge International, 2011).

In 2010, soil samples were collected and assayed; values for copper and molybdenum were elevated. The surface extent of exposed mineralized rock measured about 230 feet along the north-south axis and about 500 ft along the east-west axis. One result of the 2011 program was to the discovery of additional mineralized rock found outward of the core area at several sites. The presence of elevated copper and molybdenum values detected in soil samples at several sites outside the Blueberry prospect suggests that additional concentrations of sulfide minerals might be found with additional prospecting (Foley, 2011).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Flanders, Richard, Mataresse, Maia, Bethe, Mike, 2011, 2011 Drilling and Exploration for Lode Gold Deposits in the Nyac District, Southwest Alaska 36 p. (Report held by Calista Corporation, Anchorage, Alaska).

Foley, Jeff, 2011, Blueberry Prospect Provisional Summary, Unpublished Internal report for Calista Corporation, 3p. (Report held by Calista Corporation, Anchorage, Alaska).

Zonge International, Inc., 2012, Gradient and IP and Pole-Dipole Complex Resistivity Geophysical Survey, Blueberry Project, Nyac, Alaska, for Calista Corporation, 30 p. (Report held by Calista Corporation, Anchorage, Alaska).

Primary Reference: Foley, 2011

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-20

Site name(s): Spruce Creek (lode)

Site type: Occurrence

ARDF no.: RM041

Latitude: 61.0671

Quadrangle: RM A-3

Longitude: 159.7804

Location description and accuracy:

The location of Spruce Creek is probably incorrect on the USGS 1:63,360 topographic map. It is probably the first creek southwest of Bonanza Creek (RM031); both are east-flowing tributaries of upper Bear Creek. In 2006, the local miners place Spruce Creek in sections 5 and 8, T. 11 N., R. 59 W., of the Seward Meridian (D.J. Grybeck, field work and discussions with miners in the area, 2006). The location is probably accurate to within 1,000 feet.

Commodities:

Main: Ag, Au

Other: Pb, Zn

Ore minerals: Gold, galena, sphalerite

Gangue minerals: Calcite, quartz

Geologic description:

Spruce Creek has been known as a placer deposit (see RM033) since before 1915, when the earliest known report of mining evidence was made by Maddren (1915). The Spruce Creek occurrence may be the potential source for Spruce Creek placer gold. Bedrock in the Spruce Creek drainage includes thermally metamorphosed Jurassic volcanic rocks developed around a mid-Cretaceous granitic stock (Box and others, 1993; Wenz, 2005). Massive, unlayered porphyritic mafic flows varying in color from dark green to reddish to a distinct dark purple and interbedded layered, intermediate to felsic pyroclastics and poly-lithic volcaniclastics were encountered in two drill holes drilled by Nyac Gold LLC in 2013 (Flanders, 2013). The alteration observed in these two drill holes was silicification and silica-carbonate flooding adjacent to quartz veining and stockwork tectonized zones. Mineralization was found in yellowish-white calcite and quartz veining and translucent chalcedonic quartz veining in a foliated tectonized zone (Flanders, 2013).

In 2005-2006, a soils sampling program was conducted. In 2010, Nyac Gold LLC collected stream sediment samples at Spruce Creek (Flanders, 2013).

Alteration:

Alteration observed is silicification and silica-carbonate flooding adjacent to quartz veining and stockwork tectonized zones (Flanders, 2013).

Age of mineralization:

Mineralization likely associated with Cretaceous plutons (Flanders, 2013).

Generic deposit model:

Deposit model:

Low-sulfide gold-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Undetermined

Workings/exploration:

Open-cut placer mining took place along lower Spruce Creek until about 1920. Some of this work included a 280-foot long, 15- to 20-foot wide, and 10-foot-deep trench built as a bedrock drain. In the 1990s, Nyac Mining Company mined extensively on Spruce Creek from surface cuts.

In 2005-2006, a soil sampling program was conducted covering approximately half of a subtle aeromagnetic anomaly. In 2010, stream sediment samples were collected at Spruce Creek by Nyac Gold LLC (Flanders, 2013).

In 2013 Nyac Gold LLC drilled two holes targeting a fault zone exposed during placer mining and thought to be mineralized. Drill hole NYC13-03 intersected a 10-foot zone from 457 to 467 feet containing 32 ppb Au, 2.7 ppm Ag, 134 ppm Pb, 256 ppm Zn, and 4 ppm Mo. Another 10-foot mineralized interval in the same drill hole from 507 to 517 feet contained 0.220 gpt Au, 2.2 ppm Ag, 98 ppm Pb, 288 ppm Zn, and 6.1 ppm Cd (Flanders, 2013).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Box, S. E, Moll-Stalcup, E. J., Frost, T. P., and Murphy, J. M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., scale 1:250,000.

Flanders, Richard, 2013, 2013 Drilling and Exploration for Lode Gold Deposits in the Nyac District, Southwest Alaska, 36 p. (Report held by Calista Corporation, Anchorage, Alaska).

Maddren, A.G., 1915, Gold placers of the lower Kuskokwim, with a note on copper in the Russian Mountains: U.S. Geological Survey Bulletin 622-H, p. 292-360.

Wenz, Z. J., 2005, An investigation of the geology and gold mineralization in the Nyac district, Southwest Alaska: Bureau of Land Management Open-File Report 103, 156 p.

Primary Reference: Flanders, 2013

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Shamrock

Site type: Prospect

ARDF no.: RM042

Latitude: 61.0364 **Quadrangle:** RM A-3

Longitude: 159.8621

Location description and accuracy:

Shamrock Creek is a south-flowing tributary to Bear Creek in the Nyac area. The coordinates are at about the center of the area that was drilled in 2005 and 2006; the site is about 0.6 mile northeast of section 23, T. 11 N., R. 60 W., of the Seward Meridian. It is unclear how much of the creek will be mined, but the drilling continued for about 0.8 mile above and below this point on the creek. Mining began near the upper end of the drilling in August 2006, but more drilling is likely or has already been done above the mining. The location is probably accurate to within 1,000 feet.

Commodities:

Main: Au, Bi, Cu, Mo

Other:

Ore minerals: Bismuthinite, chalcopyrite, gold, molybdenite, pyrite

Gangue minerals: Calcite, quartz

Geologic description:

This record is about the lode prospect near Shamrock Creek placer (RM039).

The host rock at Shamrock is Jurassic volcanic and volcaniclastic rock that has undergone mesothermal alteration. Mesothermal facies developed in the Nyac host rock are pervasive propylitic, hornfelsic, and silicic alteration, along with silica-sericite selvages enveloping mesothermal veins, veinlets, and fractures. Brown biotite hornfels developed in the andesitic volcanics represent a higher degree of mesothermal alteration, surrounded by pervasive greenish quartz-calcite-chlorite propylitic alteration (Strachan, 2008).

Mineralization occurs in auriferous quartz-calcite-pyrrhotite-chalcopyrite-pyrite veins and veinlets. Another vein type with a mineral assemblage associated with gold is quartz-chlorite-calcite-pyrite-chalcopyrite-bismuthinite-molybdenite-native gold. These veins and veinlets are later than the pervasive sericitic alteration. Silica selvage is well developed away from the vein in biotite hornfels (Strachan, 2008).

Alteration:

The host rock at Shamrock is Jurassic volcanic and volcaniclastic rock that has undergone mesothermal alteration. Mesothermal facies developed in the Nyac host rock are pervasive propylitic, hornfelsic, and silicic alteration, along with silica-sericite selvages enveloping mesothermal veins, veinlets, and fractures. Brown biotite hornfels developed in the andesitic volcanics represent a higher degree of mesothermal alteration, surrounded by pervasive greenish quartz-calcite-chlorite propylitic alteration (Strachan, 2008).

Age of mineralization:

Probably mid-Cretaceous as at the Bonanza Ridge prospect, ARDF number RM037 (Wenz, 2004, 2005).

Generic deposit model:

Deposit model:

Low-sulfide gold-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

Systematic geochemical surveys have been completed in the Nyac Gold District by many entities, including Research Associates of Alaska, Placer Dome Exploration, Calista Native Corporation, Zachary Wenz, and Tonogold Resources, Inc. These surveys included collection and assaying of rock chip, soil, stream, alluvial, and pan concentrate samples (Strachan, 2008).

In 2005-2006, Tonogold Resources Inc. explored for the bedrock source of gold from the productive drainages near active placer Shamrock Creek (RM039). This effort included outcrop mapping and sampling. 3,149 grid soils samples collected in 2005 resulted in 323 (10.3 percent) assaying more than 0.1 parts per million (ppm) gold. 3,594 samples collected in 2006 resulted in 122 (5.2 percent) assaying over 0.1 ppm gold (Strachan, 2008).

In 2013, Nyac Gold LLC conducted prospecting, drilling, sampling, and petrographic work at Shamrock Creek in order to determine the extent of and complex nature of the intrusive and gold mineralization (Flanders, 2013).

Production notes:

None.

Reserves:

None.

Additional comments:

Mining on the placer Shamrock Creek (RM039) began in August 2006 (Strachan, 2008).

References:

Box, S. E, Moll-Stalcup, E. J., Frost, T. P., and Murphy, J. M., 1993, Preliminary geologic map of the Bethel and southern Russian Mission quadrangles, southwestern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-2226-A, 20 p., scale 1:250,000.

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Flanders, Richard, 2013, 2013 Drilling and Exploration for Lode Gold Deposits in the Nyac District, Southwest Alaska, 36 p. (Report held by Calista Corporation, Anchorage, Alaska).

Strachan, D. G., 2008, Geology, geochemistry, and drilling from 2005 to 2007 Nyac porphyry gold project, southwest Alaska: Private report for Tonogold Resources, Inc., 92 p., available online at: http://www.tonogold com/i/pdf/Nyac_Report_March_19_2008_with_Appendices.pdf (as of December 3, 2014).

Wenz, Z. J., 2004, Geology and gold mineralization of the Nyac district, southwest Alaska: MS thesis, University of Alaska, Fairbanks, 133 p.

Wenz, Z. J., 2005, An investigation of the geology and gold mineralization in the Nyac district, southwest

Primary Reference: Strachan, 2008

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Ivanof; Kawisgag

Site type: Prospect

ARDF no.: SB001

Latitude: 55.8876 **Quadrangle:** SB D-5

Longitude: 159.4223

Location description and accuracy:

The Ivanof prospect is on a peninsula between Humpback and Ivanof Bays. It covers an area several miles in diameter, northwest of triangulation station Short. It is at an elevation of about 1,250 feet, at the midpoint of the boundary between secs. 1 and 36, T. 49 and 50 S., R. 65 W, of the Seward Meridian. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Mo

Other: As, Pb, Zn

Ore minerals: Arsenopyrite, bornite, chalcopyrite, covellite, gold, molybdenite, pyrite, pyrrhotite

Gangue minerals: Quartz

Geologic description:

The Ivanof prospect is in sandstone, grits, and conglomerates of the Eocene to Paleocene Tolstoi Formation which is are cut by an intrusive complex (Fields, 1977; Wilson and others, 1995). Biotite from the complex has been dated at 7 million years (Wilson and others, 1994). The sedimentary rock near the complex exhibits intense thermal metamorphism which formed biotite-quartz hornfels.

The intrusive complex, best exposed in two cirque basins, consists of an early diorite porphyry phase and a later, more extensive, quartz porphyry phase. The quartz porphyry intrudes the diorite as well as the Tolstoy Formation. Peripheral sills and dikes similar in composition to the intrusive complex cut the sedimentary units.

Both intrusive phases are mineralized, but only the diorite porphyry contains copper-molybdenum values. The sulfide mineralization, which includes arsenopyrite, pyrite, pyrrhotite, chalcopyrite, bornite, and covellite, covers an area of approximately 2 by 2.5 miles. In the quartz porphyry, pyrite is pervasive as disseminations and fracture fillings as well as in the sedimentary rocks throughout a 3-square-mile area. Two zones of copper-molybdenum-quartz stockwork mineralization were outlined by Bear Creek Mining (Fields, 1977); each extends over an area of approximately 2,000 by 600 feet and occurs in the diorite as well as in the surrounding sedimentary rocks. Base metal values in rock samples collected at the surface were from 500 to 1,700 parts per million (ppm) copper and 20 to 240 ppm molybdenum, with weakly anomalous gold values. Fields describes the pyrite:chalcopyrite ratio as 1:1 to 2:1 in the main mineralized areas and 5:1 to 10:1 in surrounding areas. Rock samples collected by Resource Associates of Alaska in 1979 in the northern cirque contained as much as to 790 parts per million (ppm) copper, 2,400 ppm molybdenum, and 2.4 ppm silver.

Farnstrom (1991) associates the mineralization with two separate, intersecting quartz-sulfide stockworks. The older stockwork consists of quartz-sulfide-chlorite veinlets in the diorite porphyry that are traceable for as much as to 3,000 feet into the sedimentary rocks. These veinlets contain pyrite, pyrrhotite, and chalcopyrite. Pyrite:chalcopyrite ratios exceed 5:1. The younger stockwork consists of veinlets as much as 0.4 inch wide containing pyrite, molybdenite, and only trace amounts of chalcopyrite, covellite, bornite, and malachite. According to Farnstrom (1991), the distribution of the copper-rich stockwork is spotty; the best deposits are at the contact of the diorite porphyry and the sedimentary country rocks.

In 1979, Resource Associates of Alaska discovered quartz veins with gold and arsenopyrite in areas peripheral to the copper-molybdenum mineralization (Moller and others, 1982). Some of these veins are as much as 30 feet wide and can be traced for as much as 2,400 feet along strike. They typically are 5 to 8 feet. wide and contain 0.08 to 0.20 ounce of gold per ton.

Strong secondary biotite is localized in and around the diorite porphyry over an area approximately 1,000 feet in diameter. Widespread sericitic alteration surrounds the biotite zone and coincides with the pyritic halo. Propylitic alteration forms an outer zone of alteration (Fields, 1977).

Farnstrom (1991) described the alteration in and around the diorite porphyry as relatively slight. Mineralized areas, however, are marked by intense bleaching and silicification. According to Farnstrom, chlorite replaces mafic minerals, and also occurs in stockwork veinlets in both intrusive phases. In the diorite, the chlorite is accompanied by epidote. Feldspars in both intrusive phases are altered to sericite, but this type of alteration tends to be more intense in the quartz porphyry. In contrast to Field's (1977) pattern, Farnstrom did not recognize a zonal pattern of alteration. Some of the alteration she describes may be deuteric in origin rather than hydrothermal.

In 2005 and 2006, Metallica Resource Inc. (2008) under an option agreement with Full Metal Minerals that in turn has access to the land under an agreement with several Native corporations, mapped and sampled the prospect and carried out ground geophysical surveys to define targets for future drilling.

Alteration:

According to Fields (1977), the alteration exhibits a zonal pattern with a central potassic core surrounded by a phyllic zone and an outer propylitic zone. Farnstrom (1991) describes sericitic (phyllic) alteration that is related in part to mineralization. The mineralized areas are also marked by intense bleaching and silicification.

Age of mineralization:

Seven million years or younger, based on radiometric dating.

Generic deposit model:

Deposit model:

Porphyry Cu, Porphyry Cu-Mo, Porphyry Cu-Au (Cox and Singer, 1986; models 17, 21a, 20c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

17, 21a, 20c

Production Status: None

Site Status: Active

Workings/exploration:

Bear Creek Mining mapped and sampled this prospect for Bristol Bay Native Corporation in the 1970s (Fields, 1977). Resource Associates of Alaska mapped and sampled the deposit in the mid 1980s, and ran approximately 9 line miles of VLF-EM and magnetic surveys. The U.S. Geological Survey sampled the deposit in the mid-1980s. Cominco mapped and sampled the deposit in 1990 (Farnstrom, 1991). In 2005 and 2006, Metallica Resource Inc. (2008) mapped and sampled the prospect and carried out ground geophysical surveys to define targets for future drilling.

Production notes:

None.

Reserves:

None.

Additional comments:

This prospect is on land interim-conveyed to, or patented by the Bristol Bay Native Corporation.

References:

Angeloni, L.M., Wilson, F.H., and Sutley, Stephen, 1985, Map and tables showing preliminary rock geochemical data, Port Moller, Stepovak Bay, and Simeonof Island quadrangles, Alaska: U.S. Geological Survey Open-File Report 85-470, 179 p., 1 sheet, scale 1:250,000.

Farnstrom, H.E., 1991, Ivanof Project, 1990 final report: Cominco Alaska, 12 p. (Report held by Alaska Earth Sciences, Inc., Anchorage, Alaska .)

Fields, E.D., 1977, 1976 Annual report: Alaska search, Chignik area-Bristol Bay region: Bear Creek Mining Company, 44 p., 22 map sheets. (Report held by the Aleut Corporation, Anchorage, Alaska.)

Frisken, J.G., 1992, Interpretation of reconnaissance geochemical data from the Port Moller, Stepovak Bay, and Simeonof Island quadrangles, Alaska Peninsula, Alaska: U.S. Geological Survey Bulletin 1968, 47 p., 3 sheets, scale 1:250,000.

Green, C.B., Bundtzen, T.K., Peterson, R.J., Seward, A.F., Deagan, J.R., and Burton, J.E., 1989, Alaska's mineral industry, 1988: Alaska Division of Geological and Geophysical Surveys Special Report 43, 79 p.

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Moller, S. A., Bernt, J., Farnstrom, H. E., Toupe, W., Hanneman, Nancy, 1982, Exploration and evaluation of precious metals potential of Bristol Bay Native Corporation lands, SW Alaska, vols. IV and V: Resource Associates of Alaska, Fairbanks, Alaska. (Report on file, Bristol Bay Native Corporation, Anchorage, Alaska).

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Wilson, F.H., White, W.H., and DuBois, G.D., 1988, Brief descriptions of mines, prospects, and mineral occurrences in the Port Moller and Stepovak Bay quadrangles, Alaska Peninsula: U.S. Geological Survey Open-File Report 88-666, 128 p., 1 plate, scale 1:250,000.

Young, L.E., St. George, P., and Bouley, B., 1997, Porphyry copper deposits in relation to the magmatic history and palinspastic restoration of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral deposits of Alaska: Economic Geology Monograph 9, p. 306-333.

Primary Reference: Fields, 1977; Metallica Resources, Inc., 2008

Reporter(s): S.H. Pilcher (Anchorage, Alaska); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Unnamed (near Pinta Point)

Site type: Occurrence

ARDF no.: SD070

Latitude: 57.0981 **Quadrangle:** SD A-6

Longitude: 133.8839

Location description and accuracy:

This occurrence is along about 500 feet of the shoreline just east of Pinta Point on the northern tip of Kupreanof Island. It is near the northeast corner of section 24, T. 85 S., R. 72 E. The location is accurate.

Commodities:

Main: Au, Cu, Zn

Other:

Ore minerals: Chalcopyrite, pyrite, pyrrhotite, sphalerite.

Gangue minerals:

Geologic description:

This occurrence was discovered and first described by Still and others (2002) as part of a Bureau of Land Management mineral assessment. The rocks at the occurrence consist of siliceous, dark gray, well-foliated graphitic schist that is tightly folded and multiply deformed. Nearby, the unit includes limestone, chert, felsic schist, and greenstone; Brew and others (1984) mapped it as metamorphosed Stephens Passage Group of late Mesozoic age.

The schist near Pinta Point contains finely disseminated sulfides and sulfide-rich layers for about 500 feet of shoreline. The sulfides locally make up as much as 30 percent of the schist in layers up to 1 foot thick. One 15-foot-thick layer consists of about 10 percent sulfides across its entire width. The sulfides are mainly pyrite and pyrrhotite with minor sphalerite and chalcopyrite. A representative sample across 11 feet of the 15-foot-thick layer contained 43 parts per billion gold, 143 parts per million (ppm) copper, and 624 ppm zinc.

Alteration:

Age of mineralization:

Probably contemporaneous with the Upper Mesozoic host rock.

Generic deposit model:

Deposit model:

Sulfides in layers and disseminations in schist; possibly a volcanogenic massive sulfide deposit.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only sampling by government geologists who first discovered the occurrences in the late 1990s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brew, D.A., Ovenshine, A.T., Karl, S.M., and Hunt, S.J., 1984, Preliminary reconnaissance geologic map of the Petersburg and parts of the Port Alexander and Sumdum 1:250,000 quadrangles, southeastern Alaska: U.S. Geological Survey Open-File Report 84-405, 43 p., 2 sheets, scale 1:250,000.

Still, J.C., Bittenbender, P.E., Bean, K.W., and Gensler, E.G., 2002, Mineral assessment of the Stikine area, central Southeast Alaska: U.S. Bureau of Land Management Technical Report 51, 560 p.

Primary Reference: Still and others, 2002

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2007-04-08

Site name(s): Boundary

Site type: Prospect

ARDF no.: SK057

Latitude: 59.3506 **Quadrangle:** SK B-4

Longitude: 136.4723

Location description and accuracy:

The Boundary prospect is along and just to the east of the Alaska-Canada border, about 1.8 miles south of Mt. Henry Clay at 5,700 to 6,000 feet elevation. It is about 0.4 mile south-southeast of the center of section 15, T. 29 S., R. 53 E. The location is accurate.

Commodities:

Main: Ag, Au, Ba, Cu, Pb, Zn

Other: As, Co

Ore minerals: Barite, chalcopyrite, pyrite, pyrrhotite

Gangue minerals: Barite, calcite, quartz

Geologic description:

Mineralization in this area was discovered in 1969 by Merrill Palmer and associates and has been explored by a succession of companies including Alyu Mining in 1976 and 1977; Anaconda Minerals in 1979 and 1980; Southeastern Minerals from 1980 to 1983; Bear Creek Mining from 1983 to 1985; Newmont Exploration from 1987 to 1989; Granges Exploration Ltd. in 1989; Cominco Alaska from 1990 to 1993; Kennecott Minerals from 1993 to 1997, Rubicon Minerals from 1998 to 2000; and Toquima Minerals Corp. in 2004. It was also mapped and sampled by the U.S. Geological Survey (MacKevett 1974) and the U.S. Bureau of Mines (Still, 1984), and the Alaska Division of Geological and Geophysical Surveys (Still and others, 1991). In 2006, Constantine Metal Resources acquired the property under a long-term lease and they have been actively explored it to the present (early 2011). Their work has included detailed geologic mapping and sampling, and ground geochemical and geophysical surveys. The Boundary prospect, the southwestern-most prospect in the area has almost certainly been mapped, sampled, and covered by geochemical and geophysical surveys by several of the companies that have worked in the area. It is now part of the large block of claims held by Constantine. It has not been drilled.

The rocks in the region are part of the Upper Triassic Hyd Group that hosts similar volcanic massive sulfide deposits the length of southeastern Alaska (Newberry and others, 1997). The rocks are predominantly massive and pillow basalts and fragmental basalt and andesite(?), intercalated with siltston, tuff, and rare rhyolite flows and dikes. They have been subject to greenschist-facies metamorphism; folding and faulting locally repeats the stratigraphy in places, and the rocks are highly altered.

Still and others (1991) describe this prospect as: 'Narrow bands of iron-stained metasedimentary rocks and altered metabasalt that crop out through glacial ice. Float and bedrock samples of sedimentary and volcanic rocks contained up to 0.034 parts per million (ppm) gold, 1.214 ppm silver, 280 ppm zinc, 1,390 ppm copper, 390 ppm cobalt, 400 ppm arsenic, and 200 ppm nickel. A barite-rich band in white phyllite contained 47 percent barium. Rubicon Minerals (1998) in an unpublished Executive Summary, cites work by Kennecott Alaska Exploration that describes the Boundary prospect as: '...quartz-sericite-pyrite schist and felsite with chalcopyrite.' Rubicon also cites Kennecott samples that contained up to 6.5 percent copper, 16 ppm lead, 3,610 ppm zinc, 12 ppm silver, and 1.980 ppm gold. More recently, Constantine found barite-sulfide boulders that contained up to 2.28 percent copper, 19.7 percent zinc, and 0.61 parts per million gold.

There have been several published studies of the mineral deposits in the area by government and academe (MacKevett and others, 1974; Still, 1984, Still and others, 1991; Newberry and others, 1997; Greig and Giroux, 2010) and unpublished studies by industry. The consensus from early on was that the they are Late Triassic, stratiform volcanogenic massive-sulfide deposits.

Alteration:

Quartz-sericite-pyrite alteration associated with baritic massive-sulfide mineralization.

Age of mineralization:

Late Triassic by analogy with other similar deposits of that age along the length of southeastern Alaska and into Canada.

Generic deposit model:

Deposit model:

Besshi- or Kuroko-type massive sulfide? (Cox and Singer, 1986; models 28a? or 24b?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a? or 24b?

Production Status: None

Site Status: Active

Workings/exploration:

Mineralization in this area was discovered in 1969 by Merrill Palmer and associates and has been explored by a succession of companies including Alyu Mining in 1976 and 1977; Anaconda Minerals in 1979 and 1980; Southeastern Minerals from 1980 to 1983; Bear Creek Mining from 1983 to 1985; Newmont Exploration from 1987 to 1989; Granges Exploration Ltd. in 1989; Cominco Alaska from 1990 to 1993; Kennecott Minerals from 1993 to 1997, Rubicon Minerals from 1998 to 2000; and Toquima Minerals Corp. in 2004. It was also mapped and sampled by the U.S. Geological Survey (MacKevett 1974) and the U.S. Bureau of Mines (Still, 1984), and the Alaska Division of Geological and Geophysical Surveys (Still and others, 1991). In 2006, Constantine Metal Resources acquired the property under a long-term lease and they have been actively explored it to the present (early 2011). Their work has included detailed geologic mapping and sampling, and ground geochemical and geophysical surveys. The Boundary prospect, the southwestern-most prospect in the area has almost certainly been mapped, sampled, and covered by geochemical and geophysical surveys by several of the companies that have worked in the area. It is now part of the large block of claims held by Constantine. It has not been drilled.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Constantine Metal Resources Ltd., 2008, Palmer property info: http://www.constantinemetals.com/projects/palmer/palmer/ (as of April 8, 2008).

Gilbert, W.G., and Redman, E.C., 1989, Lode deposits, prospects, and occurrences of the Porcupine mining area, southeast Alaska: U.S. Bureau of Mines Open-File Report 17-89, 1 sheet, scale 1:39,600.

Greig, C.J., and Giroux, G.H., 2010, Palmer VMS project, southeast Alaska; Mineral resource estimation and exploration update: Technical l report for Constantine Metal Resources Ltd. 82 p. (posted on www.sedar.com, Mar. 8, 2010).

Newberry, R.J., Crafford, T.C., Newkirk, S.R., Young, L.E., Nelson, S.W., and Duke, N.A., 1997, Volcanogenic massive sulfide deposits of Alaska, in Goldfarb, R.J. and Miller, L. D., eds., Mineral deposits of Alaska: Economic Geology Monograph 9, p. 120-150.

Rubicon Minerals, 1998, Palmer VMS Project, southeast Alaska, Executive Summary: Unpublished report by Rubicon Minerals Corporation, Vancouver, British Columbia, 25 p.

Still, J.C., 1984, Stratiform massive sulfide deposits in the Mt. Henry Clay area, southeast Alaska: U.S. Bureau of Mines Open-File Report 118-84, 65 p.

Still, J.C., 1991, Bureau of Mines mineral investigations in the Juneau mining district, Alaska, 1984-1988; Volume 2, Detailed mine, prospect, and mineral occurrence descriptions, Section A, Haines-Klukwan-Porcupine subarea: U.S. Bureau of Mines of Mines Special Publication, 214 p.

Still, J.C., Gilbert, W.G., and Forbes, R.B., 1987, Final report of stream sediment, float, and bedrock sampling in the Porcupine mining area, southeast Alaska, 1983-1985: U.S. Bureau of Mines Open-File Report 36-87, 35 p., 8 sheets.

Primary Reference: Still and others, 1991; Constantine Metal Resources, Inc., 2008

Reporter(s): T.C. Crafford (T. Crafford & Associates, Anchorage); ; D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Nunatak; Saksaia Glacier

Site type: Prospect

ARDF no.: SK058

Latitude: 59.3699 **Quadrangle:** SK B-4

Longitude: 136.4125

Location description and accuracy:

The Nunatak prospect extends for 1,500 feet between 3,800 and 4,500 feet elevation on a nunatak about 1.5 miles above the terminus of the Saksaia Glacier. It is near the center of section 12, T. 29 S., R. 53 E.

Commodities:

Main: Ag, Au, Ba, Cu, Pb, Zn

Other:

Ore minerals: Barite, chalcopyrite, galena, gold, pyrite, sphalerite, sulfosalts?

Gangue minerals: Quartz, sericite

Geologic description:

Mineralization in this area was discovered in 1969 by Merrill Palmer and associates and has been explored by a succession of companies including Alyu Mining in 1976 and 1977; Anaconda Minerals in 1979 and 1980; Southeastern Minerals from 1980 to 1983; Bear Creek Mining from 1983 to 1985; Newmont Exploration from 1987 to 1989; Granges Exploration Ltd. in 1989; Cominco Alaska from 1990 to 1993; Kennecott Minerals from 1993 to 1997, Rubicon Minerals from 1998 to 2000; and Toquima Minerals Corp. in 2004. It was also mapped and sampled by the U.S. Geological Survey (MacKevett 1974) and the U.S. Bureau of Mines (Still, 1984), and the Alaska Division of Geological and Geophysical Surveys (Still and others, 1991). In 2006, Constantine Metal Resources acquired the property under a long-term lease and they have been actively explored it to the present (early 2011). Their work has included detailed geologic mapping and sampling, ground geochemical and geophysical surveys. The Nunatak prospect has been mapped, sampled, and covered by geochemical and geophysical surveys by several of the companies that have worked in the area. It is now part of the large block of claims held by Constantine. It has not been drilled.

The rocks in the region are part of the Upper Triassic Hyd Group that hosts similar volcanic massive sulfide deposits the length of southeastern Alaska (Newberry and others, 1997). The rocks are predominantly massive and pillow basalts and fragmental basalt and andesite(?), intercalated with siltston, tuff, and rare rhyolite flows and dikes. They have been subject to greenschist-facies metamorphism; folding and faulting locally repeats the stratigraphy in places, and the rocks are highly altered.

The prospect is in intensely quartz-sericite-pyrite-altered and iron-stained schist and altered volcanic rocks more than 100 feet thick exposed for 1,500 feet across the face of a nunatak (MacKevett and others, 1974; Still, 1984; Greig and Giroux, 2010). Barite lenses and beds up to 6 meters thick occur in the altered rocks. The mineral assemblage and field relationships are similar to those at the Glacier Creek prospect (SK066) (MacKevett and others, 1974). Samples of the baritic rock contain up to 2.58 parts per million (ppm) gold, 335.3 ppm silver, 2.38 percent zinc, 1,820 ppm copper, 2.0 percent lead, 48 percent barite, and 1,000 ppm arsenic. A 200-pound sample collected by Merrill Palmer was divided into 13 parts and analyzed by Newmont Gold Company. The samples averaged 11.84 ounces of silver per ton and 0.092 ounce of gold per ton. This prospect lies along a northwesterly mineral trend that extends through the Cap prospect (SK060) to the Mount Henry Clay prospect (SK068). Rubicon Minerals believed that these prospects occur at the same mineralized stratigraphic horizon and attributes their distribution to a

northwest-trending, gently plunging antiform that brings the massive-sulfide horizon close to the surface (Rubicon Minerals, 1998).

There have been several published studies of the mineral deposits in the area by government and academe (MacKevett and others, 1974; Still, 1984, Still and others, 1991; Newberry and others, 1997; Greig and Giroux, 2010) and unpublished studies by industry. The consensus from early on was that the they are Late Triassic, stratiform volcanogenic massive-sulfide deposits.

Alteration:

Intense quartz-sericite-pyrite alteration adjacent to baritic massive-sulfide layers.

Age of mineralization:

Late Triassic by analogy with other similar deposits of that age along the length of southeastern Alaska and into Canada.

Generic deposit model:

Deposit model:

Besshi- or Kuroko-type volcanogenic massive sulfide deposit (Cox and Singer, 1986; models 24b or 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24b or 28a

Production Status: None

Site Status: Active

Workings/exploration:

Mineralization in this area was discovered in 1969 by Merrill Palmer and associates and has been explored by a succession of companies including Alyu Mining in 1976 and 1977; Anaconda Minerals in 1979 and 1980; Southeastern Minerals from 1980 to 1983; Bear Creek Mining from 1983 to 1985; Newmont Exploration from 1987 to 1989; Granges Exploration Ltd. in 1989; Cominco Alaska from 1990 to 1993; Kennecott Minerals from 1993 to 1997, Rubicon Minerals from 1998 to 2000; and Toquima Minerals Corp. in 2004. It was also mapped and sampled by the U.S. Geological Survey (MacKevett 1974) and the U.S. Bureau of Mines (Still, 1984), and the Alaska Division of Geological and Geophysical Surveys (Still and others, 1991). In 2006, Constantine Metal Resources acquired the property under a long-term lease and they have been actively explored it to the present (early 2011). Their work has included detailed geologic mapping and sampling, and ground geochemical and geophysical surveys. The Nunatak prospect has undoubtedly been mapped, sampled, and covered by geochemical and geophysical surveys by several of the companies that have worked in the area. It is now part of the large block of claims held by Constantine. It has not been drilled.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Berg, H.C., 1984, Regional geologic summary, metallogenesis, and mineral resources of southeastern Alaska: U.S. Geological Survey Open-file Report 84-572, 298 p., 1 plate, scale 1:600,000.

Cobb, E.H., 1972, Metallic mineral resources map of the Skagway quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-424, 1 sheet, scale 1:250,000.

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Mt. Fairweather and Skagway quadrangles, Alaska: U.S. Geological Survey Open-File Report 78-316, 123 p.

Gilbert, W.G., and Redman, E.C., 1989, Lode deposits, prospects, and occurrences of the Porcupine mining area, southeast Alaska: U.S. Bureau of Mines Open-File Report 17-89, 1 sheet, scale 1:39,600.

Greig, C.J., and Giroux, G.H., 2010, Palmer VMS project, southeast Alaska; Mineral resource estimation and exploration update: Technical l report for Constantine Metal Resources Ltd. 82 p. (posted on www.sedar.com, Mar. 8, 2010).

MacKevett, E.M., Jr., 1971, Analyses of samples and preliminary geologic summary of barite-silver-base metal deposits near Glacier Creek, Skagway B-4 quadrangle, southeastern Alaska: U.S. Geological Survey Open-File Report 71-195, 8 p.

MacKevett, E.M., Jr., Robertson, E.C., and Winkler, G.R., 1974, Geology of the Skagway B-3 and B-4 quadrangles, southern Alaska: U.S. Geological Survey Professional Paper 832, 33 p., 1 plate.

Newberry, R.J., Crafford, T.C., Newkirk, S.R., Young, L.E., Nelson, S.W., and Duke, N.A., 1997, Volcanogenic massive sulfide deposits of Alaska, in Goldfarb, R.J. and Miller, L. D., eds., Mineral deposits of Alaska: Economic Geology Monograph 9, p. 120-150.

Rubicon Minerals, 1998, Palmer VMS Project, southeast Alaska, Executive Summary: Unpublished report by Rubicon Minerals Corporation, Vancouver, British Columbia, 25 p.

Still, J.C., 1984, Stratiform massive sulfide deposits in the Mt. Henry Clay area, southeast Alaska: U.S. Bureau of Mines Open-File Report 118-84, 65 p.

Still, J.C., 1991, Bureau of Mines mineral investigations in the Juneau mining district, Alaska, 1984-1988; Volume 2, Detailed mine, prospect, and mineral occurrence descriptions, Section A, Haines-Klukwan-Porcupine subarea: U.S. Bureau of Mines of Mines Special Publication, 214 p.

Still, J.C., Hoekzema, R.B., Bundtzen, T.K., Gilbert, W.G., Wier, K.R., Burns, L.E., and Fechner, S.A., 1991, Economic geology of Haines-Klukwan-Porcupine area, southeastern Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 91-4, 156 p., 5 sheets, scale 1:63,360.

Winkler, G.R., and MacKevett, E.M., Jr., 1970, Analyses of bedrock and stream-sediment samples from the Haines-Porcupine region, southeastern Alaska: U.S. Geological Survey Open-File Report 369, 91 p., 1 sheet, scale 1:125,000.

Primary Reference: Still, 1984

Reporter(s): T.C. Crafford (T. Crafford & Associates, Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Cap

Site type: Prospect

ARDF no.: SK060

Latitude: 59.3775 **Quadrangle:** SK B-4

Longitude: 136.4185

Location description and accuracy:

The Cap prospect is near the north edge of Saksaia Glacier at an elevation of about 3,800 feet. It is approximately 2.1 miles east of Mt. Henry Clay and about 0.6 mile south-southwest of the center of Section 1, T. 29 E., R. 53 E., of the Copper River Meridian. The location is accurate within 500 feet.

Commodities:

Main: Ag, Au, Ba, Cu, Pb, Zn

Other: Co, Sb

Ore minerals: Acanthite, barite, galena, pyrargyrite, pyrite, sphalerite, tetrahedrite

Gangue minerals: Calcite, quartz

Geologic description:

The rocks in the region are part of the Upper Triassic Hyd Group that hosts similar volcanic massive sulfide deposits the length of southeastern Alaska (Newberry and others, 1997). The rocks are predominantly massive and pillow basalts and fragmental basalt and andesite(?), intercalated with siltstone, tuff, and rare rhyolite flows and dikes. They have been subject to greenschist-facies metamorphism; folding and faulting locally repeats the stratigraphy in places, and the rocks are highly altered.

As described by Still (1984) and Still and others (1991), the Cap prospect consists of barite-rich sulfide lenses up to 8 feet thick in a 50-foot-thick, 220-foot-long, iron-stained zone capped by volcanics that outcrop above the Saksaia glacier. The full extent of the prospect is hidden by glacier and surficial material. The barite lenses contain pyrite, sphalerite, galena, and tetrahedrite. Samples contained up to 50 percent barium, 1.1 percent zinc, 0.33 percent lead, 277.7 parts per million (ppm) silver, 1.371 ppm gold, and 100 ppm cobalt.

Rubicon Minerals (1998) cites a 43-foot channel sample that contained 247.6 ppm silver, 0.263 ppm gold, 2,753 ppm zinc, 1,803 ppm lead, and 174 ppm copper. They also report a drill hole with a 76.3-foot-thick intercept that averaged 3.7 ounces of silver per ton. Rubicon (1998) concluded that the Cap prospect lies along a northwest-trending mineral belt that includes the Nunatak (SK058), Cap, and MHC (SK068) prospects. They believe that these deposits are at the same stratigraphic horizon and attribute their distribution to a northwest-trending, shallowly plunging antiform that brings the massive-sulfide horizon close to the surface (Rubicon Minerals, 1998).

As described by Constantine Metal Resources, Ltd., (2007, 2008) and Greig and Giroux (2010), the Cap prospect is a silver-rich, barite-zinc-lead-gold massive-sulfide horizon 7 to 8 meters thick, in a veined and brecciated, amygdaloidal basalt. The deposit is marked by intense quartz-sericite-pyrite alteration. The basalt is capped by a bed of massive pyritic barite. Mineralized seams, veins, and layers up to 4.2 meters thick of massive barite with some chert occur throughout the section of altered basalt. In the core of the altered zone the basalt is completely replaced by quartz, sericite, and pyrite, and only the amygdules remain of the unaltered basalt. The amygdules are filled with quartz, minor barite, and sericite and are locally cored with sphalerite and galena. Veins and the matrix of the breccia in the altered basalt consist mainly of barite, quartz, pyrite, and sericite. The veins commonly have irregular, ‘wormy’ forms and typically are zoned, with pyrite margins and quartz-barite cores. The veins contain pyrite, sphalerite, galena, acanthite, and

possibly pyrargyrite. The highest metal values are associated with the barite lenses. Constantine (2007) drilled two holes in 2007 that cut sections 730- and 300-feet thick of altered pyritic rocks. The best intersect was a 25.5-foot interval with 43 grams of silver per tonne, 0.29 gram of gold per tonne, 1.2 percent zinc, and 0.60 percent lead; this interval included a 6.3-foot section that contained 3.75 percent zinc, 1.91 percent lead, 0.18 percent copper, 92.1 grams of silver per tonne, and 0.47 grams of gold per tonne.

There have been several published studies of the mineral deposits in the area by government and academia (MacKevett and others, 1974; Still, 1984, Still and others, 1991; Newberry and others, 1997; Greig and Giroux, 2010) and unpublished studies by industry. The consensus from early on was that they are Late Triassic, stratiform volcanogenic massive-sulfide deposits.

Alteration:

The deposit is associated with a basalt layer that is intensely altered to quartz, sericite, and pyrite (Constantine Metal Resources, Ltd., 2007, 2008 and Greig and Giroux, 2010).

Age of mineralization:

Late Triassic by analogy with other similar deposits of that age along the length of southeastern Alaska and into Canada (Greig and Giroux, 2010).

Generic deposit model:

Deposit model:

Kuroko- or Besshi-type volcanogenic massive sulfide (Cox and Singer, 1986; models 28a or 24b)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 24b

Production Status: None

Site Status: Active

Workings/exploration:

Mineralization in this area was discovered in 1969 by Merrill Palmer and associates and has been explored by a succession of companies including Alyu Mining in 1976 and 1977; Anaconda Minerals in 1979 and 1980; Southeastern Minerals from 1980 to 1983; Bear Creek Mining from 1983 to 1985; Newmont Exploration from 1987 to 1989; Granges Exploration Ltd. in 1989; Cominco Alaska from 1990 to 1993; Kennecott Minerals from 1993 to 1997, Rubicon Minerals from 1998 to 2000; and Toquima Minerals Corp. in 2004 (Greig and Giroux, 2010). It was also mapped and sampled by the U.S. Geological Survey (MacKevett and others, 1974) and the U.S. Bureau of Mines (Still, 1984), and the Alaska Division of Geological and Geophysical Surveys (Still and others, 1991). In 2006, Constantine Metal Resources acquired the property under a long-term lease and began actively exploring it. Their work has included detailed geologic mapping and sampling, ground geochemical and geophysical surveys (Greig and Giroux, 2010).

The Cap prospect has been explored by a number of companies including Newmont Gold Company and Rubicon Minerals since at least the late 1990s; their work included surface mapping, trenching, and at least three drill holes. As of early 2011, it was actively being explored by Constantine Metal Resources Ltd., who drilled two holes in 2007 (Greig and Giroux, 2010).

In 2014, Constantine reported assay highlights at Cap of 1) 134 grams of silver per tonne over 23.2. meters (3.9 ounces per ton over 75 feet) from drill holes CAP01, and 2) 31 grams of silver per tonne over 90.6 meters (0.9 ounce per ton over 294 feet) (Constantine Metal Resources Ltd., 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Greig, C.J., and Giroux, G.H., 2010, Palmer VMS project, southeast Alaska; Mineral resource estimation and exploration update: Technical l report for Constantine Metal Resources Ltd. 82 p. (posted on www.sedar.com, Mar. 8, 2010) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00023827&fileName=/csfsprod/data104/filings/01543498/00000001/C%3A%5CSEDAR%5CCEM_Filings%5CPalmer_43-101_Rept_CEM_2010.pdf (as of December 24, 2014).

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Newberry, R.J., Crafford, T.C., Newkirk, S.R., Young, L.E., Nelson, S.W., and Duke, N.A., 1997, Volcanogenic massive sulfide deposits of Alaska, in Goldfarb, R.J. and Miller, L. D., eds., Mineral deposits of Alaska: Economic Geology Monograph 9, p. 120-150.

Rubicon Minerals, 1998, Palmer VMS Project, southeast Alaska, Executive Summary: Unpublished report by Rubicon Minerals Corporation, Vancouver, British Columbia, 25 p.

Still, J.C., 1984, Stratiform massive sulfide deposits in the Mt. Henry Clay area, southeast Alaska: U.S. Bureau of Mines Open-File Report 118-84, 65 p.

Still, J.C., Hoekzema, R.B., Bundtzen, T.K., Gilbert, W.G., Wier, K.R., Burns, L.E., and Fechner, S.A.,

Primary Reference: Constantine Metal Resources Ltd. (2007, 2008, 2014)

Reporter(s): T.C. Crafford (T. Crafford & Associates, Anchorage); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-24

Site name(s): Hanging Glacier

Site type: Prospect

ARDF no.: SK061

Latitude: 59.387

Quadrangle: SK B-4

Longitude: 136.4248

Location description and accuracy:

The Hanging Glacier prospect is between an elevation of 5,100 and 5,700 feet above a small unnamed hanging glacier that is about a mile and a half west of the terminus of the Saksaia Glacier. It is about 0.5 mile south-southwest of the center of section 1, T. 29 S., R. 53 E.

Commodities:

Main: Ag, Au, barite, Cu, Pb, Zn

Other:

Ore minerals: Barite, chalcopyrite, galena, gold, pyrite, sphalerite

Gangue minerals:

Geologic description:

Mineralization in this area was discovered in 1969 by Merrill Palmer and associates and has been explored by a succession of companies including Alyu Mining in 1976 and 1977; Anaconda Minerals in 1979 and 1980; Southeastern Minerals from 1980 to 1983; Bear Creek Mining from 1983 to 1985; Newmont Exploration from 1987 to 1989; Granges Exploration Ltd. in 1989; Cominco Alaska from 1990 to 1993; Kennecott Minerals from 1993 to 1997, Rubicon Minerals from 1998 to 2000; and Toquima Minerals Corp. in 2004. It was also mapped and sampled by the U.S. Geological Survey (MacKevett 1974) and the U.S. Bureau of Mines (Still, 1984), and the Alaska Division of Geological and Geophysical Surveys (Still and others, 1991). In 2006, Constantine Metal Resources acquired the property under a long-term lease and they have been actively explored it to the present (early 2011). Their work has included detailed geologic mapping and sampling, and ground geochemical and geophysical surveys. The Hanging Glacier prospect has almost certainly been mapped, sampled, and covered by geochemical and geophysical surveys by several of the companies that have worked in the area. It is now part of the large block of claims held by Constantine. It has not been drilled.

As described by Still (1984 [OF 118-84]) and Still and others (1991), the Hanging Glacier prospect is an iron-stained zone of Late Triassic, Hyd Group metasediments and hydrothermally altered metabasalt several hundred feet thick and about 2,000 feet long that strikes northeast and dips steeply north. The mineralization consists of barite lenses up to several feet thick and quartz-calcite ladder veins up to 0.5 feet thick. Both lenses and veins contain barite, pyrite, sphalerite, galena, and minor chalcopyrite. Samples from the lenses and veins contain up to 54 percent barium, 14.1 percent zinc, 0.35 percent copper, 0.37 percent lead, 19.36 parts per million (ppm) silver, and 0.244 ppm gold. MacKevett and others (1974) note that ladder veins occur within a 4- to 8-foot-thick altered dike that cuts the metavolcanic rocks. The ladder veins are as much as 6 inches thick and contain quartz, calcite, sphalerite, galena and minor chalcopyrite. They describe the barite lenses as a baritic footwall vein that contains abundant galena and minor pyrite, sphalerite, and chalcopyrite.

Samples collected by Rubicon Minerals (1998) contained up to 18.25 percent zinc, 0.11 percent copper, 0.05 percent lead, 0.49 ppm gold, and 36.2 ppm silver. Rubicon surmised that the Hanging Glacier prospect was a volcanogenic massive-sulfide system that could be stratigraphically higher than the Cap (SK060) and Nunatak (SK058) prospects or, alternatively, a structural repetition of the Cap-Nunatak horizon (Rubicon

Minerals, 1998).

There have been several published studies of the mineral deposits in the area by government and academe (MacKevett and others, 1974; Still, 1984, Still and others, 1991; Newberry and others, 1997; Greig and Giroux, 2010) and unpublished studies by industry. The consensus from early on was that the they are Late Triassic, stratiform volcanogenic massive-sulfide deposits.

Alteration:

Quartz-sericite-pyrite alteration associated with baritic massive-sulfide mineralization.

Age of mineralization:

Late Triassic by analogy with other similar deposits of that age along the length of southeastern Alaska and into Canada.

Generic deposit model:

Deposit model:

Probably a volcanogenic massive-sulfide deposit with associated veining, some of which may be due to remobilization during deformation and metamorphism (Cox and Singer, 1986; models 28a or 24b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 24b

Production Status: None

Site Status: Active

Workings/exploration:

Mineralization in this area was discovered in 1969 by Merrill Palmer and associates and has been explored by a succession of companies including Alyu Mining in 1976 and 1977; Anaconda Minerals in 1979 and 1980; Southeastern Minerals from 1980 to 1983; Bear Creek Mining from 1983 to 1985; Newmont Exploration from 1987 to 1989; Granges Exploration Ltd. in 1989; Cominco Alaska from 1990 to 1993; Kennecott Minerals from 1993 to 1997, Rubicon Minerals from 1998 to 2000; and Toquima Minerals Corp. in 2004. It was also mapped and sampled by the U.S. Geological Survey (MacKevett 1974) and the U.S. Bureau of Mines (Still, 1984), and the Alaska Division of Geological and Geophysical Surveys (Still and others, 1991). In 2006, Constantine Metal Resources acquired the property under a long-term lease and they have been actively explored it to the present (early 2011). Their work has included detailed geologic mapping and sampling, and ground geochemical and geophysical surveys. The Hanging Glacier prospect has almost certainly been mapped, sampled, and covered by geochemical and geophysical surveys by several of the companies that have worked in the area. It is now part of the large block of claims held by Constantine. It has not been drilled.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Berg, H.C., 1984, Regional geologic summary, metallogenesis, and mineral resources of southeastern Alaska: U.S. Geological Survey Open-file Report 84-572, 298 p., 1 plate, scale 1:600,000.

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Rubicon Minerals, 1998, Palmer VMS Project, southeast Alaska, Executive Summary: Unpublished report by Rubicon Minerals Corporation, Vancouver, British Columbia, 25 p.

Still, J.C., 1984, Stratiform massive sulfide deposits in the Mt. Henry Clay area, southeast Alaska: U.S. Bureau of Mines Open-File Report 118-84, 65 p.

Still, J.C., Hoekzema, R.B., Bundtzen, T.K., Gilbert, W.G., Wier, K.R., Burns, L.E., and Fechner, S.A., 1991, Economic geology of Haines-Klukwan-Porcupine area, southeastern Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 91-4, 156 p., 5 sheets, scale 1:63,360.

Primary Reference: Still and others, 1991

Reporter(s): T.C. Crafford (T. Crafford & Associates, Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Red Creek; Wolf Den

Site type: Prospect

ARDF no.: SK063

Latitude: 59.4001 **Quadrangle:** SK B-4

Longitude: 136.3221

Location description and accuracy:

The Red Creek or Wolf Den prospect is at an elevation of about 2,500 feet on the north slope of the ridge that trends north-northeast from Flower Mountain. It is about 2.0 miles south-southwest of the mouth of Glacier Creek on the Klehini river and about 0.2 mile southeast of the center of section 36, T. 28 S., R. 53 E. of the Copper River Meridian. This location follows Still (1991); the exact location is somewhat uncertain and several reports, for example Constantine Metal Resources Ltd. (2008), place the Red Creek prospect about 3 miles east of the Main Zone deposit (SK066) or about a half mile east of the coordinates given here.

Commodities:

Main: Ag, Au, Ba, Pb, Zn

Other: Hg

Ore minerals: Arsenopyrite, barite, galena, pyrite, sphalerite

Gangue minerals: Barite, calcite, quartz

Geologic description:

Two sources, Still and others (1991) and Rubicon Minerals (1998), provide similar locations for this prospect but name it differently and describe it's geology differently. Still and others (1991) describe the Wolf Den prospect as quartz-pyrite-arsenopyrite-sphalerite veins in a tan dike less than 10 feet thick. The veins are up to 0.3 feet thick, are up to 5 feet long, and are confined to the dike. Samples from the veins contained up to 11.4 parts per million (ppm) gold and 3,500 ppm zinc. A 5-foot-long chip sample of slate with pyrite bands collected upstream form the dike contained 0.103 ppm gold and 225 ppm zinc.

Rubicon Minerals (1998) refers to an unpublished Cominco Alaska report that describes the Red Creek prospect as a '...rhyolite fragmental with a small two-foot-thick exposure of a massive pyrite breccia in a creek bed.' They also report the discovery in 1998 of barite and semi-massive pyrite and cite samples with 2,080 ppm zinc and 12.83 ppm mercury. Rubicon Minerals (1998) and Constantine Metal Resources Ltd. (2008) consider the Red Creek deposit to be at the end of a belt of massive sulfide deposits that extends northwest for about 5 miles through the Main Zone (SK066), RW Zone (SK067), and Little Jarvis (SK069) prospect.

The descriptions for this prospect suggest that the deposit is either: 1) a volcanogenic massive-sulfide deposit of probable Late Triassic age (Still, 1984; Newberry and others, 1997), or 2) Cretaceous or younger, auriferous quartz-sulfide veins in a northwest- trending zone of quartz-sulfide veining in metasedimentary rocks (Wright, 1904; Eakin, 1918 and 1919; MacKevett and others, 1974).

Alteration:

Based on its similarity to the Golden Eagle prospect (SK047) and other occurrences in the area, the tan dike is probably a mafic dike that has been altered to a silica-carbonate rock (Still and others, 1991).

Age of mineralization:

The Wolf Den prospect, if different from Red Creek prospect, may be related to Cretaceous plutonism. The description of the Red Creek prospect suggests it is a volcanogenic massive-sulfide deposit correlative

with the Upper Triassic, Windy Craggy deposit in British Columbia and the Greens Creek deposit near Juneau (Still, 1984; Newberry and others, 1997).

Generic deposit model:

Deposit model:

The deposit has been described as both a polymetallic quartz-sulfide vein or a volcanogenic massive sulfide. There may be two different types of deposits (Cox and Singer, 1986; models 22c,? 24b?, 28a?.)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?, 24b?, 28a?

Production Status: None

Site Status: Active

Workings/exploration:

The Red Creek prospect was discovered by Cominco Alaska in 1990. Additional prospecting by Rubicon Minerals and its associates in 1998 discovered barite and semi-massive pyrite breccia (Rubicon Minerals, 1998). Constantine Metal Resources Ltd. (2008) currently holds the claims in the area. The Wolf Den prospect, which may or may not be a different deposit, has been known since at least 1904, but apparently little has been done on it since.

Production notes:

None.

Reserves:

None.

Additional comments:

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Primary Reference: Still and others, 1991; Rubicon Minerals, 1998

Reporter(s): T.C. Crafford (T. Crafford & Associates, Anchorage); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Glacier Creek; Main Zone; RW Zone; South Wall Zone; Palmer

Site type:

Prospect

ARDF no.: SK066

Latitude: 59.3966 **Quadrangle:** SK B-4

Longitude: 136.3919

Location description and accuracy:

The various parts of the Glacier Creek prospect as defined in 2011 are often referred to separately as the Main Zone, RW Zone, and South Wall Zone, but recent work has united them geologically in an overall estimate of their mineral resources. In plan view, this prospect extends east-west for about 900 meters; the center is about 500 meters east-southeast of Peak 1745 (meters), locally called Mount Morian, which is east of the head of the Little Jarvis Glacier. The center is about 0.6 mile southwest of the center of section 34, T. 28 S., R. 55 E., of the Copper River Meridian. A map of the prospect is figure 8 of Greig and Giroux (2010). This location is accurate within 50 feet.

Commodities:

Main: Ag, Au, Ba, Cu, Pb, Zn

Other:

Ore minerals: Barite, arsenopyrite, chalcopyrite, galena, gold, magnetite, pyrite, pyrrhotite, sphalerite, tennantite, tetrahedrite

Gangue minerals: Calcite, quartz

Geologic description:

The rocks in the region are part of the Upper Triassic Hyd Group that hosts similar volcanic massive sulfide deposits the length of southeastern Alaska (Newberry and others, 1997). The rocks are predominantly massive and pillow basalts and fragmental basalt and andesite(?), intercalated with siltstone, tuff, and rare rhyolite flows and dikes. They have been subject to greenschist-facies metamorphism; folding and faulting locally repeats the stratigraphy in places, and the rocks are highly altered.

In 2006, Constantine Metal Resources acquired the property under a long-term lease and began actively exploring it. Their work has included detailed geologic mapping and sampling, ground geochemical and geophysical surveys, and through 2009, they had drilled 32 holes totaling more than 12,000 meters (Constantine Metal Resources Ltd., 2010).

There have been several published studies of the Glacier Creek prospect by government and academia (MacKevett and others, 1974; Still, 1984; Still and others, 1991; Newberry and others, 1997) and unpublished studies by industry. The consensus has long been that the prospect is a Late Triassic, stratiform volcanogenic massive-sulfide deposit. However, many of the earlier studies suffered from the complexity of the geology, the lack of systematic geologic control at depth, and the difficulty in producing an overall synthesis from the scattered outcrops of mineralization at the surface. While questions remain, the recent synthesis by Greig and Giroux (2010), based on the drilling and other work by Constantine Metal Resources Inc., presents the best description of the deposit to date.

As described by Greig and Giroux (2010) most of the mineralization at the Glacier Creek prospect is in two massive-sulfide horizons: 1) the (upper) RW Zone which is up to 15 meters thick, consists of baritic massive sulfides +/- chert, tuff, and argillite; and 2) the (lower) Main Zone with drill intercepts of up to 35 meters of baritic massive sulfides. The ore minerals in the massive-sulfide horizons are mainly coarse-grained barite, with sphalerite, pyrite, chalcopyrite, and galena, along with less abundant magnetite,

pyrrhotite, arsenopyrite, tetrahedrite, and tennantite. Quartz is conspicuous, calcite less so. The two massive sulfide horizons are separated by 70 to 135 feet of rhyolite and basalt that are intensely altered to quartz, sericite, and pyrite (or QSP alteration as it is locally called), and are cut by scattered vein and stockwork mineralization. Basalt underlies the Main Zone and the rocks above the RW zone are more than 150 feet of massive and pillow basalts, a thick gabbro sill, and thin tuffaceous limestone beds.

The structure of the Glacier Creek prospect is a large overturned antiform that trends about east-west for at least 500 meters. The north limb is nearly horizontal but the south limb dips steeply north and is overturned. The hinge of the fault is displaced by a north-dipping thrust fault.

The mineralization in the RW and Main zones persist along both limbs of the antiform but its geometry and grade remain to be worked out. (Constantine refers to the mineralization on the flat north limb of the fold as the RW and Main Zones; the mineralization along the steep overturn south limb as the South Wall Zone.) As known in 2010, the mineralization has been traced along strike for 450 meters down to a depth of 525 meters and was open at both ends and down dip.

Constantine drilled 10 more holes in the summer of 2010 (Constantine Metal Resources Ltd., 2010). Some notable intercepts were 20.8 meters with 1.03 percent copper, 5.01 percent zinc, 0.14 gram of gold per tonne, and 11.3 grams of silver per tonne; and 10.15 meters with 0.70 percent copper, 6.51 percent zinc, 1.02 percent lead, 0.39 gram of gold per tonne, and 89.7 grams of silver per tonne. While noteworthy in themselves, the intercepts also give the general tenor of intercepts in the many holes drilled previously.

In 2014, Constantine drilled 5 holes to test a 400 meter by 400 meter target area modeled from borehole geophysical data. All 5 holes intersected significant mineralization, including drillhole CMR14-65, which yielded the widest intersection drilled to date – 89 meters grading 0.79 percent copper, 5.03 percent zinc, 21.1 grams of silver per tonne and 0.32 gram of gold per tonne. These results have extended the South Wall Zone a further 100 meters west and 50 meters lower in elevation (Constantine Metal Resources Ltd., 2014).

In 2016, Dowa funded a $3.7 million exploration program. Two holes were drilled at the CAP prospect (SK060) totaling 595 m; they intersected semi-massive pyrite, and intervals with anomalous silver and other pathfinder elements. Constantine also sampled rocks at the CAP (SK060), Nunatak (SK058), Gullies (SK070), MHC (SK068), Jag, Waterfall, Boundary (SK057), and Tsirku prospects and obtained many promising assays. Constantine completed environmental assessment work for the U.S. Bureau of Land Management and began construction of its Glacier Creek access road, which will connect the resource area to the Haines highway (Athey and Werdon, 2017).

Alteration:

Quartz-sericite-pyrite (phyllic) alteration and chloritic alteration developed within mafic metavolcanics (Greig and Giroux, 2010).

Age of mineralization:

Late Triassic by analogy with other similar deposits of that age along the length of southeastern Alaska and into Canada (Greig and Giroux, 2010).

Generic deposit model:

Deposit model:

Besshi- or Kuroko-type volcanogenic massive sulfide (Cox and Singer, 1986; models 24b or 28a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

24b or 28a

Production Status: None

Site Status: Active

Workings/exploration:

The deposit was discovered in 1969 by Merrill Palmer and associates and has been explored by a succession of companies. These include Alyu Mining in 1976 and 1977; Anaconda Minerals in 1979 and

1980; Southeastern Minerals from 1980 to 1983; Bear Creek Mining from 1983 to 1985; Newmont Exploration from 1987 to 1989; Granges Exploration Ltd. in 1989; Cominco Alaska from 1990 to 1993; Kennecott Minerals from 1993 to 1997, Rubicon Minerals from 1998 to 2000; and Toquima Minerals Corp. in 2004 (Greig and Giroux, 2010). It was also mapped and sampled by the U.S. Geological Survey (MacKevett, 1971; MacKevett and others, 1974) and the U.S. Bureau of Mines (Still, 1984) and by the Alaska Division of Geological and Geophysical Surveys (Still and others, 1991). In 2006, Constantine Metal Resources acquired the property under a long-term lease and began actively exploring it. Their work has included detailed geologic mapping and sampling and ground geochemical and geophysical surveys. Through 2009, they had drilled 32 holes totaling more than 12,000 meters. Constantine drilled 10 more holes in the summer of 2010 (Constantine Metal Resources Ltd., 2010).

Constantine drilled 10 more holes in 2013, targeting open edges of the South Wall and RW zones of the 2010 resource estimate, with step-out distances ranging from 30 to 100 meters. Focus was on targets at elevations above the 1,100 meter level. These holes provided further confirmation of the geological model. Highlights of results are 1) South Wall Zone I step-out hole CMR13-49 intersected 24.7 meters (80.9 feet) near true width of 2.02 percent copper, 8.47 percent zinc, 31.7 grams of silver per tonne and 0.51 gram of gold per tonne, and 2) drill holes CMR13-50, which intersected precious metal-rich RW Zone oxide mineralization including 37.5 meters (123 feet) of 123.2 grams of silver per tonne and 0.62 gram of gold per tonne. The intersection includes a partially unoxidized subinterval of 13.7 meters (45 feet) grading 0.51 percent copper, 4.97 percent zinc, 1.61 percent lead, 134.3 grams of silver per tonne and 0.71 gram of gold per tonne (Constantine Metal Resources Ltd., 2013).

As of September 29, 2014, Constantine's 2014 drill program had drilled 11 holes totaling approximately 6,913 meters, focused on increasing inferred mineral resources and expanding the footprint of the mineralized system. Five of the holes drilled were to test a 400 meter by 400 meter target area modeled from borehole geophysical data. All 5 holes intersected significant mineralization, including drillhole CMR14-65, which yielded the widest intersection drilled to date – 89 meters grading 0.79 percent copper, 5.03 percent zinc, 21.1 grams of silver per tonne and 0.32 gram of gold per tonne. These results have extended the South Wall Zone a further 100 meters west and 50 meters lower in elevation (Constantine Metal Resources Ltd., 2014).

In 2016, Dowa Metals and Mining Co., Ltd. completed its $22 million earn-in and has exercised its option to participate as a joint-venture partner on the Palmer project. Constantine Metal Resources Ltd. owns 51 percent participating interest and Dowa 49 percent, with Constantine as operator. In 2016, Dowa funded a $3.7 million exploration program. Two holes were drilled at the CAP prospect (SK060) totaling 595 m; they intersected semi-massive pyrite, and intervals with anomalous silver and other pathfinder elements. Constantine also sampled rocks at the CAP (SK060), Nunatak (SK058), Gullies (SK070), MHC (SK068), Jag, Waterfall, Boundary (SK057), and Tsirku prospects and obtained many promising assays. Constantine completed environmental assessment work for the U.S. Bureau of Land Management and began construction of its Glacier Creek access road, which will connect the resource area to the Haines highway (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

Greig and Giroux (2010) estimated the resources of the Glacier Creek prospect. Using a Net Smelter Return (NSR) cutoff of 50 US dollars, the RW and South Wall zones have an inferred resource of 4.750 million tonnes with an average grade of 1.84 percent copper, 4.57 percent zinc, 0.28 gram of gold per tonne, and 29.1 grams of silver per tonne; at a NSR of 75 US dollars, there is an inferred resource of 4.120 millions tonnes with an average grade of 2.01 percent copper, 4.79 percent zinc, 0.16 percent lead, 0.30 gram of gold per tonne, and 30.5 grams of silver per tonne; and at a NSR of 100 US dollars, the inferred resource is 3 million tonnes with an average grade of 2.31 percent copper, 5.14 percent zinc, 0.17 percent lead, 0.33 gram of gold per tonne, and 33.3 grams of silver per tonne.

At the Palmer project, Constantine Metal Resources Ltd. has delineated an inferred resource of 8.1 million tonnes at 1.41 percent Cu, 5.25 percent Zn, 31.7 grams of silver per tonne, and 0.32 gram of gold per tonne (Gray and Cunningham-Dunlop, 2015).

Additional comments:

References:

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Newberry, R.J., Crafford, T.C., Newkirk, S.R., Young, L.E., Nelson, S.W., and Duke, N.A., 1997, Volcanogenic massive sulfide deposits of Alaska, in Goldfarb, R.J. and Miller, L. D., eds., Mineral deposits of Alaska: Economic Geology Monograph 9, p. 120-150.

Still, J.C., 1984, Stratiform massive sulfide deposits in the Mt. Henry Clay area, southeast Alaska: U.S. Bureau of Mines Open-File Report 118-84, 65 p.

Primary Reference: Still, 1984; Constantine Metal Resources, Ltd., 2013

Reporter(s): T.C. Crafford (T. Crafford & Associates, Anchorage); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Little Jarvis; RW

Site type: Prospect

ARDF no.: SK067

Latitude: 59.4001 **Quadrangle:** SK B-4

Longitude: 136.4133

Location description and accuracy:

The Little Jarvis prospect is probably the prospect that Rubicon Minerals drilled in 1999 as the RW. It is of the east side of the Little Jarvis Glacier about 0.7 mile northwest of peak 1745 (meters) which is locally called Mt. Moorian. It is about 0.2 mile southwest of the center of section 33, T. 28 S., R. 55 E.

Commodities:

Main: Ag, Cu, Zn

Other: Au

Ore minerals: Barite, chalcopyrite, pyrite, sphalerite

Gangue minerals: Chlorite, quartz, sericite

Geologic description:

Mineralization in this area was discovered in 1969 by Merrill Palmer and associates and has been explored by a succession of companies including Alyu Mining in 1976 and 1977; Anaconda Minerals in 1979 and 1980; Southeastern Minerals from 1980 to 1983; Bear Creek Mining from 1983 to 1985; Newmont Exploration from 1987 to 1989; Granges Exploration Ltd. in 1989; Cominco Alaska from 1990 to 1993; Kennecott Minerals from 1993 to 1997, Rubicon Minerals from 1998 to 2000; and Toquima Minerals Corp. in 2004. It was also mapped and sampled by the U.S. Geological Survey (MacKevett 1974) and the U.S. Bureau of Mines (Still, 1984), and the Alaska Division of Geological and Geophysical Surveys (Still and others, 1991). In 2006, Constantine Metal Resources acquired the property under a long-term lease and they have been actively explored it to the present (early 2011). Their work has included detailed geologic mapping and sampling, ground geochemical and geophysical surveys, and through 2009 they had drilled 32 holes just a mile to the east on the Glacier Creek prospect (SK066). The Jarvis Creek prospect was probably found early in the history of the work in the area. Kennecott Minerals drilled one hole in 1994 and Rubicon Minerals Ltd. drilled 6 holes in 1999 under the name RW. It is now part of the large block of claims held by Constantine who call it the Little Jarvis prospect.

The rocks in the region are part of the Upper Triassic Hyd Group that hosts similar volcanic massive sulfide deposits the length of southeastern Alaska (Newberry and others, 1997). The rocks are predominantly massive and pillow basalts and fragmental basalt and andesite(?), intercalated with siltston, tuff, and rare rhyolite flows and dikes. They have been subject to greenschist-facies metamorphism; folding and faulting locally repeats the stratigraphy in places, and the rocks are highly altered.

The drilling by Rubicon Minerals in 1999 (Rubicon Minerals (1998) discovered massive sulfide mineralization. Mineralization intersected in drill holes occurs as: 1) chalcopyrite-sphalerite massive-sulfide mineralization, and 2) chalcopyrite-bearing, stringer in a zone of strong chloritic alteration. The massive-sulfide, drill-intersect thicknesses ranged from 7.2 feet to 15 feet and contained up to 13.48 percent zinc, 1.89 percent copper, 2.98 ounces of silver per ton, and 0.02 ounces of gold per ton. Massive-sulfide drill intercepts extend along a dip length of 420 feet. The stringer mineralization is beneath the massive sulfide horizon. One drill hole intersected 156 feet of stringer mineralization that included a 67.8-foot-thick interval with an average grade of 0.62 percent copper. In this interval, there was a 16.2-foot interval that contained 1.50 percent copper. There has not been any drilling on the Little Jarvis prospect since 1999, but there has

been extensive drilling and exploration on the nearby Glacier Creek prospect (SK066) where the RW zone is extensive. Although it is likely that the mineralization at this prospect is a continuation of the mineralization of the Glacier Peak prospect whose orientation is controlled by a large overturned east-west-trending antiform, recent mapping by Constantine (figure 8 of Greig and Giroux, 2010) suggests that the Little Jarvis mineralization trends north-northwest.

There have been several published studies of the mineral deposits in the area by government and academe (MacKevett and others, 1974; Still, 1984, Still and others, 1991; Newberry and others, 1997; Greig and Giroux, 2010) and unpublished studies by industry. The consensus from early on was that the they are Late Triassic, stratiform volcanogenic massive-sulfide deposits.

Alteration:

Intense sericitic and chloritic alteration associated with the layers of massive sulfides.

Age of mineralization:

Late Triassic by analogy with other similar deposits of that age along the length of southeastern Alaska and into Canada.

Generic deposit model:

Deposit model:

Kuroko- or Besshi-type volcanogenic massive-sulfide deposit (Cox and Singer, 1986; models 28a or 24b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 24b

Production Status: None

Site Status: Active

Workings/exploration:

Mineralization in this area was discovered in 1969 by Merrill Palmer and associates and has been explored by a succession of companies including Alyu Mining in 1976 and 1977; Anaconda Minerals in 1979 and 1980; Southeastern Minerals from 1980 to 1983; Bear Creek Mining from 1983 to 1985; Newmont Exploration from 1987 to 1989; Granges Exploration Ltd. in 1989; Cominco Alaska from 1990 to 1993; Kennecott Minerals from 1993 to 1997, Rubicon Minerals from 1998 to 2000; and Toquima Minerals Corp. in 2004. It was also mapped and sampled by the U.S. Geological Survey (MacKevett 1974) and the U.S. Bureau of Mines (Still, 1984), and the Alaska Division of Geological and Geophysical Surveys (Still and others, 1991). In 2006, Constantine Metal Resources acquired the property under a long-term lease and they have been actively explored it to the present (early 2011). Their work has included detailed geologic mapping and sampling, ground geochemical and geophysical surveys, and through 2009 they had drilled 32 holes just a mile to the east on the Glacier Creek prospect (SK066). The Jarvis Creek prospect was probably found early in the history of the work in the area. Kennecott Minerals drilled one hole in 1994 and Rubicon Minerals Ltd. drilled 6 holes in 1999 under the name RW. It is now part of the large block of claims held by Constantine who call it the Little Jarvis prospect. It has undoubtedly been mapped, sampled, and covered by geochemical and geophysical surveys by several of the companies that have worked in the area. It is now part of the large block of claims held by Constantine who call it the Little Jarvis prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Still, J.C., 1991, Bureau of Mines mineral investigations in the Juneau mining district, Alaska, 1984-1988; Volume 2, Detailed mine, prospect, and mineral occurrence descriptions, Section A, Haines-Klukwan-Porcupine subarea: U.S. Bureau of Mines of Mines Special Publication, 214 p.

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Still, J.C., Hoekzema, R.B., Bundtzen, T.K., Gilbert, W.G., Wier, K.R., Burns, L.E., and Fechner, S.A., 1991, Economic geology of Haines-Klukwan-Porcupine area, southeastern Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 91-4, 156 p., 5 sheets, scale 1:63,360.

Winkler, G.R., and MacKevett, E.M., Jr., 1970, Analyses of bedrock and stream-sediment samples from the Haines-Porcupine region, southeastern Alaska: U.S. Geological Survey Open-File Report 369, 91 p., 1 sheet, scale 1:125,000.

Primary Reference: Rubicon Minerals, 1999

Reporter(s): T.C. Crafford (T. Crafford & Associates, Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): MHC; Mount Henry Clay

Site type: Prospect

ARDF no.: SK068

Latitude: 59.3944 **Quadrangle:** SK B-4

Longitude: 136.4674

Location description and accuracy:

The MHC prospect consists of a 1/2-mile-long arcuate pattern of mineralized float below a small hanging glacier. Most of the mineralized float is between about 4,200 and 4,400 feet elevation in a narrow septum of rock and talus between glaciers. It is about 1 mile north-northeast of Mt. Henry Clay in section 3, T. 29 S., R. 53 E., of the Copper River Meridian. Figure 11 of Greig and Giroux (2010) is a geologic map of the prospect. The location is accurate within 500 feet.

Commodities:

Main: Ag, Au, Ba, Cu, Pb, Zn

Other:

Ore minerals: Barite, bornite, chalcopyrite, galena, gold, pyrite, sphalerite

Gangue minerals: Calcite, chlorite, epidote, quartz

Geologic description:

The MHC prospect was found at the base of a retreating glacier by Merrill Palmer in 1984 as numerous high-grade massive-sulfide boulders (Greig and Giroux, 2010).

The rocks in the region are part of the Upper Triassic Hyd Group that hosts similar volcanic massive sulfide deposits the length of southeastern Alaska (Newberry and others, 1997). The rocks are predominantly massive and pillow basalts and fragmental basalt and andesite(?), intercalated with siltstone, tuff, and rare rhyolite flows and dikes. They have been subject to greenschist-facies metamorphism; folding and faulting locally repeats the stratigraphy in places, and the rocks are highly altered.

Still (1984) reported that more than 30 high-grade sphalerite-barite-pyrite-chalcopyrite boulders up to 6 feet in diameter had been found in float over an area about 800 meters in diameter. Assays of the boulders varied. The highest grade contained 20 to 44 percent zinc, 5 percent barium, and several percent copper. No ore-grade mineralization was found in place but altered andesite in the area contained elevated zinc, copper, barium, lead, silver, and gold. None of 13 holes drilled by Kennecott, Granges, and Rubicon cut mineralization as high grade as the boulders (Greig and Giroux, 2010). Several of the drill holes intersected lower-grade mineralization in broad quartz-sericite-pyrite-chlorite alteration zones. The better intercepts were 49.1 meters with 0.19 percent copper, 10.7 meters with 0.44 percent copper, and 36.6 feet with 0.29 percent copper. Drilling by Stryker Resources and Freeport Resources nearby in Canada showed similar values (Still and others, 1991; Rosenkrans and Jones, 1985).

There have been several published studies of the mineral deposits in the area by government and academia (MacKevett and others, 1974; Still, 1984, Still and others, 1991; Newberry and others, 1997; Greig and Giroux, 2010) and unpublished studies by industry. The consensus from early on was that they are Late Triassic, stratiform volcanogenic massive-sulfide deposits.

Alteration:

Intense quartz-sericite-pyrite and chloritic alteration near mineralization (Greig and Giroux, 2010).

Age of mineralization:

Late Triassic by analogy with the many other similar deposits in Hyd Group rocks of that age spread along the length of southeastern Alaska and into Canada (Greig and Giroux, 2010).

Generic deposit model:

Deposit model:

Kuroko- or Besshi-type volcanogenic massive-sulfide deposit (Cox and Singer, 1986; models 28a or 24b)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 24b

Production Status: None

Site Status: Active

Workings/exploration:

The MHC prospect was found by Merrill Palmer in 1984 at the base of a retreating glacier as numerous high-grade massive-sulfide boulders. Subsequently, a succession of companies explored in the general area including Bear Creek Mining from 1983 to 1985; Newmont Exploration from 1987 to 1989; Granges Exploration Ltd. in 1989; Cominco Alaska from 1990 to 1993; Kennecott Minerals from 1993 to 1997, Rubicon Minerals from 1998 to 2000; and Toquima Minerals Corp. in 2004 (Greig and Giroux, 2010). Kennecott Exploration drilled 7 holes at MHC; Ganges Exploration Ltd. drilled 4 holes, and Rubicon Minerals Corp. drilled 2 holes. The holes totaled 2,957 feet. The area was also mapped and sampled by the U.S. Geological Survey (MacKevett and other, 1974) and the U.S. Bureau of Mines (Still, 1984) and the Alaska Division of Geological and Geophysical Surveys (Still and others, 1991). In 2006, Constantine Metal Resources Ltd. acquired the property under a long-term lease and began actively exploring it. Their work has included detailed geologic mapping and sampling, ground geochemical and geophysical surveys (Greig and Giroux, 2010). In 1985, Stryker Resources drilled 5 holes totaling 2,787 feet in length on extensions of this prospect on the Canadian side of the border (Still and others, 1991; Rosenkrans and Jones, 1985).

In 2013, Constantine conducted a two day massive sulfide boulder survey where the glacier had retreated; 311 samples were counted. These boulders were newly exposed and 'upstream' from the samples collected by the US Bureau of Mines in 1985 where the average of 26 boulders sampled were 19.3 percent zinc, 1.0 percent copper, 0.22 gram of gold per tonne and 38.2 grams of silver per tonne (individual boulders up to 6 feet in diameter) (Constantine Metal Resources Ltd., 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Constantine Metal Resources Ltd., 2014, Corporate Presentation February 2014: http://constantinemetals.com/_resources/presentations/CEM_Presentation.pdf (as of Sept. 16, 2014).

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Greig, C.J., and Giroux, G.H., 2010, Palmer VMS project, southeast Alaska; Mineral resource estimation and exploration update: Technical l report for Constantine Metal Resources Ltd. 82 p. (posted on www.

sedar.com, Mar. 8, 2010) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00023827&fileName=/csfsprod/data104/filings/01543498/00000001/C%3A%5CSEDAR%5CCEM_Filings%5CPalmer_43-101_Rept_CEM_2010.pdf (as of December 24, 2014).

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Still, J.C., Hoekzema, R.B., Bundtzen, T.K., Gilbert, W.G., Wier, K.R., Burns, L.E., and Fechner, S.A., 1991, Economic geology of Haines-Klukwan-Porcupine area, southeastern Alaska: Alaska Division of

Primary Reference: Still, 1984; Constantine Metal Resources, Ltd., 2014

Reporter(s): T.C. Crafford (T. Crafford & Associates, Anchorage); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-24

Site name(s): Unnamed (on west side of Little Jarvis Glacier)

Site type: Prospect

ARDF no.: SK069

Latitude: 59.4095 **Quadrangle:** SK B-4

Longitude: 136.4258

Location description and accuracy:

This prospect is about 3 miles northeast of the summit of Mt. Henry Clay at an elevation of approximately 3,500 feet. It is near the southeast corner of section 29, T. 28 S., R. 53 E. Still and others (1991) informally named this the Little Jarvis prospect For this record, it is not named to distinguish it from the better known prospect of that name to the southeast on the other side of the Little Jarvis Glacier (SK067).

Commodities:

Main: Ag, Au, Ba, Cu, Pb, Zn

Other:

Ore minerals: Barite, galena, pyrite, sphalerite

Gangue minerals:

Geologic description:

Still and others (1991) describe this prospect as small discontinuous sulfide bands in metasedimentary and metavolcanic rocks. Their samples contained up to 0.345 parts per million (ppm) gold, 11.8 ppm silver, 13.6 percent zinc, 1,900 ppm copper, 3.8 percent lead, 1.44 percent barium, and 2,000 ppm arsenic. This prospect is not specifically mentioned in Greig and Giroux (2010). However, it is at the southeast end of a 3-mile-long line of massive sulfide occurrences and they suggest that all of the volcanic massive sulfide deposits in this area are related, if they were not originally continuous.

The rocks in the region are part of the Upper Triassic Hyd Group that hosts similar volcanic massive sulfide deposits the length of southeastern Alaska (Newberry and others, 1997). The rocks are predominantly massive and pillow basalts and fragmental basalt and andesite(?), intercalated with siltston, tuff, and rare rhyolite flows and dikes. They have been subject to greenschist-facies metamorphism; folding and faulting locally repeats the stratigraphy in places, and the rocks are highly altered.

There have been several published studies of the mineral deposits in the area by government and academe (MacKevett and others, 1974; Still, 1984, Still and others, 1991; Newberry and others, 1997; Greig and Giroux, 2010) and unpublished studies by industry. The consensus from early on was that the they are Late Triassic, stratiform volcanogenic massive-sulfide deposits.

Alteration:

Age of mineralization:

Late Triassic by analogy with other similar deposits of that age along the length of southeastern Alaska and into Canada.

Generic deposit model:

Deposit model:

Probably a Besshi- or Kuroko-type volcanogenic massive sulfide (Cox and Singer, 1986; models 28a or 24b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 24b

Production Status: None

Site Status: Active

Workings/exploration:

The only published record of work at this prospect was sampling by Still (1991). However, it is in a large block of claims in an area that has been intensely explored by government and industry for several decades (Greig and Giroux, 2010).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Greig, C.J., and Giroux, G.H., 2010, Palmer VMS project, southeast Alaska; Mineral resource estimation and exploration update: Technical l report for Constantine Metal Resources Ltd. 82 p. (posted on www.sedar.com, Mar. 8, 2010).

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Rubicon Minerals, 1999, Press releases from 1999 drill exploration program: Internet site of Rubicon Minerals Corporation, Vancouver, British Columbia (http://www.rubiconminerals.com)

Still, J.C., 1984, Stratiform massive sulfide deposits in the Mt. Henry Clay area, southeast Alaska: U.S. Bureau of Mines Open-File Report 118-84, 65 p.

Still, J.C., Hoekzema, R.B., Bundtzen, T.K., Gilbert, W.G., Wier, K.R., Burns, L.E., and Fechner, S.A., 1991, Economic geology of Haines-Klukwan-Porcupine area, southeastern Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 91-4, 156 p., 5 sheets, scale 1:63,360.

Primary Reference: Still and others, 1991

Reporter(s): T.C. Crafford (T. Crafford & Associates, Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Gullies; Jarvis Glacier Gulches

Site type: Occurrences

ARDF no.: SK070

Latitude: 59.4204 **Quadrangle:** SK B-4

Longitude: 136.4517

Location description and accuracy:

The Gullies prospect includes several mineralized exposures on the south side of the Jarvis Glacier in a steep walled canyon about 4 miles east-southeast of the Pleasant Camp border station on the Haines Highway. They are in the NE1/4, section 30, T. 28 S., R. 53 E. The prospect was informally called the 'Jarvis Glacier Gulches' prospect by Still and others (1991); Constantine Metal Resources Ltd. (2008) called it the Gullies prospect.

Commodities:

Main: Ag, Au, Ba, Cu, Pb, Zn

Other:

Ore minerals: Barite, chalcopyrite, galena, goethite, gold, pyrite, pyrrhotite, sphalerite

Gangue minerals: Calcite, chlorite, quartz

Geologic description:

Sulfide float found by the U. S. Bureau of Mines at the mouth of a steep north-draining canyon led to the initial discovery of some of the occurrences in August, 1983. Other occurrences were discovered by Alyu Mining Corporation in September, 1983.

According to Still (1984), the occurrences are located in the Little Jarvis volcanic-sedimentary sequence that consists of basalt, andesite, and metasediments and slate and limestone (Redman, 1983). Most of the occurrences are in slate, limestone and andesite, capped by andesite and pillow basalt. The Little Jarvis sequence probably correlate with the Glacier Creek sequence which hosts the Glacier Creek prospect (SK066) (Redman, 1983). They are part of the Late Triassic Hyd Group which hosts similar deposits the length of southeastern Alaska and into Canada(Newberry and others, 1997).

Still (1984) describes a mineralized exposure at an elevation of about 3,600 feet on the southwest side of the canyon (his number 109 on figure 8). The exposure consits of a zone of metasediments and andesite altered to chlorite that contains lenses of massive and disseminated sulfides. The zone follows bedding, is up to 5 feet thick, and contains massive-sulfide lenses up to 0.5 foot thick. It can be traced at least 100 feet. The sulfide lenses consist of pyrite, sphalerite, chalcopyrite, and galena in calcite- and quartz-rich rock. Samples contained up to 17.8 percent zinc, 0.3 percent lead, 1.3 percent copper, 11.56 parts per million (ppm) silver, and 0.163 ppm gold (Still, 1984; Still and others, 1991). On the northeast side of the canyon at an elevation of 3,200 feet are quartz-stringer zones and sulfide zones. Samples of the sulfide zones contained up to 6.1 percent zinc, 0.76 percent copper, 110 ppm cobalt, 4.64 ppm silver, and 0.127 ppm gold (Still, 1984; Still and others, 1991).

Greig and Giroux (2010) note that this mineralization may be the northwest extension of the important RW and South Wall mineralized horizons at the Glacier Creek prospect (SK066) about 3 miles to the southeast. Their map (figure 5) also shows that these mineral occurrences extend northwest for about 3 kilometers to the Little Jarvis Glacier and ARDF site SK069.

There have been several published studies of the mineral deposits in the area by government and academe (MacKevett and others, 1974; Still, 1984, Still and others, 1991; Newberry and others, 1997; Greig and Giroux, 2010) and unpublished studies by industry. The consensus from early on was that the they are Late

Triassic, stratiform volcanogenic massive-sulfide deposits.

Alteration:

Chloritic.

Age of mineralization:

Late Triassic by analogy with the many other similar deposits of that age spread along the length of southeastern Alaska and into Canada.

Generic deposit model:

Deposit model:

Probably a Kuroko- or Besshi-type volcanogenic massive sulfide system with associated veining (Cox and Singer, 1986; models 28a or 24b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 24b

Production Status: None

Site Status: Active

Workings/exploration:

Sulfide float found by the U.S. Bureau of Mines lead to the initial discovery of some of these occurrences here in August, 1983. Other occurrences were discovered by Alyu Mining Corporation in September, 1983. The deposit has probably been visited and sampled by several of the succession of companies who have worked in the area. It has not been drilled.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Constantine Metal Resources Ltd., 2008, Palmer property info: http://www.constantinemetals.com/projects/palmer/palmer/ (as of April 9, 2008).

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Greig, C.J., and Giroux, G.H., 2010, Palmer VMS project, southeast Alaska; Mineral resource estimation and exploration update: Technical l report for Constantine Metal Resources Ltd. 82 p. (posted on www.sedar.com, Mar. 8, 2010).

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Primary Reference: Still, 1984; Constantine Metal Resources, Inc., 2008

Reporter(s): T.C. Crafford (T. Crafford & Associates, Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): 737 Zone

Site type: Prospect

ARDF no.: SK079

Latitude: 59.399 **Quadrangle:** SK

Longitude: 136.3731

Location description and accuracy:

The 737 prospect is about 0.7 mile north of the terminus of the Saksaia Glacier at an elevation of about 3,200 feet. It is about 0.5 mile east-southeast of the center of section 34, T. 28 S., R. 54 E. The location is accurate.

Commodities:

Main: Ag, Pb, Zn

Other:

Ore minerals: Galena, sphalerite

Gangue minerals: Calcite, quartz

Geologic description:

The 737 Prospect was first identified as a volcanogenic, massive-sulfide deposit by Constantine Metal Resources (2008); it is one of several along a well defined belt of similar Upper Triassic deposits that extend southeast for about 5 miles from unnamed prospects near the Jarvis Glacier (SK070), through the Little Jarvis Glacier prospect (SK069), the RW Zone (SK067) , the Main Zone prospect (SK066), and the 737 prospect, to the Red Creek prospect (SK063). Relatively little is known about the 737 prospect specifically although it clearly is similar to others along the belt. It is on a Pulse EM, geophysical anomaly that indicated a buried massive-sulfide deposit. One drill hole on the 737 prospect did not intersect mineralization but a surface sample collected across 0.5 feet of massive sulfides contained 12.0 percent zinc, 2.66 percent lead, and 47.6 gram of silver per ton.

Alteration:

None specifically noted.

Age of mineralization:

Late Triassic; correlative with similar deposits nearby along a belt of massive-sulfide mineralization.

Generic deposit model:

Deposit model:

Probably a Besshi- or Kuroko-type volcanogenic massive sulfide (Cox and Singer, 1986; models 28a or 24b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a or 24b

Production Status: None

Site Status: Active

Workings/exploration:

Sampled at the surface and covered by a pulse EM geophysical survey. One hole drilled in 1998.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Constantine Metal Resources Inc., 2008, Other: http://www.constantinemetals.com/projects/palmer/other/ (as of April 8, 2008).

Primary Reference: Constantine Metal Resources Inc., 2008 (Other)

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Koyana Creek

Site type: Mine

ARDF no.: SO004

Latitude: 64.5703 **Quadrangle:** SO C-4

Longitude: 163.6712

Location description and accuracy:
A limited amount of mining at unknown locations took place along Koyana Creek until about 1930. Koyana Creek is a small drainage that flows south to Norton Sound; the mouth of the creek is about 2.5 miles east of the old town of Bluff at the mouth of Daniels Creek. The location is accurate.

Commodities:

Main: Au

Other: Hg

Ore minerals: Cinnabar, gold

Gangue minerals:

Geologic description:
Small-scale placer mining took place on Koyana Creek in the early part of the 1900s (Collier, 1908) and between 1928 and 1930 (Cobb, 1978). The placer deposits were shallow and apparently low grade. Mulligan (1971) estimates that less than 100 ounces of gold were produced. Cinnabar was recovered in the placer concentrates (Cathcart, 1922). Bedrock in the area is a lower Paleozoic metasedimentary sequence that includes marble and schist (Till and others, 1986). As of early 2010, there has apparently not been any placer mining on Koryana Creek for decades but it is on a large block of ground that was being explored for its lode gold potential by Millrock Resources Inc. (2010). Much of the creek is only slightly above the present sea level and the placer deposits may have been reworked by Quaternary sea level fluctuations.

Alteration:

Age of mineralization:
Quaternary. Much of the creek is only slightly above the present sea level and the placer deposits may have been reworked by Quaternary sea level fluctuations.

Generic deposit model:
Placer deposits (Garnett and Bassett, 2005)

Deposit model:
Placer Au-PGE (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Small open-cut placer mining until about 1930. As of early 2010, there has apparently not been any placer mining on Koryana Creek for decades but it is on a large block of ground that was being explored for its lode gold potential by Millrock Resources Inc. (2010).

Production notes:

Mulligan (1971) estimates that less than 100 ounces of gold were produced.

Reserves:

None.

Additional comments:

References:

Cathcart, S.H., 1922, Metalliferous lodes in southern Seward Peninsula: U.S. Geological Survey Bulletin 722-F, p. 163-261.

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Collier, A.J., Hess, F.L., Smith, P.S., and Brooks, A.H., 1908, The gold placers of parts of Seward Peninsula, Alaska, including the Nome, Council, Kougarok, Port Clarence, and Goodhope precincts: U.S. Geological Survey Bulletin 328, 343 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

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Stevens, D.L., 2010, Bluff Gold prospect, Seward Peninsula, western Alaska: NI43-101 Technical Report for Millrock Resources Inc., 153 p. (posted on www.sedar.com on February 4, 2010).

Primary Reference: Stevens, 2010

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Swede Creek

Site type: Mine

ARDF no.: SO005

Latitude: 64.5681 **Quadrangle:** SO C-4

Longitude: 163.7002

Location description and accuracy:
Swede Creek (Gulch) is a small, 0.4 mile long drainage that flows south to Norton Sound, 1.7 miles east of Bluff. It is about 0.5 mile east of the center of section 5, T. 11 S., R. 25 W. The location is accurate.

Commodities:

Main: Au

Other: Hg

Ore minerals:

Gangue minerals:

Geologic description:
Placer gold was discovered on Swede Creek between 1900 and 1902 (Collier and others, 1908) but most mining was between 1918 and WW II (Mulligan, 1971). The placer workings were shallow and extended 600 feet upstream from the steep sea cliffs along Norton Sound (Herreid, 1965). The documented gold production from Swede Creek is less than 1,000 ounces but the extent of the workings suggested to Mulligan (1971) that production could have been greater. Bedrock in the area is Paleozoic marble to both sides of a wide band of schist (Herreid, 1965; Mulligan, 1971; Till and others, 1986). Cinnabar was reported in the placer deposits as early as 1922 (Cathcart, 1922) and a lode cinnabar deposit (SO133) was subsequently identified within about a hundred feet of the point that Swede Creek cascades down the almost vertical sea cliffs that are several hundred feet high.

Alteration:

Age of mineralization:
Quaternary.

Generic deposit model:
Placer deposits (Garnett and Bassett, 2005)

Deposit model:
Placer gold (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The placer workings were shallow and extend about 600 feet upstream from the coastal bluff (Herreid, 1965).

Production notes:

The documented gold production from Swede Creek is less than 1,000 ounces but the extent of the workings suggested to Mulligan (1971) that production could have been greater.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Solomon quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-181, 185 p.

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Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Herreid, G.H., 1965, Geology of the Bluff area, Solomon quadrangle, Seward Peninsula, Alaska: Alaska Division of Geological and Geophysical Surveys Geological Report 10, 21 p., 1 sheet, scale 1:40,000.

Millrock Resources Inc., 2010, Bering Straits Native Corporation Lands: http://www.millrockresources.com/index.php/projects/bering_straits/ (as of Feb 10, 2010).

Mulligan, J.J., 1971, Sampling gold lode deposits, Bluff, Seward Peninsula, Alaska, with a section on petrography by Walter L. Gnagy: U.S. Bureau of Mines Report of Investigations 7555, 40 p.

Stevens, D.L., 2010, Bluff Gold prospect, Seward Peninsula, western Alaska: NI43-101 Technical Report for Millrock Resources Inc., 153 p. (posted on www.sedar.com on February 4, 2010).

Till, A.B., Dumoulin, J.A., Gamble, B. ., Kaufman, D.S., and Carroll, P.I., 1986, Preliminary geologic map and fossil data, Solomon, Bendeleben, and southern Kotzebue quadrangles, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 86-276, 10 p., 3 plates, scale 1:250,000.

Primary Reference: Mulligan, 1971; Stevens, 2010

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Daniels Creek

Site type: Mine

ARDF no.: SO006

Latitude: 64.5727 **Quadrangle:** SO C-4

Longitude: 163.7447

Location description and accuracy:

Daniels Creek, a famous early placer on the Seward Peninsula, enters Norton Sound at the now-abandoned settlement of Bluff. About 3,000 feet was placer mined above the mouth of the creek. There was also considerable early mining in the beach sands at its mouth. During the 1930s there was considerable mining offshore in the winter through the ice to exploit the offshore extension of Daniels Creek into Norton Sound. Most of the mining took place through the center of the southeast quarter of section 32, T. 10 W., R. 25 W. The location is accurate.

Commodities:

Main: Au

Other: Hg, W

Ore minerals: Cinnabar, gold, scheelite

Gangue minerals:

Geologic description:

Placer gold was discovered in beach sand at the mouth of Daniels Creek in 1899 but within a year the beach placer was largely mined out (Brooks and others, 1901; Mulligan, 1971). Placer gold was soon discovered on Daniels Creek but little mining took place until water was brought in by an extensive ditch system. This supported hydraulic mining. Most of the mining took place in the lower 3,000 feet or so of the creek which flows on Paleozoic marble. The marble bedrock is characterized by irregular solution channels, crevices, sink holes, pits, and collapsed caverns that are in places tens of feet deep and below sea level. The mining was probably difficult and Mulligan (1971) notes the many buckets left along Daniels Creek that were used in mining the sink holes, pits, and caverns. In addition to the usual magnetite and ilmenite, the placer concentrates contained abundant cinnabar and some scheelite. (Onshore) Daniels Creek was probably largely mined out by World War I.

As early as 1901, it was known that the channel of Daniels Creek continued offshore as miners had cut holes in the ice in the winter and sent divers down to mine (Spence, 1996). By the 1930s, the marine extension of Daniels Creek was being mined through the ice in the winter with churn drills and drag lines through a system of hoists, towers, and cableways. Apparently, the sink holes and pits of the onshore portion Daniels Creek persisted in its extension in Norton Sound; this made the mining difficult and hindered gold recovery. The winter, offshore mining persisted until about the beginning of World War II.

Mulligan (1971) notes 4 phases of the gold mining on Daniels Creek and its marine extension. From 1899 to 1900, about 30,000 ounces of gold was produced, largely from the beach placers. From 1900 to 1920, about 45,000 ounces of gold was produced, almost all from the onshore portion of Daniels Creek. From 1920 to 1940, about 16,500 ounces of gold was produced, most from the marine extension of Daniels Creek. Perhaps another 60 ounces was produced from 1940 to 1965 from the onshore channel of Daniels Creek and beach placers. Thus the total gold production from Daniels Creek and its marine extension is about 90,000 ounces of gold.

The Daniels Creek placer was rich but allowing that it is short, it is well defined, and the intensity of the prospecting and mining effort was so great, is unlikely that there is any substantial amount of placer gold

remaining in (onshore) Daniels Creek. However, there were attempts during the 1970s at offshore mining using various dredge technology. None were successful and the remains of a large screw dredge on a barge rusts on the beach a few hundred yards west of the mouth of Daniels Creek (D.J. Grybeck, personal observation, 2008). As of early 2010, there is no placer mining or exploration on Daniels Creek; however, it is in a large block of ground that is being explored by Millrock Resources Inc. for lode gold (Stevens, 2010; Millrock Resources Inc., 2010). The head of Daniels Creek is one of the important targets (SO177) of the lode exploration as well as being a potential source for the placer gold in lower Daniels Creek.

Alteration:

Age of mineralization:

Quaternary; the placer deposits have clearly been influenced by Quaternary sea level fluctuations.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Beach placer; marine channel placer, alluvial placer (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; medium

Site Status: Active

Workings/exploration:

Placer gold was discovered in beach sand at the mouth of Daniels Creek in 1899 but within a year the beach placer was largely mined out (Brooks and others, 1901; Mulligan, 1971). Placer gold was soon discovered on Daniels Creek but little mining took place until water was brought in by an extensive ditch system. This supported hydraulic mining. Most of the mining took place in the lower 3,000 feet or so of the creek which flowed on Paleozoic marble. The marble bedrock is characterized by irregular solution channels, crevices, sink holes, pits, and collapsed caverns that are in places tens of feet deep and below sea level. The mining was probably difficult and Mulligan (1971) notes the many buckets left along Daniels Creek that were used in mining the sink holes, pits, and caverns. In addition to the usual magnetite and ilmenite, the placer concentrates contained abundant cinnabar and some scheelite. (Onshore) Daniels Creek was probably largely mined out by World War I. As early as 1901, it was known that the channel of Daniels Creek continued offshore as miners had cut holes in the ice in the winter and sent divers down to mine (Spence, 1996). By the 1930s, the marine extension of Daniels Creek was being mined through the ice in the winter with churn drills and drag lines through a system of hoists, towers, and cableways. The winter, offshore mining persisted until about the beginning of World War II.

Production notes:

Mulligan (1971) notes 4 phases of the gold mining on Daniels Creek and its marine extension. From 1899 to 1900, about 30,000 ounces of gold was produced, largely from the beach placers. From 1900 to 1920, about 45,000 ounces of gold was produced, almost all from the onshore portion of Daniels Creek. From 1920 to 1940, about 16,500 ounces of gold was produced, most from the marine extension of Daniels Creek. Perhaps another 60 ounces was produced from 1940 to 1965 from the onshore channel of Daniels Creek and beach placers. Thus the total gold production from Daniels Creek and its marine extension is about 90,000 ounces of gold.

Reserves:

The Daniels Creek placer was rich but allowing that it is short, it is well defined, and the intensity of the prospecting and mining effort was so great, is unlikely that there is any substantial amount of placer gold

remaining in (onshore) Daniels Creek. However, there were attempts during the 1970's at offshore mining using various dredge technology. None were successful and the remains of a large screw dredge on a barge rusts on the beach a few hundred yards west of the mouth of Daniels Creek (D.J. Grybeck, personal observation, 2008).

Additional comments:

References:

Brooks, A.H., Richardson, G.B., Collier, A.J., and W.C. Mendenhall, 1901, A reconnaissance in the Cape Nome and adjacent gold fields of Seward Peninsula, Alaska, in 1900: U.S. Geological Survey Special Publication, p. 1-185, maps.

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Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Herreid, G.H., 1965, Geology of the Bluff area, Solomon quadrangle, Seward Peninsula, Alaska: Alaska Division of Geological and Geophysical Surveys Geological Report 10, 21 p., 1 sheet, scale 1:40,000.

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Till, A.B., Dumoulin, J.A., Gamble, B. ., Kaufman, D.S., and Carroll, P.I., 1986, Preliminary geologic map and fossil data, Solomon, Bendeleben, and southern Kotzebue quadrangles, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 86-276, 10 p., 3 plates, scale 1:250,000.

Primary Reference: Stevens, 2010

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Big Hurrah

Site type: Mine

ARDF no.: SO023

Latitude: 64.6514 **Quadrangle:** SO C-5

Longitude: 164.2398

Location description and accuracy:

The Big Hurrah mine is located on the south side of Big Hurrah Creek (SO022) and the east side of Little Hurrah Creek at an elevation of about 275 feet. It is about 1/4 mile southeast of the confluence of Little and Big Hurrah creeks. It is locality 17 of Cobb (1972, MF 445; 1978, OF 78-181).

Commodities:

Main: Au

Other: Ag, Cu, W, Zn

Ore minerals: Arsenopyrite, chalcopyrite, electrum, gold, pyrite, scheelite, sphalerite

Gangue minerals: Albite, carbonate, quartz, sericite

Geologic description:

The Big Hurrah mine has been the most productive lode gold mine on the Seward Peninsula to date. Gold-quartz veins in slaty graphitic schist produced about 27,000 ounces of gold (Read and Meinert, 1986) primarily between 1903 and 1907, when a 20-stamp mill was in operation (Smith, 1910). The ore that was mined averaged a little less than 1 ounce of gold per ton (Cobb, 1978); six samples collected underground in 1952 from the 70 foot level contained 0.08 to 5.2 ounces of gold per ton and 0.5 to 17.2 ounces of silver per ton (Asher, 1969). The mill tailings were cyanided and there were attempts to restart underground mining in the 1950s. A fire and unstable ground prevented further underground work and all workings are now (2007) flooded. However, considerable core drilling and surface trenching has taken place in recent years, primarily in the 1980s.

NovaGold Resources, Inc. (2006) acquired the Big Hurrah deposit in mid-2004. In 2004 and 2005, they drilled a total of 17,750 meters in 292 core and rotary holes. The objective was to define an open-pittable resource of 100,000 to 200,000 ounces of gold in ore that contains 5 to 7 grams of gold per ton. Production of this resource is being evaluated as part of the Rock Creek (NM207) feasibility study. In this scenario, the Big Hurrah ore would be trucked 48 miles to the proposed Rock Creek mill for processing. As of March 28, 2007, NovaGold (2007) listed a measured and indicated resource in the Big Hurrah mine as 1.8 millions tons of ore with a grade of 4.61 grams of gold per metric ton; there was an additional inferred resource of 0.6 million tons of material with a grade of 3.05 grams of gold per metric ton.

Read and Meinert (1986) describe five types of veins: 1) quartz +/- carbonate lenses, 2 to 7 centimeters thick, locally contain minor sphalerite, chlorite and arsenopyrite; 2) quartz, carbonate, pyrite, sphalerite and chalcopyrite form tabular veins 2 to 5 millimeters thick; 3) ribbon quartz veins up to 4 meters wide that average about 0.5 meters wide occupy NW-trending faults and contain more than 90 percent quartz, dolomite, albite, sericite, scheelite, arsenopyrite, pyrite and native gold; the total sulfide content is less than 2 to 3 percent and scheelite is less than 1 percent; 4) quartz-albite +/- arsenopyrite veins 5 to 25 centimeters wide contain up to 25 percent albite, up to 20 percent arsenopyrite and minor gold; thought to be syngenetic; 5) post-mineralization carbonate-quartz veinlets 2 to 3 millimeters thick that cut all other vein types. Coats (1944) estimated that the scheelite content of gold ore that remained in the bins was 0.25 percent by volume. Some veins are up to several hundred feet long; the larger veins strike northwest and dip southwest (Asher, 1969, DGGS R33). Fluid inclusion data from these veins indicate multiple generations of fluids; early veins

contain CO_2-CH_4 and later veins are rich in H_2O-NaCl. Homogenization temperatures vary from 390 to 90 degrees C. The available data suggests that the gold-bearing fluids were produced by regional metamorphic processes. The country rock is part of a lower Paleozoic metasedimentary assemblage (Sainsbury and others, 1972; Till and others, 1986) that includes a distinctive black, very fine-grained, graphitic schist that early workers called the Hurrah Slate.

The Big Hurrah veins are probably similar in age to some other gold-quartz veins of southern Seward Peninsula. The other southern Seward Peninsula lode gold deposits formed as a result of mid-Cretaceous metamorphism (Apodoca, 1994; Ford, 1993, Ford and Snee, 1996; Goldfarb and others, 1997) that accompanied regional extension (Miller and Hudson, 1991) and crustal melting (Hudson, 1994). This higher temperature metamorphism was superimposed on high pressure/low temperature metamorphic rocks of the region.

Alteration:

Silicification, carbonatization, and development of quartz-carbonate stockworks.

Age of mineralization:

Cretaceous?

Generic deposit model:

Deposit model:

Gold-quartz vein in metamorphic rocks; low sulfide-Au quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

A 60-degree inclined shaft extended to the 250 foot level; there are about 1,800 feet of lateral workings developed off it on the 70, 150, and 250 foot-levels. In 1954, a 105-foot-long sublevel was driven at 20 feet below the 150-East level (Asher, 1969, DGGS R33). There are also numerous surface prospecting pits and trenches on the property.

NovaGold Resources, Inc. acquired the Big Hurrah deposit in mid-2004. In 2004 and 2005, they drilled a total of 17,750 meters in 292 core and rotary holes. The objective is to define an open-pittable resource of 100,000 to 200,000 ounces of gold in ore that contains 5 to 7 grams of gold per ton. Production of this resource is being evaluated as part of the Rock Creek (NM207) feasibility study. In this scenario, the Big Hurrah ore would be trucked 48 miles to the proposed Rock Creek mill for processing.

Production notes:

The Big Hurrah mine is the only lode gold mine on Seward Peninsula. The gold-quartz veins in slaty graphitic schist produced about 27,000 ounces of gold (Read and Meinert, 1986), primarily between 1903 and 1907, when a 20-stamp mill was in operation (Smith, 1910).

Reserves:

As of March 28, 2007, NovaGold (2007) listed a measured and indicated resource in the Big Hurrah mine as 1.8 millions tons of ore with a grade of 4.61 grams of gold per metric ton; there was an additional inferred resource of 0.6 milllion tons of material with a grade of 3.05 grams of gold per metric ton.

Additional comments:

References:

Apodoca, L.E., 1994, Genesis of lode gold deposits of the Rock Creek area, Nome mining district, Seward Peninsula, Alaska: Boulder, Colorado, University of Colorado, Ph.D. dissertation, 208 p.

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NovaGold Resources Inc., 2007 (Reserve): (http://www.novagold.net/i/pdf/NGReserve_ResourceTable.pdf (March, 2007).

Read, J.J., and Meinert, L.D., 1986, Gold-bearing quartz vein mineralization at the Big Hurrah mine, Seward Peninsula, Alaska: Economic Geology, v. 81, p. 1760-1774.

Sainsbury, C.L., Hudson, T.L., Ewing, R., and Marsh, W.R., 1972, Reconnaissance geologic maps of the Solomon D-5 and C-5 quadrangles, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 511, 12 p., 2 sheets, scale 1:63,360.

Smith, P.S., 1910, Geology and mineral resources of the Solomon and Casadepaga quadrangles, Seward Peninsula, Alaska: U.S. Geological Survey Bulletin 433, 234 p.

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Primary Reference: Read and Meinert, 1986

Reporter(s): Travis L. Hudson (Applied Geology, Inc.)

Last report date: 2005-10-10

Site name(s): Wheeler

Site type: Mine

ARDF no.: SO132

Latitude: 64.9775 **Quadrangle:** SO D-6

Longitude: 164.6444

Location description and accuracy:

This prospect is on the Pilgrim River just below the mouth of Iron Creek. It is cut into two parts, one north of the river and the other south. The coordinates are at the north part about 0.7 mile southeast of the center of section 12, T. 6 S., R. 30 W. The location is accurate.

Commodities:

Main: Ag, Au, Pb, Zn

Other:

Ore minerals: Boulangerite?, galena, pyrite, sphalerite

Gangue minerals: Ankerite?, calcite, quartz

Geologic description:

This locality has two parts, one on each side of the Pilgrim (Kruzgamepa) River, just downstream from the mouth of Iron Creek (SO127). They are separated by 1,000 feet of the Pilgrim River floodplain. The mineralization on the north side of the river consists of lenses of massive galena in marble near a contact with schist (Smith, 1908). One lens exposed over a distance of 3 feet in a prospect trench contain pyrite, finely crystalline galena, and minor sphalerite. A 2-foot sample across the highest-grade part contained 0.30 ounce of gold per ton, 2.3 ounces of silver per ton and 2.95 percent lead (Asher, 1969). Two samples reported by the owner contained 22.87 percent lead and 20.0 ounces of silver per ton and 14.2 percent lead and 14.5 ounces of silver per ton. The deposits on the south side of the river also include discontinuous lenses of massive galena. An 8- to 10-foot long, 6-foot wide,and 1.5-foot- thick lens of pyrite, fine galena, and limonite with siliceous marble, calcite, and quartz gangue was mined from a 25-foot-long adit and a few tons of ore were apparently shipped. Some boulangerite may also be present (Sainsbury and others, 1972). Pb-isotope analysis of one galena sample gave results identical to samples from the Red Dog (DL001) and Drenchwater Creek (DL002-004) deposits of the western Brooks Range (Church and others, 1985). The mineralization is preferentially developed in the marble but nearby quartz mica schist contains pyrite. The schist/marble contacts appear sheared (Cathcart, 1922). The massive galena is described as a replacement of the host marble (Smith, 1908).

Till and others (2011) map the host rocks as part of the Devonian Nome Complex that consists of pelitic, calcareous, and graphitic schist. Slack and others (2011) reject a volcanogenic massive sulfide origin for the deposit. Their work on this and similar deposits in the Nome Complex indicates that the protolith of the metamorphic rocks that host the deposits are sedimentary and they see no evidence of volcanic rocks associated with them. They base their conclusion: 1) sulfur isotope analysis of the sulfides that indicate a marine origin for the sulfur, 2) isotopic analysis of the barite in some of the deposits that indicate the probable source of the sulfur is Devonian or Mississippi(?) sea water, and 3) whole-rock analyses of the host rocks of the mineralization that indicate that they were originally clastic sedimentary rocks. They propose a sedimentary-exhalative (SEDEX) origin for the deposit during Devonian rifting of the continental margin. Subsequently, the rocks in the area were subjected to blueschist facies metamorphism, then retrograded to greenschist-grade metamorphic rocks in the Jurassic and early Cretaceous.

Alteration:

Oxidation to gossan with abundant limonite, and possible silicification.

Age of mineralization:

Deposited syngenetically in a marine environment during the Devonian; metamorphosed in the Jurassic or early Cretaceous.

Generic deposit model:

Deposit model:

Sedimentary exhalative (SEDEX) lead-zinc-silver-fluorite deposit (Cox and Singer, 1986, model 31a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

31a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

An adit, prospect trenches, and a 2- foot-deep pit are present on the northwest side of the Pilgrim River. On the southeast side of the river, a 25-foot-long adit and numerous prospect pits explored the deposit. Some diamond drilling appears to have occurred in 1971 or 1972 (Sainsbury and others, 1972).

Production notes:

A few tons of ore apparently were mined and shipped.

Reserves:

None.

Additional comments:

References:

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Wimmler, N.L., 1926, Lode deposits in Seward Peninsula: Alaska Territorial Department of Mines Miscellaneous Report 192-01, 10 p.

Primary Reference: Asher, 1969; Slack and others, 2011

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Unnamed (near mouth of Swede Creek)

Site type: Prospect

ARDF no.: SO133

Latitude: 64.5669 **Quadrangle:** SO C-4

Longitude: 163.6984

Location description and accuracy:

This prospect extends for several hundred feet east of where Swede Creek cascades over the steep beach cliffs along Norton Sound. Swede Creek is an informal name for the south-flowing drainage no more than a half mile long whose mouth is about a mile west of the mouth of Koyana Creek. It is about 0.3 mile south of the northeast corner of section 5, T. 11 S., R. 25 W. The location is accurate.

Commodities:

Main: Hg

Other:

Ore minerals: Cinnabar

Gangue minerals: Carbonates

Geologic description:

Cinnabar was reported in the placer gold deposits of Swede Creek in 1922 (Cathcart, 1922) and lode prospecting began by at least 1929 (Smith, 1932). The rocks in the area are Paleozoic marble (Herreid, 1965; Mulligan, 1971; Till and others, 1986). In early 2010, the Swede Creek mercury prospect was not being actively explored. However, it is within a large block of ground that is being explored by Millrock Resources Inc. for lode gold (Stevens, 2010; Millrock Resources Inc., 2010).

Two short adits and a shaft explore cinnabar-bearing lodes exposed in the sea cliff 400 feet east of the mouth of Swede Creek (Anderson, 1947; Mulligan, 1971). The portals to the two adits are about 30 or 40 feet below the top of the steep sea cliffs. The adits are short, one was 70 feet long and one 20 feet long (Malone, 1962). The 55-foot-deep vertical shaft is about 50 feet inland from the sea cliff (Malone, 1962; Mulligan, 1971). Cinnabar occurs along two, narrow fault zones; they are about 70 feet apart stratigraphically, subparallel to layering in marble, and dip 10 to 15 degrees north. The lenses are 5-10 inches thick and a few feet long; the longest dimension of an individual lens is 7 feet (Anderson, 1947). Samples of pinkish marble with disseminated cinnabar contained form 0.04 to 0.14 percent mercury; an 18-inch chip sample across a cinnabar-bearing lens contained 6.76 percent mercury; and a 7-foot chip sample across the same lens and adjacent lower grade mineralized rock contained 2.36 percent mercury (Anderson, 1947).

Mulligan (1971) noted that a rotary retort to process mercury ore lies several miles away on the hillside just above the mouth of Daniels Creek; apparently it was never used.

Alteration:

Age of mineralization:

Unknown; possibly Cretaceous or Tertiary.

Generic deposit model:

Deposit model:

Cinnabar in lenses and disseminated along a shallow-dipping fault in marble.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Cinnabar was reported in the placer gold deposits of Swede Creek in 1922 (Cathcart, 1922) and lode prospecting began by at least 1929 (Smith, 1932). In early 2010, the Swede Creek mercury prospect was not being actively explored. However, it is within a large block of ground that is being explored by Millrock Resources Inc. for lode gold (Stevens, 2010; Millrock Resources Inc., 2010). Two short adits and a shaft were driven sometime before 1947 in the sea cliff 400 feet east of the mouth of Swede Creek (Anderson, 1947; Mulligan, 1971). The portals to the two adits are about 30 or 40 feet below the top of the steep sea cliffs. The adits are short, one was 70 feet long and one 20 feet long (Malone, 1962).

Production notes:

Probably none but a few pounds of mercury could easily have been retorted for local use.

Reserves:

None.

Additional comments:

References:

Anderson, Eskil, 1947, Mineral occurrences other than gold deposits in northwestern Alaska: Alaska Territorial Division of Mines Pamphlet 5-R, 48 p.

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Cobb, E.H., 1978, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Solomon quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-181, 185 p.

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Stevens, D.L., 2010, Bluff Gold prospect, Seward Peninsula, western Alaska: NI43-101 Technical Report for Millrock Resources Inc., 153 p. (posted on www.sedar.com on February 4, 2010).

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Primary Reference: Mulligan, 1971; Stevens, 2010

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Idaho, Eskimo

Site type:

ARDF no.: SO134

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

As originally compiled (under a misleading name that referred to several nearby lode deposits), this record treated the offshore extension of the Daniels Creek placer mine into the Bering Sea as a separate deposit. The information that was in this site has now been integrated into the record for the Daniels Creek placer mine, ARDF site SO006. The ARDF number in this record has been preserved only for accounting purposes.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-03-04

Site name(s): Idaho; Eskimo; Seagull

Site type: Mine

ARDF no.: SO135

Latitude: 64.5698 **Quadrangle:** SO C-4

Longitude: 163.75

Location description and accuracy:

This prospect is exposed about 1,000 feet east of the mouth of Daniels Creek at the base of the cliffs along Norton Sound. It is about 0.7 mile south of the center of section 31, T. 11 S., R. 25 W. The location is accurate.

Commodities:

Main: Ag, As, Au Bi, Cd, Cu, Pb, Sb, W

Other: W

Ore minerals: Arsenopyrite, chalcopyrite, gold, pyrite, scheelite

Gangue minerals: Clay, quartz

Geologic description:

This prospect has long been known but few details have been published. It was discovered after 1908 inasmuch as Brooks (1908) makes a point of the absence of any nearby lode source for the placer gold in Daniels Creek (SO006). In 1939, the Alaska Homestake Gold Mining Company began work on the lode deposits in the vicinity of Daniels Creek (Stevens, 2010). They identified three vein systems in the beach cliffs just east of the mouth of Daniels Creek that they called the Idaho, Eskimo, and Seagull lodes (which are shown by name on figure 3 of Mulligan,1971). Their work extended inland for a considerable distance, probably into what is now included in the Daniels prospect (SO177).

The veins just east of the mouth of Daniels Creek have been sampled several times and restaked at least once (Mulligan, 1971; Herreid, 1965; Stevens, 2010). The sea cliff exposures include a subhorizontal, massive arsenopyrite-pyrite lens 4 feet wide and 20 feet long that pinches down to a foot or less at its ends. The east end of this lens becomes a foot-wide quartz vein. A 4-foot chip sample by Herreid (1965) across the sulfide lens contained 0.18 ounce of gold per ton and 0.35 ounce of silver per ton. Other grab samples from the sea cliff exposures contained 0.02 to 0.42 ounce of gold per ton and 0.16 to 0.55 ounce of silver per ton (Herreid, 1965). Four samples collected by Millrock Resources Ltd. in 2008 contained up to 0.1 part per million (ppm) silver, 13.82 ppm gold, more than 10,000 ppm arsenic, 140 ppm bismuth, 1,000 ppm cadmium, 265 ppm copper, 611 ppm lead, 597 ppm antimony, and 17 ppm zinc (Stevens, 2010). The Bureau of Mines cut a trench 946 feet long, oriented nearly east-west, on the hillside above the beach cliffs, about 500-1000 feet north of the veins exposed at the bottom of the sea cliffs. The trench was systematically sampled; most samples had 'Nil' to 'Trace' gold, the highest value was 0.085 ounce of gold per ton over 10 feet. Millrock Resources Inc. drilled one hole 458 feet deep in schist on the hillside about 600 feet north of the lode exposed at the bottom of the sea cliffs. The best intercept was 4.5 feet that contained 3.819 grams per ton of gold. The only other notable intercept was 1.2 feet with 7.689 grams of gold per tonne.

A sample of white mica from a quartz vein nearby at the Saddle prospect SO175) gave a Ar/Ar plateau date of 109.1 +/- 0.2 Ma and metamorphic white mica in the host schist gave Ar/Ar total gas dates of 122.6 +/- 0.4 Ma and 122.4 +/- 0.2 Ma (Ford and Snee, 1996). This indicates that the mineralization in the Bluff area is Late Cretaceous and probably related to regional metamorphism, as are many other deposits on the Seward Peninsula (Apodoca, 1994; Ford, 1993, Ford and Snee, 1996; Goldfarb and others, 1997).

Alteration:

The surface and near-surface gold-bearing rocks are oxidized and iron-staining is common. The quartz veins often contain clay.

Age of mineralization:

Cretaceous; at the nearby Saddle prospect (SO175) which is probably of the same age, a sample of white mica from a quartz vein nearby at the Saddle prospect SO175) gave a Ar/Ar plateau date of 109.1 +/- 0.2 Ma (Ford and Snee, 1996).

Generic deposit model:

Deposit model:

Discontinuous, irregular to joint-con tolled arsenopyrite-quartz veins and breccia with disseminated arsenopyrite and pyrite in host rocks; low sulfide-Au quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: Undetermined

Site Status: Active

Workings/exploration:

This prospect has long been known but few details have been published. It was discovered after 1908 inasmuch as Brooks (1908) makes a point of the absence of any nearby lode source for the placer gold in Daniels Creek (SO006). In 1939, the Alaska Homestake Gold Mining Company began work on the lode deposits in the vicinity of Daniels Creek (Stevens, 2010). They identified three vein systems in the beach cliffs just east of the mouth of Daniels Creek that they called the Idaho, Eskimo, and Seagull lodes (which are shown by name on figure 3 of Mulligan, 1971). Their work extended inland for a considerable distance, probably into what is now included in the Daniels prospect (SO New D1014). In 2008. Millrock Resources Inc. drilled one hole 458 feet deep in schist on the hillside about 600 feet north of the lode exposed at the bottom of the sea cliffs (Stevens, 2010).

Production notes:

Probably none.

Reserves:

None.

Additional comments:

References:

Apodoca, L.E., 1994, Genesis of lode gold deposits of the Rock Creek area, Nome mining district, Seward Peninsula, Alaska: Boulder, Colorado, University of Colorado, Ph.D. dissertation, 208 p.

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Brooks, A.H., 1908, The Bluff Region: U.S. Geological Survey Bulletin 328, p. 283-293.

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Ford, R.C., 1993, Geology, geochemistry, and age of gold lodes at Bluff and Mt. Distin, Seward Peninsula, Alaska: Golden, Colorado School of Mines, Ph.D. dissertation, 302 p.

Ford, R.C., and Snee, L.W., 1996, 40Ar/39Ar thermochronology of white mica from the Nome district, Alaska--The first ages of lode sources to placer gold deposits in the Seward Peninsula: Economic Geology, v. 91, p. 213-220.

Goldfarb, R.J., Miller, L.D., Leach, D.L., and Snee, L.W, 1997, Gold deposits in metamorphic rocks in Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 151-190.

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Mulligan, J.J., 1971, Sampling gold lode deposits, Bluff, Seward Peninsula, Alaska, with a section on petrography by Walter L. Gnagy: U.S. Bureau of Mines Report of Investigations 7555, 40 p.

Stevens, D.L., 2010, Bluff Gold prospect, Seward Peninsula, western Alaska: NI43-101 Technical Report for Millrock Resources Inc., 153 p. (posted on www.sedar.com on February 4, 2010).

Till, A.B., Dumoulin, J.A., Gamble, B. ., Kaufman, D.S., and Carroll, P.I., 1986, Preliminary geologic map and fossil data, Solomon, Bendeleben, and southern Kotzebue quadrangles, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 86-276, 10 p., 3 plates, scale 1:250,000.

Primary Reference: Ford, 1993; Stevens, 2010

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Unnamed (near mouth of Koyana Creek)

Site type: Prospect

ARDF no.: SO136

Latitude: 64.5688 **Quadrangle:** SO C-4

Longitude: 163.6651

Location description and accuracy:

This lode gold prospect is about 500 feet east of the mouth of Koyana Creek in the beach cliffs just above the high-tide line. Koyana Creek is a small drainage that flows south to its mouth on Norton Sound; it is about 2.6 miles east of the old community of Bluff. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Arsenopyrite, gold

Gangue minerals: Quartz

Geologic description:

This prospect is at the east end of an arcuate band of Paleozoic schist about three miles long and up to a half mile wide that hosts most of the lode deposits in the Bluff area, including the Koryana (SO176) , Saddle (SO175), Daniels Creek (SO New D1014), and Idaho (SO135) prospects. The schist is bordered to the north and south by thick, extensive marble; the contacts are probably thrust faults.

Gold-bearing lode mineralization was discovered near the mouth of Koryana creek in the early 1900s (Collier and others, 1908). Three short adits and a shallow shaft were developed, probably before WWII (Mulligan, 1971). In early 2010, the prospect was on a large block of ground being explored by Millrock Resources, Inc.; the prospect was sampled in 2008 (Stevens, 2010).

Exposures in the beach cliffs expose the portal of a 30-foot-long adit into a zone about 20 feet wide in schist with a network of ramifying quartz veins and breccia (Cathcart, 1922). Thin quartz veins extend along joints oblique to the foliation of the schist for a considerable distance from the main mineralization. Pyrite and arsenopyrite are common in the quartz and are disseminated in the schist wall rock. The largest crosscutting quartz vein observed by Herreid (1965) was 4 inches wide and 10 feet long. Seven grab and chip samples contained 0.01 to 0.32 ounce of gold per ton and 0.16 to 0.65 ounce of silver per ton. One composite chip sample of schist, collected every 10 feet over a distance of 700 feet, contained 0.07 ounce of gold per ton. Thirteen samples collected in 2008 across the mineralization contained up to 35.6 parts per million (ppm) gold, less than 0.1 ppm silver, 10,000 ppm or more arsenic, up to 177 ppm bismuth, up to 1000 ppm cadmium, and barely above background copper lead, and zinc (Stevens, 2010).

This prospect is probably similar to the nearby Saddle prospect (SO175) and Koryana prospect (SO176) which have been described by Ford (1993) and Ford and Snee (1996). Samples of white mica from a vein at the Saddle prospect has a Ar/Ar plateau age of 109.3 +/- 0.3 Ma and metamorphic white mica in the host schist have Ar/Ar plateau ages of 122.6 +/- 0.4 Ma and 122.4 +/- 0.2 Ma (Ford and Snee, 1996). The deposit is thus probably mid-Cretaceous, as are many of the other lode gold deposits on southern Seward Peninsula (Apodoca, 1994; Ford, 1993, Hudson, 1994; Ford and Snee, 1996; Goldfarb and others, 1997).

Alteration:

Quartz veining; much bright orange staining, probably from oxidization of pyrite.

Age of mineralization:

Mid-Cretaceous; Samples of white mica from a vein at the Saddle prospect has a Ar/Ar plateau age of 109.3 +/- 0.3 Ma.

Generic deposit model:

Deposit model:

Discontinuous, irregular to joint-con tolled arsenopyrite-quartz veins and breccia with disseminated arsenopyrite and pyrite in host rocks; low sulfide-Au quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

Developed by three short adits, one 30 feet long, and a shallow shaft Mulligan, 1971). The prospect was sampled in 2008 and in early 2010, the prospect was on a large block of ground being explored by Millrock Resources, Inc. (Stevens, 2010).

Production notes:

A few tons of ore were reported to have been sacked but it is not known if this was shipped (Smith and Eakin, 1911).

Reserves:

None.

Additional comments:

References:

Apodoca, L.E., 1994, Genesis of lode gold deposits of the Rock Creek area, Nome mining district, Seward Peninsula, Alaska: Boulder, Colorado, University of Colorado, Ph.D. dissertation, 208 p.

Cathcart, S.H., 1922, Metalliferous lodes in southern Seward Peninsula: U.S. Geological Survey Bulletin 722-F, p. 163-261.

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Till, A.B., Dumoulin, J.A., Gamble, B. ., Kaufman, D.S., and Carroll, P.I., 1986, Preliminary geologic map and fossil data, Solomon, Bendeleben, and southern Kotzebue quadrangles, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 86-276, 10 p., 3 plates, scale 1:250,000.

Primary Reference: Herreid, 1965; Stevens, 2010

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Saddle

Site type: Prospect

ARDF no.: SO175

Latitude: 64.5766 **Quadrangle:** SO C-4

Longitude: 163.7203

Location description and accuracy:

The Saddle prospect is an area about 800 meters long by 300 meters wide. It was originally defined by anomalous arsenic and gold in soil samples; later 14 scattered holes were drilled in it. The center of the area is about 1.0 mile northeast of the abandoned settlement of Bluff. It is about 0.2 mile southwest of the center of section 32, T. 10 S., R. 25 W. The location is accurate.

Commodities:

Main: As, Au

Other:

Ore minerals: Arsenopyrite, gold, marcasite, pyrite, pyrrhotite

Gangue minerals: Carbonates, quartz

Geologic description:

The Saddle prospect was first identified by BHP-Utah in 1995 as an area anomalous in arsenic and gold in soils. Subsequently they drilled 10 holes in the area before they dropped the property in 1990. In 2008, Millrock Resources Inc. (2010) began exploring in the area under an agreement with Bering Straits Native Corporation. Millrock's work on the Saddle prospect included geologic mapping and sampling, reanalysis of some of the BHP core, and geochemical soil surveys.

The Saddle prospect is near the center of an arcuate band of Paleozoic schist about three miles long and up to a half mile wide that extends from the mouth of Koryana Creek to the mouth of Daniels Creek (Herreid, 1965; Mulligan, 1971; Till and others, 1986; Stevens, 2010)) . This schist unit hosts most of the lode deposits in the Bluff area, including the Koryana (SO176), Daniels Creek (SO177), and Idaho (SO135) prospects. The schist is bordered to the north and south by thick, extensive marble; the schist-marble contacts are probably thrust faults.

There is little outcrop in the Saddle area and most of the information about it comes from the 10 BHP-Utah drill holes. As described by Ford (1993) and Ford and Snee (1996), the mineralization at the Saddle prospect is localized in extensional joints that strike easterly and dip moderately to the south in quartz-muscovite schist. The veins are discontinuous and commonly less than 3 inches thick. Gold grades are irregularly distributed; vein intersections up to 3.3 feet across contain up to 1.8 ounces of gold per ton. The quartz veins frequently contain a few percent of ore minerals, mainly arsenopyrite, but marcasite, pyrite, and pyrrhotite occur in small amounts. The veins are commonly bordered by altered zones with plagioclase, chlorite, carbonate, white mica, biotite, titanite, and tourmaline. A sample of white mica from a quartz vein gave an Ar/Ar plateau date of 109.1 +/- 0.2 Ma and metamorphic white mica in the host schist gave Ar/Ar total gas dates of 122.6 +/- 0.4 Ma and 122.4 +/- 0.2 Ma (Ford and Snee, 1996). This indicates that the mineralization at Saddle is Late Cretaceous and probably related to regional metamorphism as are many other deposits on the Seward Peninsula (Apodoca, 1994; Ford, 1993, Ford and Snee, 1996; Goldfarb and others, 1997).

On the basis of their drilling, BHP-Utah concluded that the resources of the Saddle prospect was 1,500,000 tons of material with a grade of 7.77 grams of gold per tonne, or a total resource of 165,000 ounces of gold (Heine and Kell, 1991; Stevens, 2010). (However, Stevens also emphasized that the BHP-

Utah 'resource' for Saddle was not 43-101 compliant.)

Alteration:

Quartz veining; the veins are commonly bordered by altered zones with plagioclase, chlorite, carbonate, white mica, biotite, titanite, and tourmaline.

Age of mineralization:

Mid-Cretaceous; a sample of white mica from a quartz vein gave an Ar/Ar plateau date of 109.1 +/- 0.2 Ma (Ford and Snee, 1996).

Generic deposit model:

Deposit model:

Discontinuous, irregular to joint-con tolled arsenopyrite-quartz veins and breccia with disseminated arsenopyrite and pyrite in host rocks; low sulfide-Au quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

The Saddle prospect was first identified by BHP-Utah in 1995 as an area anomalous in arsenic and gold in soils. Subsequently they drilled 10 holes in the area before they dropped the property in 1990. As of early 2010, Millrock's work on the Saddle prospect included geologic mapping and sampling, reanalysis of some of the BHP-Utah core, and geochemical soil surveys.

Production notes:

None.

Reserves:

On the basis of their drilling, BHP-Utah concluded that the resource of the Saddle prospect was 1,500,000 tons of material with a grade of 7.77 grams of gold per tonne or a total resource of 165,000 ounces of gold (Heine and Kell, 1991; Stevens, 2010). However, Stevens also emphasized that the BHP-Utah 'resource' for Saddle was not 43-101 compliant.

Additional comments:

References:

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Till, A.B., Dumoulin, J.A., Gamble, B. ., Kaufman, D.S., and Carroll, P.I., 1986, Preliminary geologic map and fossil data, Solomon, Bendeleben, and southern Kotzebue quadrangles, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 86-276, 10 p., 3 plates, scale 1:250,000.

Primary Reference: Stevens, 2010

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Koyana

Site type: Prospect

ARDF no.: SO176

Latitude: 64.5717 **Quadrangle:** SO C-4

Longitude: 163.6859

Location description and accuracy:

The Koyana prospect is an area about 1,100 meters long by 300 meters wide. It was originally defined by anomalous arsenic and gold in soil samples and 10 scattered holes were drilled in it. The center of the area is about 0.5 mile west-northwest of the mouth of Koyana Creek and 0.5 mile south of the center of section 33, T.10 S., R. 25 W., of the Kateel River Meridian. The location is accurate to within 500 feet.

Commodities:

Main: Au

Other: As

Ore minerals:

Gangue minerals: Carbonates, quartz

Geologic description:

The Koyana prospect was first identified by BHP-Utah in 1986 as an area anomalous in arsenic and gold in soils. Subsequently they drilled 10 holes in the area before they dropped the property in 1990 (Stevens, 2010). The Koyana prospect is at the east end of an arcuate band of Paleozoic schist about three miles long and up to a half mile wide that extends from the mouth of Koyana Creek to the mouth of Daniel's Creek (Herreid, 1965; Mulligan, 1971; Till and others, 1986). This schist unit hosts most of the lode deposits in the Bluff area, including the Saddle (SO175), Daniel's Creek (SO006), and Idaho (SO135) prospects. The schist is bordered to the north and south by thick, extensive marble; the schist-marble contacts are probably thrust faults.

There is little outcrop in the Koyana area and most of the information about it comes from 10 BHP-Utah drill holes. As described by Ford (1993) and Ford and Snee (1996), the mineralization at the Koyana prospect is localized in extensional joints that strike easterly and dip moderately to the south in quartz-muscovite schist. The veins are discontinuous and commonly less than 3 inches thick. Gold grades are irregularly distributed; vein intersections up to 3.3 feet across contain up to 1.8 ounces of gold per ton. The quartz veins frequently contain a few percent of ore minerals, mainly arsenopyrite, but marcasite, pyrite, and pyrrhotite occur in small amounts. The veins are commonly bordered by altered zones with plagioclase, chlorite, carbonate, white mica, biotite, titanite, and tourmaline. A sample of white mica from a quartz vein gave an Ar/Ar plateau date of 109.1 +/- 0.2 Ma and metamorphic white mica in the host schist gave Ar/Ar total gas dates of 122.6 +/- 0.4 Ma and 122.4 +/- 0.2 Ma (Ford and Snee, 1996). This indicates that the mineralization at Saddle is Late Cretaceous and probably related to regional metamorphism as are many other deposits on the Seward Peninsula (Apodoca, 1994; Hudson, 1994; Ford, 1993, Ford and Snee, 1996; Goldfarb and others, 1997).

Based on their 10 drill holes, BHP-Utah concluded that the resource of the Koyana prospect was 1.81 million tonnes of material with a grade of 0.69 gram of gold per tonne, or a total resource of 1.24 million grams of gold (Heine and Kell, 1991; Stevens, 2010). However, Stevens also emphasized that the BHP-Utah 'resource' for Koyana was not 43-101 compliant.

In 2008, Millrock Resources Inc. began exploring in the area under an agreement with Bering Straits Native Corporation. As of early 2010, Millrock's work on the Koyana prospect included geologic mapping

and sampling, reanalysis of some of the BHP core, and geochemical soil surveys (Stevens, 2010).
A field exploration program undertaken in 2010 by Millrock Resources Inc. extended the known areas of anomalous values into areas not previously sampled. The anomalies included gold values of up to 483 parts per billion (ppb) and a positive correlation with arsenic values. This work identified a conformable, depositional contact of graphitic schist with the carbonaceous marble on a cliff face, despite poor outcrop due to recessive weathering (Negri, 2011).

Alteration:

Quartz veins are commonly bordered by altered zones with plagioclase, chlorite, carbonate, white mica, biotite, titanite, and tourmaline (Stevens, 2010).

Age of mineralization:

Mid-Cretaceous; white mica from similar quartz veins nearby in the Koyana Creek area gave Ar/Ar plateau dates of 109.1 +/- 0.7 Ma and 109.6 +/- 0.2 Ma (Ford and Snee, 1996).

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active?

Workings/exploration:

The Koyana prospect was first identified by BHP-Utah in 1986 as an area anomalous in arsenic and gold in soils. Subsequently they drilled 10 holes in the area before they dropped the property in 1990. In 2008, Millrock Resources Inc. began exploring in the area under an agreement with Bering Straits Native Corporation. In early 2010, Millrock's work on the Koyana prospect included geologic mapping and sampling, reanalysis of some of the BHP core, and geochemical soil surveys (Stevens, 2010).

Production notes:

None.

Reserves:

Based on their drilling, BHP-Utah concluded that the resource of the Koyana prospect was 1.81 million tonnes of material with a grade of 0.69 gram of gold per tonne, or a total resource of 1.24 million grams of gold (Heine and Kell, 1991; Stevens, 2010). However, Stevens also emphasized that the BHP-Utah 'resource' for Koyana was not 43-101 compliant.

Additional comments:

References:

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Till, A.B., Dumoulin, J.A., Gamble, B. ., Kaufman, D.S., and Carroll, P.I., 1986, Preliminary geologic map

Primary Reference: Stevens, 2010

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Daniels

Site type: Prospect

ARDF no.: SO177

Latitude: 64.5789

Quadrangle: SO C-4

Longitude: 163.7356

Location description and accuracy:

The Daniels prospect is an area about 960 meters long by 300 meters wide that was originally defined by anomalous arsenic and gold in soil samples. There is little outcrop but it has been drilled several times. The center of the area is in the headwaters of Daniels Creek about 0.7 mile northeast of the abandoned settlement of Bluff. It is about 0.5 mile east of the center of section 31, T. 10 S., R. 25 W. The location is accurate.

Commodities:

Main: As, Au

Other: Ag, Bi, Cd, Cu, Pb, Sb, W, Zn

Ore minerals: Arsenopyrite, gold, marcasite, pyrite, pyrrhotite, scheelite

Gangue minerals: Carbonates, quartz

Geologic description:

The Daniels prospect was first identified by BHP-Utah in 1995 as an area anomalous in arsenic and gold in soils. Subsequently, they drilled 10 holes in the area before they dropped the property in 1990 (Stevens, 2010). In 2008, Millrock Resources Inc. began exploring in the area under an agreement with Bering Straits Native Corporation. As of early 2010, Millrace's work on the Daniels prospect included geologic mapping and sampling, reanalysis of some of the BHP core, and geochemical soil surveys (Millrock Resources Inc., 2010 [Bering Straits]). They also drilled 4 short holes in 2008 that totaled only 809 feet. The drilling was poorly done and the core recovery was poor. In 2010, Millrock and its partner Valdez Gold Inc. drilled 24 holes, 130-meters deep, in fences of holes (Millrock, 2010 [Millrock and Valdez Gold]).

There was at least some early exploration in the area as there is a small dump at a caved shaft near the center of the area; parts for a small mill are nearby but it apparently was never put in operation. The Bureau of Mines dug several trenches about 1970 Mulligan (1971). The Daniels prospect is essentially contiguous to and a geologic extension of the Saddle prospect (SO175); they were described separately by BHP-Utah as a convenience.

The Daniels prospect is near the center of an arcuate band of Paleozoic schist about three miles long and up to a half mile wide that extends from the mouth of Korean Creek to the mouth of Daniels Creek (Herreid, 1965; Mulligan, 1971; Till and others, 1986). This schist unit hosts most of the lode deposits in the Bluff area, including the Koyana (SO176), Saddle (SO175), and Idaho (SO135) prospects. The schist is bordered to the north and south by thick, extensive marble; the schist-marble contacts are probably thrust fault.

There is little outcrop in the Daniels prospect area and much of the information about the mineralization comes from the 10 BHP-Utah drill holes, the 4 holes drilled by Millrock in 2008, and the 24 holes drilled by Millrock and Valdez Gold in 2010. As described by Ford (1993) and Ford and Snee (1996), the mineralization at the Daniels prospect consists of quartz veins localized in extensional joints that strike easterly and dip moderately to the south in quartz-muscovite schist. The veins are discontinuous and commonly less than 3 inches thick. Gold grades are erratic but vein intersections up to 3.3 feet across contain up to 1.8 ounces of gold per ton. The quartz veins frequently contain a few percent of ore minerals, mainly arsenopyrite, but marcasite, pyrite, and pyrrhotite occur in small amounts.

The four short holes drilled by Millrock in 2008 were in quartz-muscovite schist, graphitic schist, marble and gouge (Stevens, 2009). The best intercepts were 5.94 meters that contained 1.397 grams of gold per tonne and 1.37 meters that contained 3.819 grams of gold per tonne. The 2010 drilling (Millrock, 2010 [Millrock and Valdez Gold]) extended the mineralized zone to a strike length of 960 meters. The best intersection was 32.0 meters with 3.8 grams of gold per tonne.

A sample of oxidized arsenopyrite-rich dump material beside an old shaft in about the center of the Daniels prospect contained 2.76 ounces of gold per ton and 1.49 ounces of silver per ton; eight other samples of dump materials contained 0.03 to 0.23 ounces of gold per ton and 0.03 to 1.57 ounces of silver per ton (Herreid, 1965). Herreid (1965) reports that scheelite can be panned from some dump materials. Several chip samples from dozer trenches cut across the north-trending schist belt in the area were locally mineralized and included some 10-foot intervals with up to 0.04 ounce of gold Au per ton (Mulligan, 1971). Quartz-clay veinlets were common in the mineralized parts of the trench exposures. One high grade sample collected in 2009 near or at the old shaft contained 0.1 part per million (ppm) silver, 13.82 ppm gold, 10,000 or more ppm arsenic, 140 ppm bismuth, 1,000 ppm cadmium, 265 ppm copper, 611 ppm lead, 597 ppm antimony, and 27 ppm zinc.

The veins are commonly bordered by altered zones with plagioclase, chlorite, carbonate, white mica, biotite, titanite, and tourmaline. A sample of white mica from a quartz vein gave a Ar/Ar plateau date of 109.1 +/- 0.2 Ma and metamorphic white mica in the host schist gave Ar/Ar total gas dates of 122.6 +/- 0.4 Ma and 122.4 +/- 0.2 Ma (Ford and Snee, 1996). This indicates that the mineralization at Saddle is Late Cretaceous and probably related to regional metamorphism as are many other deposits on the Seward Peninsula (Apodoca, 1994; Hudson, 1994; Ford, 1993, Ford and Snee, 1996; Goldfarb and others, 1997).

On the basis of their drilling, BHP-Utah concluded that the resources of the Daniels prospect was 3,000,000 tons of material with a grade of 3.43 grams of gold per tonne, or a total resource of 300,000 ounces of gold (Heinz and Keel, 1991; Stevens, 2010). (However, Stevens also emphasized that the BHP-Utah 'resource' for Daniels was not 43-101 compliant.)

Alteration:

The quartz veins are commonly bordered by altered zones with plagioclase, chlorite, carbonate, white mica, biotite, titanite, and tourmaline. The drill holes commonly cut gouge.

Age of mineralization:

Cretaceous; a sample of white mica from a quartz vein gave a Ar/Ar plateau date of 109.1 +/- 0.2 Ma (Ford and Snee, 1996).

Generic deposit model:

Deposit model:

Discontinuous, irregular to joint-con tolled arsenopyrite-quartz veins and breccia with disseminated arsenopyrite and pyrite in host rocks; low sulfide-Au quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Active

Workings/exploration:

The Daniels prospect was first identified by BHP-Utah in 1995 as an area anomalous in arsenic and gold in soils. Subsequently, they drilled 10 holes in the area before they dropped the property in 1990 (Stevens, 2010). In 2008, Millrock Resources Inc. began exploring in the area under an agreement with Bering Straits Native Corporation. As of early 2010, Millrace's work on the Daniels prospect included geologic mapping and sampling, reanalysis of some of the BHP core, and geochemical soil surveys (Millrock Resources Inc., 2010). They also drilled 4 short holes in 2008 that totaled only 809 feet. The drilling was poorly done and

the core recovery was poor. In 2010, MIllrock and its partner Valdez Gold Inc. drilled 24 holes, 130-meters deep, in fences of holes (Millrock, 2010 [Millrock and Valdez Gold]). There was at least some early exploration in the area as there is a small dump at a caved shaft near the center of the area; parts for a small mill were nearby but it apparently was never put in operation. The Bureau of Mines dug several trenches about 1970 Mulligan (1971). The Daniels prospect is essentially contiguous to and a geologic extension of the Saddle prospect; they were described separately by BHP-Utah as a convenience.

Production notes:

None.

Reserves:

On the basis of their drilling, BHP-Utah concluded that the resource at the Saddle prospect was 3,000,000 tons of material with a grade of 3.43 grams of gold per tonne, or a total resource of 300,000 ounces of gold (Heinz and Keel, 1991; Stevens, 2010). (However, Stevens also emphasized that the BHP-Utah 'resource' for the Daniels prospect was not 43-101 compliant.)

Additional comments:

References:

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Primary Reference: Stevens, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Unnamed (near Peak 3231, Darby Ridge)

Site type: Occurrence

ARDF no.: SO178

Latitude: 64.8365 **Quadrangle:** SO D-1

Longitude: 162.4615

Location description and accuracy:

This occurrence is on a rugged east-west ridge that intersects the principal north-south divide crest of the Darby Mountains. Elevations in the area of the occurrence range more than 2,000 feet up to 3,243 feet at the top of an unnamed mountain about one mile northwest of the prospect. Drainage from the area is into the upper tributaries of Clear Creek. The main site is a high saddle on the east flank of peak 3231 in the S1/2 sec. 35, T. 5 S., R. 19 W. of the Kateel River Meridian, and additional sample sites are located at a cirque at 64.8653 N, 162.4624 W in section 26.

Accuracy of the location is about 1,500 feet.

Commodities:

Main: U

Other: Pb

Ore minerals:

Gangue minerals: Carbonate, chlorite, clay minerals, epidote, hematite, magnetite, pyrrhotite, quartz, sericite

Geologic description:

The Darby pluton is relatively homogeneous, mostly quartz monzonite and minor granite. Locally there are segregations of quartz-deficient, potassium-rich rocks including syenite and alkali granite. In the vicinity of Clear Creek, the rocks of the Darby pluton are mostly quartz monzonite containing biotite and lesser hornblende. The quartz monzonite is cut by tourmaline aplite, and rhyolite and tourmaline-bearing pegmatite dikes and a swarm of lamprophyre and apparently related variants of dark-colored sub-alkaline porphyritic dikes.

This occurrence consists of altered quartz monzonite intruded by a syenite dike. Radiometric measurements over argillic alteration in the quartz monzonite were two times background and a sample assayed 47 parts per million (ppm) uranium. A second sample of altered quartz monzonite from about 2,500 feet to the east reported 24 ppm uranium. Hawley and others (1978) reported up to 80 ppm uranium in soil samples from a gossan near the divide between Clear and Dry Canyon Creeks believed to be immediately north of this occurrence but the site was not re-located. Similar alteration occurs along the Darby Ridge two miles north (two samples of altered andesite assayed 40 and 50 ppm uranium) and three miles south of the Peak 3231 occurrence (soil sample assayed 77 ppm uranium) (Foley and Barker, 1986).

Alteration:

Greisen float, locally intense argillic alteration, locations with hematitic staining with silicification formed in shear zones; discrete zones of sericite development, epidote, and chlorite alteration. Adjacent quartz monzonite exhibits propylitic alteration. Oxidation and clay minerals after argillic alteration (Foley and Barker, 1986).

Age of mineralization:

Quartz monzonite of the Darby pluton is reported to be Late Cretaceous (Miller and Bunker, 1975; Eakins and others, 1977; Wilson and others, 2015).

Generic deposit model:

Deposit model:

Granite-hosted veins with uranium generally much greater than thorium; minimal REE and tin; uranium does not concentrate in resistant minerals as indicated by heavy mineral survey (Foley and Barker, 1986); mineralized shear zones with structural control, spatial association with lamprophyre dikes; no clear comparable examples available.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

This occurrence consists of altered quartz monzonite intruded by a syenite dike. Radiometric measurements over argillic alteration in the quartz monzonite were two times background and a sample assayed 47 parts per million (ppm) uranium. A second sample of altered quartz monzonite from about 2,500 feet to the east reported 24 ppm uranium. Hawley (1978) reported up to 80 ppm uranium in soil samples from a gossan near the divide between Clear and Canyon Creeks believed to be immediately north of this occurrence but the site was not re-located. Similar alteration occurs along the Darby Ridge two miles north (two samples of altered andesite assayed 40 and 50 ppm uranium) and three miles south of the Peak 3231 occurrence (soil sample assayed 77 ppm uranium) (Foley and Barker, 1986).

Production notes:

None.

Reserves:

No reserves.

Additional comments:

The Darby Mountain area was selected for study by the U.S. Bureau of Mines in 1979 as part of ongoing mineral land assessments in Alaska and land designations proposed by Congress, and because recent (1970s) private sector exploration had discovered sedimentary uranium in the Boulder Creek basin at the southern end of Death Valley about 10 miles to the northeast (Dickinson and others, 1987). No further work was performed; claims are active in southern Death Valley, in the Boulder Creek basin area.

References:

Dickinson, K.A., Cunningham, K.D., and Ager, T.A., 1987, Geology and origin of the Death Valley Uranium deposit, Seward Peninsula, Alaska: Economic Geology, volume 82, p. 1558-1574.

Eakins, G.R., Jones, B.K., and Forbes, R.B., 1977, Investigation of Alaska's uranium potential: Alaska Division of Geological & Geophysical Surveys Alaska Open-File Report 109, 213 p., 10 sheets, scale 1:250,000.

Hawley, C.C. and Associates, 1978, Uranium evaluation of the Seward-Selawik area, Alaska: NURE report prepared for Department of Energy, contract GJBX-105(78), 155 p.

Foley, J.Y., and Barker, J.C., 1986, Uranium occurrences in the Northern Darby Mountains, Alaska: U.S. Bureau of Mines Information Circular IC 9103, 27 p.

Miller, T.P., and Bunker, C.M., 1975, A Reconnaissance Study of the Uranium and Thorium Contents of Plutonic Rocks of the Southeastern Seward Peninsula, Alaska: U.S. Geological Survey Open File Report

75-217, 24 p.

Wilson, F.H., Hults, C.P., Mull, C.G, and Karl, S.M, compilers, 2015, Geologic map of Alaska: U.S. Geological Survey Scientific Investigations Map 3340, pamphlet 196 p., 2 sheets, scale 1:1,584,000, http://dx.doi.org/10.3133/sim3340.

Primary Reference: Foley and Barker, 1986

Reporter(s): J.C. Barker

Last report date: 2016-12-15

Site name(s): West Vulcan Creek No. 1

Site type: Occurrence

ARDF no.: SO179

Latitude: 64.9274

Quadrangle: SO D-1

Longitude: 162.2591

Location description and accuracy:

The West Vulcan Creek No. 1 consists of a group of mineral showings located on a north-facing promontory on the ridge that forms the south side of a tributary to Vulcan Creek. Elevation of the occurrence ranges from 1,500 to 2,000 feet.

Vulcan Creek is a headwater drainage of the Tubutulik River located east of the report area. The creek is one of several that drain the east flank of the Darby Mountains. The occurrence site is in the N1/2 sec. 35, T. 6 S., R. 18 W. of the Kateel River Meridian and the coordinates given above are the approximate midpoint of the east-northeast trend of alteration and mineral showings. Accuracy of the location is about 1,000 feet.

Commodities:

Main: U

Other: Pb

Ore minerals:

Gangue minerals: Chlorite, clay minerals, epidote, hematite, magnetite, plagioclase, pyrrhotite, quartz, sericite

Geologic description:

The Darby pluton is a relatively homogeneous intrusion, mostly composed of quartz monzonite and minor granite. Locally there are segregations of quartz-deficient, potassium-rich rocks, including syenite and alkali granite. The pluton is further cut by rhyolite, aplite, and tourmaline-bearing pegmatite dikes.

In the Vulcan Creek and adjacent Rock Creek area, the Darby pluton is quartz monzonite containing include biotite and lesser hornblende and is cut by tourmaline aplite and a swarm of lamprophyre and apparently related variants of sub-alkaline dikes (Foley and Barker, 1986). These dark-colored, porphyritic dikes contain euhedral biotite, amphibole, corroded quartz xenocrysts and, more rarely, clinopyroxenite or olivine in a groundmass of altered plagioclase, and minor potassium feldspar.

Generally, the Vulcan Creek and Rock Creek area has higher radiometric levels than the surrounding region. At outcrop scale, mineralized zones will give radiometric responses of 2 to 10 times background.

At West Vulcan Creek no. 1, radiometric measurements up to six times background occur over frost boils along the ridge top. Downslope from these several groundwater seeps apparently emit radon. Altered shear zones and secondary quartz occurs along the ridge that descends east-northeast-oriented and is intruded by a dark-green fine-grained dike. Test pits encountered high levels of radiation and revealed hematitic mud, clay, and regolith containing quartz crystals variably altered to a sooty black color. Fragments of quartz-sericite greisen with boxwork after sulfides were found in several nearby test pits. Fourteen assayed samples ranged up to 1,290 parts per million (ppm) uranium. The highest uranium values are from test pit sites that expose decomposed, clayey, quartz monzonite that has a secondary matrix of varicolored earthy oxides. Several pits dug to 5.5 feet depth encountered residual stratified gruss with layers of varying radiometric response suggestive of localized secondary uranium. Distinctly higher radiometric measurements were recorded over hydrothermally altered veins and were structurally controlled by high-angle shear zones and breccia masses. Radiometric response locally exceeded the calibration limits of handheld scintillometers. These radiometric anomalies generally featured hematite, black iridescent manganese staining, quartz stockwork, ferruginous quartz, jasper, drusy and vuggy quartz. A sample from a nearby carbonate-altered,

dark green porphyry contained 68 ppm uranium. The anomalous radiometric response apparently reflects uranium, as very little thorium was reported in any of the samples. Some samples containing elevated uranium values also contained anomalous lead (Foley and Barker, 1986).

Gangue minerals include chlorite, various clay minerals, hematite, secondary drusy and vein quartz, sericite, epidote, and plagioclase that is partly to mostly altered to white mica and carbonate and opaque minerals, which include magnetite, and pyrrhotite.

Alteration:

Greisen, locally argillic, pervasive hematitic staining and corroded quartz, wide zones of sericite, argillite, and chlorite alteration. Alteration is best exposed in avalanche gullies and/or some structurally controlled swales along exposed ridges (Foley and Barker, 1986).

Age of mineralization:

Quartz monzonite of the Darby pluton is reported to be Late Cretaceous with some subordinate granitic rocks (Miller and Bunker, 1975; Eakins and others, 1977; Wilson and others, 2015).

Generic deposit model:

Deposit model:

Granite-hosted veins with uranium values generally much greater than thorium; minimal REE, tin; uranium values that do not concentrate in resistant minerals as indicated by heavy mineral survey (Foley and Barker, 1986); mineralized shear zones by structural control, spatial association with lamprophyre dikes; no clear comparable examples available.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Fourteen assayed samples ranged up to 1,290 parts per million (ppm) uranium. The highest uranium values are from test pit sites that expose decomposed, clayey, quartz monzonite that has a secondary matrix of varicolored earthy oxides. Several pits dug to 5.5 feet depth encountered residual stratified gruss with layers of varying radiometric response suggestive of localized secondary uranium. Distinctly higher radiometric measurements were recorded over hydrothermally altered veins and were structurally controlled by high-angle shear zones and breccia masses. Radiometric response locally exceeded the calibration limits of handheld scintillometers. These radiometric anomalies generally featured hematite, black iridescent manganese staining, quartz stockwork, ferruginous quartz, jasper, drusy and vuggy quartz. A sample from a nearby carbonate-altered, dark green porphyry contained 68 ppm uranium. The anomalous radiometric response apparently reflects uranium, as very little thorium was reported in any of the samples. Some samples containing elevated uranium values also contained anomalous lead (Foley and Barker, 1986).

Production notes:

None.

Reserves:

No reserves.

Additional comments:

The West Vulcan-Rock Creek area was selected for study by the U.S. Bureau of Mines in 1979 as part of ongoing mineral land assessments in Alaska and land designations proposed by Congress, and because recent (1970s) private sector exploration had discovered sedimentary uranium in the Boulder Creek basin in

southern Death Valley about 6 miles to the north (Dickinson and others, 1987). No further work was performed; claims for sedimentary uranium are active in the Death Valley area.

References:

Dickinson, K.A., Cunningham, K.D., and Ager, T.A., 1987, Geology and origin of the Death Valley Uranium deposit, Seward Peninsula, Alaska: Economic Geology, volume 82, p. 1558-1574.

Eakins, G.R., Jones, B.K., and Forbes, R.B., 1977, Investigation of Alaska's uranium potential: Alaska Division of Geological & Geophysical Surveys Alaska Open-File Report 109, 213 p., 10 sheets, scale 1:250,000.

Foley, J.Y., and Barker, J.C., 1986, Uranium Occurrences in the Northern Darby Mountains, Alaska: U.S. Bureau of Mines Information Circular IC 9103, 27 p.

Miller, T.P., and Bunker, C.M., 1975, A Reconnaissance Study of the Uranium and Thorium Contents of Plutonic Rocks of the Southeastern Seward Peninsula, Alaska. U.S. Geological Survey Open File Report 75-217, 24 p.

Wilson, F.H., Hults, C.P., Mull, C.G, and Karl, S.M, compilers, 2015, Geologic map of Alaska: U.S. Geological Survey Scientific Investigations Map 3340, pamphlet 196 p., 2 sheets, scale 1:1,584,000, http://dx.doi.org/10.3133/sim3340.

Primary Reference: Foley and Barker, 1986

Reporter(s): J.C. Barker

Last report date: 2016-12-15

Site name(s): West Vulcan Creek No. 2

Site type: Occurrence

ARDF no.: SO180

Latitude: 64.9297 **Quadrangle:** SO D-1

Longitude: 162.3009

Location description and accuracy:

The West Vulcan Creek No. 2 consists of a group of mineral showings located on the ridge forming the south side of a east flowing tributary to Vulcan Creek. Elevation of the prospect area ranges from 1,800 to 2,200 feet.

Vulcan Creek is one of several creeks that drain the east flank of the Darby Mountains and is a tributary to the Tubutulik River, which is located east of the report area. The occurrence site is in the NW1/4 sec. 34, T. 6 S., R. 18 W. of the Kateel River Meridian and is the approximate midpoint of the 2,000 foot-long northeast trend of alteration and mineral showings.

Accuracy of the location is about 1,000 feet.

Commodities:

Main: U

Other: Pb

Ore minerals:

Gangue minerals: Chlorite, clay minerals, epidote, hematite, magnetite, plagioclase, pyrrhotite, quartz, sericite

Geologic description:

The Darby pluton is relatively homogeneous, mostly quartz monzonite and minor granite. Locally there are segregations of quartz-deficient, potassium-rich rocks including syenite and alkali granite.

In the Vulcan Creek and adjacent Rock Creek area the Darby pluton is quartz monzonite containing biotite and lesser hornblende. The pluton is also cut by lamprophyre, rhyolite, aplite, and tourmaline-bearing pegmatite dikes. These later dikes contain euhedral biotite, amphibole, corroded quartz xenocrysts and, more rarely, clinopyroxenite or olivine in a groundmass of altered plagioclase and minor potassium feldspar (Foley and Barker, 1986).

Generally, the Vulcan and Creek Rock Creek area has higher radiometric levels than the surrounding region. At West Vulcan Creek No. 2 radiometric measurements vary from 1.5 to 6 times background over frost boils along the 300 foot-long exposed strike of the northeast-trending quartz system in a small avalanche gully. The zone goes under surficial cover on both ends but where exposed it appears to be about 40 feet wide. The prospect is marginal to silica-poor sheared chloritic, argillic-altered quartz monzonite.

Test pits exposed irregular replacement-style masses of red hematitic quartz pods 6-10 feet wide mixed in a kaolinized and sheared biotite quartz monzonite and quartz stockwork marginal to the shear zone. The altered shear zone and secondary quartz occur where exposed by erosion along the steeply descending, northeast trending gully. Test pits encountered intense radiation. Fragments of quartz-sericite-chlorite greisen with boxwork after sulfides were also found in additional nearby test pits along strike. Assays of fourteen samples ranged up to 435 parts per million (ppm) uranium. An unidentified radioactive yellow oxide was also noted within the silicified zone. Higher uranium values are associated with lead values up to 3,000 ppm lead, and slightly elevated copper values; these are from the silicified masses, whereas altered marginal quartz monzonite assayed lower uranium values, between 10 to 24 ppm. Very little thorium was reported in any of the quartz-rich samples, though slightly elevated thorium values (up to 76 ppm) are found in the altered quartz monzonite.

No ore minerals were identified but there was a radioactive yellow oxide noted in the silicified shear zone. Gangue minerals include chlorite, clay minerals, hematite, replacement quartz, and sericite. Epidote, plagioclase that is generally altered to carbonate and white mica with opaque minerals including clay minerals, magnetite, and pyrrhotite.

Alteration:

Greisen, locally argillic, pervasive hematitic staining and corroded quartz occurring in wide zones of sericite and chlorite alteration. Alteration is best exposed in avalanche gullies and/or some structurally controlled swales along exposed ridges (Foley and Barker, 1986).

Age of mineralization:

Quartz monzonite of the Darby pluton is reported to be Late Cretaceous (Miller and Bunker, 1975; Eakins and others, 1977; Wilson and others, 2015).

Generic deposit model:

Deposit model:

Granite-hosted veins with uranium values generally much greater than thorium; minimal REE, tin; uranium values that do not concentrate in resistant minerals as indicated by heavy mineral survey (Foley and Barker, 1986); mineralized shear zones by structural control, spatial association with lamprophyre dikes; no clear comparable examples available.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Test pits exposed irregular replacement-style masses of red hematitic quartz pods 6-10 feet wide mixed in a kaolinized and sheared biotite quartz monzonite and quartz stockwork marginal to the shear zone. The altered shear zone and secondary quartz occur where exposed by erosion along the steeply descending, northeast trending gully. Test pits encountered intense radiation. Fragments of quartz-sericite-chlorite greisen with boxwork after sulfides were also found in additional nearby test pits along strike. Assays of fourteen samples ranged up to 435 parts per million (ppm) uranium. An unidentified radioactive yellow oxide was also noted within the silicified zone. Higher uranium values are associated with lead values up to 3,000 ppm lead, and slightly elevated copper values; these are from the silicified masses, whereas altered marginal quartz monzonite assayed lower uranium values, between 10 to 24 ppm. Very little thorium was reported in any of the quartz-rich samples, though slightly elevated thorium values (up to 76 ppm thorium) are found in the altered quartz monzonite. Distinctly higher radiometric measurements generally are recorded over hydrothermally altered veins and structurally controlled high-angle shear zones and breccia masses. Radiometric readings will locally exceed the calibration of handheld scintillometers. These radiometric anomalies generally feature hematite, black iridescent manganese staining, quartz stockwork, ferruginous quartz, jasper, drusy and vuggy quartz.

Production notes:

None.

Reserves:

No reserves.

Additional comments:

The West Vulcan-Rock Creek area was selected for study by the U.S. Bureau of Mines in 1979 as part of ongoing mineral land assessments in Alaska and land designations proposed by Congress, and because recent (1970s) private sector exploration had discovered sedimentary uranium in the Boulder Creek basin in southern Death Valley about 6 miles to the north (Dickinson and others, 1987). No further work was performed.

References:

Dickinson, K.A., Cunningham, K.D., and Ager, T.A., 1987, Geology and origin of the Death Valley Uranium deposit, Seward Peninsula, Alaska: Economic Geology, volume 82, p. 1558-1574.

Eakins, G.R., Jones, B.K., and Forbes, R.B., 1977, Investigation of Alaska's uranium potential: Alaska Division of Geological & Geophysical Surveys Alaska Open-File Report 109, 213 p., 10 sheets, scale 1:250,000.

Foley, J.Y., and Barker, J.C., 1986, Uranium Occurrences in the Northern Darby Mountains, Alaska: U.S. Bureau of Mines Information Circular IC 9103, 27 p.

Miller, T.P., and Bunker, C.M., 1975, A Reconnaissance Study of the Uranium and Thorium Contents of Plutonic Rocks of the Southeastern Seward Peninsula, Alaska: U.S. Geological Survey Open File Report 75-217, 24 p.

Wilson, F.H., Hults, C.P., Mull, C.G, and Karl, S.M, compilers, 2015, Geologic map of Alaska: U.S. Geological Survey Scientific Investigations Map 3340, pamphlet 196 p., 2 sheets, scale 1:1,584,000, http://dx.doi.org/10.3133/sim3340.

Primary Reference: Foley and Barker, 1986

Reporter(s): J.C. Barker

Last report date: 2016-12-15

Site name(s): West Vulcan Creek No. 3

Site type: Occurrence

ARDF no.: SO181

Latitude: 64.9297 **Quadrangle:** SO D-1

Longitude: 162.3009

Location description and accuracy:

West Vulcan Creek No. 3 consists of a group of mineral showings located on the ridge forming the south side of the West Vulcan Creek valley. Elevations at the occurrence area range from 1,500 to 1,900 feet.

Vulcan Creek is one of several creeks that drain the east flank of the Darby Mountains and is a tributary to the Tubutulik River, which is located east of the report area. The occurrence site is in the NW1/4 sec. 34, T. 6 S., R. 18 W. of the Kateel River Meridian and is the approximate midpoint of the 1,200 foot-long northeast trend of alteration and mineral showings.

Accuracy of the location is about 1,000 feet.

Commodities:

Main: U

Other: Pb

Ore minerals:

Gangue minerals: Chlorite, clay minerals, epidote, hematite, magnetite, plagioclase, pyrrhotite, quartz, sericite

Geologic description:

The Darby pluton is relatively homogeneous, mostly quartz monzonite and minor granite. Locally there are segregations of quartz-deficient, potassium-rich rocks including syenite and alkali granite.

In to the Vulcan Creek and adjacent Rock Creek area the Darby pluton is quartz monzonite containing biotite and lesser hornblende. The pluton is also cut by lamprophyre, rhyolite, aplite, and tourmaline-bearing pegmatite dikes. These later dikes contain euhedral biotite, amphibole, corroded quartz xenocrysts and, more rarely, clinopyroxenite or olivine in a groundmass of altered plagioclase and minor potassium feldspar (Foley and Barker, 1986).

Generally, the Rock Creek and West Vulcan Creek area has higher radiometric levels than the surrounding region.

At West Vulcan Creek No. 3 radiometric measurements vary up to three times background over altered sub-crop, and ground water seeps from fractures along an altered, deeply leached shear zone in a north-trending gully and avalanche chutes. Propylitic- and argillic-altered zones occur in the quartz monzonite and closely spaced shear zones strike north and are exposed over 40 feet of width and 800 feet along strike at this location. Unlike other occurrences in the area, only minor silica and hematite replacements are noted at this site (Foley and Barker, 1986).

Grab samples of altered monzonite and discontinuous quartz fracture fillings assayed 37 to 89 parts per million (ppm) uranium. Sediment from a seep contained 76 ppm uranium.

Gangue minerals include chlorite, clay minerals, hematite, sericite. Quartz forms drusy replacement fillings. Epidote, plagioclase generally altered to carbonate and white mica, with opaque minerals including clay minerals, magnetite, and pyrrhotite.

Alteration:

Greisen, locally argillic, local hematitic staining and corroded quartz, wider zones of sericite and chlorite alteration in the quartz monzonite. Alteration is best exposed in avalanche gullies and/or some structurally

controlled swales along the gully (Foley and Barker, 1986).

Age of mineralization:

Quartz monzonite of the Darby pluton is reported to be Late Cretaceous (Miller and Bunker, 1975; Eakins and others, 1977; Wilson and others, 2015).

Generic deposit model:

Deposit model:

Granite-hosted veins with uranium concentrations generally much greater than thorium; minimal REE and tin; uranium does not concentrate in resistant minerals as indicated by heavy mineral survey (Foley and Barker, 1986); mineralized shear zones with structural control, spatial association with lamprophyre dikes; no clear comparable examples available.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Grab samples of altered monzonite and discontinuous quartz fracture fillings assayed 37 to 89 parts per million (ppm) uranium. Sediment from a seep contained 76 ppm uranium. Distinctly higher radiometric measurements are recorded over hydrothermally altered veins and structurally controlled high-angle shear zones and breccia masses. These radiometric anomalies generally feature hematite, black iridescent manganese staining, quartz stockwork, ferruginous quartz, jasper, and drusy and vuggy quartz.

Production notes:

None.

Reserves:

No reserves.

Additional comments:

The West Vulcan and Rock Creek area was selected for study by the U.S. Bureau of Mines in 1979 as part of ongoing mineral land assessments in Alaska and land designations proposed by Congress, and because recent (1970s) private sector exploration had discovered sedimentary uranium in the Boulder Creek basin of southern Death Valley about 6 miles to the north (Dickinson and others, 1987). No further work was performed.

References:

Eakins, G.R., Jones, B.K., and Forbes, R.B., 1977, Investigation of Alaska's uranium potential: Alaska Division of Geological & Geophysical Surveys Alaska Open-File Report 109, 213 p., 10 sheets, scale 1:250,000.

Foley, J.Y., and Barker, J.C., 1986, Uranium Occurrences in the Northern Darby Mountains, Alaska: U.S. Bureau of Mines Information Circular IC 9103, 27 p.

Miller, T.P., and Bunker, C.M., 1975, A Reconnaissance Study of the Uranium and Thorium Contents of Plutonic Rocks of the Southeastern Seward Peninsula, Alaska: U.S. Geological Survey Open File Report 75-217, 24 p.

Wilson, F.H., Hults, C.P., Mull, C.G, and Karl, S.M, compilers, 2015, Geologic map of Alaska: U.S.

Geological Survey Scientific Investigations Map 3340, pamphlet 196 p., 2 sheets, scale 1:1,584,000, http://dx.doi.org/10.3133/sim3340.

Primary Reference: Foley and Barker, 1986

Reporter(s): J.C. Barker

Last report date: 2016-12-15

Site name(s): Rock Creek No. 4

Site type: Occurrence

ARDF no.: SO182

Latitude: 64.9371 **Quadrangle:** SO D-1

Longitude: 162.3755

Location description and accuracy:

The Rock Creek No. 4 consists of a group of mineral showings located on a prominent north-facing buttress above an upper cirque near the head of Rock Creek. Elevations in the area of the occurrence range from about 1,500 feet up to 2,400 feet at the top of the buttress.

Rock Creek is one of several creeks that drain the east flank of the north-trending Darby Mountains and is a tributary to the Tubutulik River, which is located east of the report area. The occurrence site is in W1/2SW1/4 sec. 29, T. 6 S., R. 18 W. of the Kateel River Meridian and is the approximate midpoint of several vein and alteration features along the 2,000-foot north trend of alteration and mineral showings across the top of the buttress.

Accuracy of the location is about 1,000 feet.

Commodities:

Main: U

Other: Pb, Zn

Ore minerals:

Gangue minerals: Chlorite, clay minerals, epidote, hematite, magnetite, plagioclase, pyrrhotite, sericite

Geologic description:

The Darby pluton is relatively homogeneous, mostly quartz monzonite and minor granite. Locally there are segregations of quartz-deficient, potassium-rich rocks including syenite and alkali granite.

In to the Vulcan Creek and adjacent Rock Creek area the Darby pluton is quartz monzonite containing biotite and lesser hornblende. The pluton is also cut by lamprophyre, rhyolite, aplite, and tourmaline-bearing pegmatite dikes. These later dikes contain euhedral biotite, amphibole, corroded quartz xenocrysts and, more rarely, clinopyroxenite or olivine in a groundmass of altered plagioclase and minor potassium feldspar (Foley and Barker, 1986).

Generally, the Rock Creek and West Vulcan Creek area has higher radiometric levels than the surrounding region. At this occurrence numerous quartz veins and abundant vein quartz rubble occur along a high cirque wall for 1,000 feet and at several sites of alteration on the top of the buttress. In bedrock showings, the veins are leached and the wall rock variably altered to hematitic clay residue and drusy quartz. Veins dip vertically and range from less than an inch up to several feet thick. Veins are contain secondary drusy quartz, relic pyrite and traces of other sulfide minerals. A grab sample from a hematitic quartz vein contained 153 parts per million (ppm) uranium and 236 ppm thorium. No radiometric readings were collected due to weather conditions at the time. Random samples of altered granitic and vein rock contained 10 to 53 ppm uranium (Foley and Barker, 1986).

Gangue minerals include chlorite, clay minerals, hematite, and sericite. Epidote and plagioclase, are generally altered to carbonate and white mica, occurs with opaque minerals including pyrrhotite and magnetite. Generally the entire area of the occurrence is variably hydrothermally altered and discolored. Fine-grained epidote and chlorite impart a light green color to the less altered rocks. Locally, the granitic rocks contain quartz stockwork and veins, cryptocrystalline silica coatings and segregated masses, abundant hematite, clay minerals, carbonate, and sericite. More highly altered rocks are various shades of red due to

iron oxide minerals.

Alteration:

Greisen, locally argillic, pervasive hematitic staining and corroded quartz after silicification, quartz stockwork and veining; discrete zones of sericite development, epidote, and chlorite alteration (Foley and Barker, 1986).

Age of mineralization:

Quartz monzonite of the Darby pluton is reported to be Late Cretaceous (Miller and Bunker, 1975; Eakins and others, 1977; Wilson and others, 2015).

Generic deposit model:

Deposit model:

Granite-hosted veins with uranium values generally much greater than thorium; minimal REE and tin; uranium does not concentrate in resistant minerals as indicated by heavy mineral survey (Foley and Barker, 1986); mineralized shear zones by structural control, spatial association with lamprophyre dikes; no clear comparable examples available.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

A grab sample from a hematitic quartz vein contained 153 parts per million (ppm) uranium and 236 ppm thorium. No radiometric readings were collected due to weather conditions at the time. Random samples, of altered granitic and vein rock contained 10 to 53 ppm uranium (Foley and Barker, 1986).

Production notes:

None.

Reserves:

No reserves.

Additional comments:

The West Fork Vulcan and Rock Creek area was selected for study by the U.S. Bureau of Mines in 1979 as part of ongoing mineral land assessments in Alaska and land designations proposed by Congress, and because recent (1970s) private sector exploration had discovered sedimentary uranium in the Boulder Creek basin of southern Death Valley about 6 miles to the north (Dickinson and others, 1987). No further work was performed.

References:

Dickinson, K.A., Cunningham, K.D., and Ager, T.A., 1987, Geology and origin of the Death Valley Uranium deposit, Seward Peninsula, Alaska: Economic Geology, volume 82, p. 1558-1574.

Eakins, G.R., Jones, B.K., and Forbes, R.B., 1977, Investigation of Alaska's uranium potential: Alaska Division of Geological & Geophysical Surveys Alaska Open-File Report 109, 213 p., 10 sheets, scale 1:250,000.

Foley, J.Y., and Barker, J.C., 1986, Uranium Occurrences in the Northern Darby Mountains, Alaska: U.S. Bureau of Mines Information Circular IC 9103, 27 p.

Miller, T.P., and Bunker, C.M., 1975, A Reconnaissance Study of the Uranium and Thorium Contents of Plutonic Rocks of the Southeastern Seward Peninsula, Alaska: U.S. Geological Survey Open File Report 75-217, 24 p.

Wilson, F.H., Hults, C.P., Mull, C.G, and Karl, S.M, compilers, 2015, Geologic map of Alaska: U.S. Geological Survey Scientific Investigations Map 3340, pamphlet 196 p., 2 sheets, scale 1:1,584,000, http://dx.doi.org/10.3133/sim3340.

Primary Reference: Foley and Barker, 1986

Reporter(s): J.C. Barker

Last report date: 2016-12-15

Site name(s): Rock Creek No. 5

Site type: Occurrence

ARDF no.: SO183

Latitude: 64.9426

Quadrangle: SO D-1

Longitude: 162.3461

Location description and accuracy:

The Rock Creek No. 5 occurs in a steep, narrow gully above a northwest-facing cirque on the right limit of upper Rock Creek. Elevations in the area of the occurrence range from about 1,700 feet up to 2,800 feet at the top of the cirque wall. Rock Creek is one of several creeks that drain the east flank of the north-trending Darby Mountains and is a tributary to the Tubutulik River, which is located east of the report area. The occurrence site is in E1/2NE1/4 sec. 29, T. 6 S., R. 18 W. of the Kateel River Meridian and coordinates are the approximate midpoint of several vein and alteration features.

Accuracy of the location is about 1,000 feet.

Commodities:

Main: U

Other: Pb

Ore minerals:

Gangue minerals: Chlorite, clay minerals, epidote, hematite, magnetite, plagioclase, pyrrhotite, quartz, sericite

Geologic description:

The Darby pluton is relatively homogeneous, mostly quartz monzonite and minor granite. Locally there are segregations of quartz-deficient, potassium-rich rocks including syenite and alkali granite.

In to the Vulcan Creek and adjacent Rock Creek area the Darby pluton is quartz monzonite containing biotite and lesser hornblende. The pluton is also cut by lamprophyre, rhyolite, aplite, and tourmaline-bearing pegmatite dikes. These later dikes contain euhedral biotite, amphibole, corroded quartz xenocrysts and, more rarely, clinopyroxenite or olivine in a groundmass of altered plagioclase and minor potassium feldspar (Foley and Barker, 1986). Generally, the Rock Creek and West Vulcan Creek area has higher radiometric levels than the surrounding region.

Rock Creek No. 5 consists of several closely spaced, parallel, silicified shear zones that are poorly exposed in a steep, narrow avalanche chute above the northwest-facing cirque on the right limit of upper Rock Creek. The zones strike west-northwest with a steep northerly dip. At one outcrop within the chute, a 1.5 foot-wide silicified zone with hematite, chlorite, and secondary quartz veins contains disseminated pyrite and rare chalcopyrite. Other outcrops and float are leached of sulfide minerals. The presence of boulder-sized rubble in the chute indicates that silicified shear zones range in width from 1 to 4 feet or more and are bordered by narrow zones of clay and fault gouge. Generally the leached and silicified zones yield radiometric values of 2 times background. Two chip samples of leached hematitic quartz vein rubble contained 140 and 170 parts per million (ppm) uranium and anomalous lead concentrations (Foley and Barker, 1986).

Gangue minerals include chlorite, clay minerals, hematite, quartz, and sericite. Epidote and plagioclase generally altered to white mica and carbonate occurs with opaque minerals including magnetite and pyrrhotite.

Alteration:

Greisen, locally argillic, pervasive hematitic staining and corroded quartz after silicification, quartz

stockwork and veining with silicification formed in sheared clay and crushed granitic host rock zones; discrete zones of sericite development, epidote, and chlorite alteration were observed (Foley and Barker, 1986).

Age of mineralization:

Quartz monzonite of the Darby pluton is reported to be Late Cretaceous (Miller and Bunker, 1975; Eakins and others, 1977; Wilson and others, 2015).

Generic deposit model:

Deposit model:

Granite-hosted veins with uranium concentrations generally much greater than thorium; minimal REE and tin; uranium does not concentrate in resistant minerals as indicated by heavy mineral survey (Foley and Barker, 1986); mineralized shear zones with structural control, spatial association with lamprophyre dikes; no clear comparable examples available.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Generally the leached and silicified zones yield radiometric values of 2 times background. Two chip samples of leached hematitic quartz vein rubble contained 140 and 170 parts per million (ppm) uranium and anomalous lead concentrations (Foley and Barker, 1986).

Production notes:

None.

Reserves:

No reserves.

Additional comments:

The West Vulcan and Rock Creek area was selected for study by the U.S. Bureau of Mines in 1979 as part of ongoing mineral land assessments in Alaska and land designations proposed by Congress, and because (1970s) private sector exploration had discovered sedimentary uranium in the Boulder Creek basin of southern Death Valley about 6 miles to the north (Dickinson and others, 1987). No further work was performed.

References:

Dickinson, K.A., Cunningham, K.D., and Ager, T.A., 1987, Geology and origin of the Death Valley Uranium deposit, Seward Peninsula, Alaska: Economic Geology, volume 82, p. 1558-1574.

Eakins, G.R., Jones, B.K., and Forbes, R.B., 1977, Investigation of Alaska's uranium potential: Alaska Division of Geological & Geophysical Surveys Alaska Open-File Report 109, 213 p., 10 sheets, scale 1:250,000.

Foley, J.Y., and Barker, J.C., 1986, Uranium Occurrences in the Northern Darby Mountains, Alaska: U.S. Bureau of Mines Information Circular IC 9103, 27 p.

Miller, T.P., and Bunker, C.M., 1975, A Reconnaissance Study of the Uranium and Thorium Contents of Plutonic Rocks of the Southeastern Seward Peninsula, Alaska: U.S. Geological Survey Open File Report

75-217, 24 p.

Wilson, F.H., Hults, C.P., Mull, C.G, and Karl, S.M, compilers, 2015, Geologic map of Alaska: U.S. Geological Survey Scientific Investigations Map 3340, pamphlet 196 p., 2 sheets, scale 1:1,584,000, http://dx.doi.org/10.3133/sim3340.

Primary Reference: Foley and Barker, 1986

Reporter(s): J.C. Barker

Last report date: 2016-12-15

Site name(s): Rock Creek No. 6

Site type: Occurrence

ARDF no.: SO184

Latitude: 64.9554 **Quadrangle:** SO D-1

Longitude: 162.3553

Location description and accuracy:

Rock Creek No. 6 occurs in steep, narrow, northwest-oriented gullies incised in the ridge that forms the northwest-facing slope above the upper right limit of Rock Creek. Elevations in the area of the occurrence range from about 1,500 feet up to 2,800 feet at the top of the cirque wall. Rock Creek is a tributary to the Tubutulik River, which is located east of the report area. Rock Creek is one of several creeks that drain the east flank of the north-trending Darby Mountains. The occurrence site is in W1/2NE1/4 sec. 20, T. 6 S., R. 18 W. of the Kateel River Meridian and coordinates are the approximate midpoint of several vein and alteration features.

Accuracy of the location is about 1,500 feet.

Commodities:

Main: U

Other: Pb

Ore minerals: Pitchblende

Gangue minerals: Banded jasper, chlorite, clay minerals, epidote, hematite, magnetite, plagioclase, pyrrhotite, quartz, sericite

Geologic description:

The Darby pluton is a relatively homogeneous, mostly quartz monzonite and minor granite. Locally there are segregations of quartz-deficient, potassium-rich rocks including syenite and alkali granite. The pluton is cut by rhyolite, aplite, and tourmaline-bearing pegmatite dikes. In to the Vulcan Creek and adjacent Rock Creek area, the Darby pluton is quartz monzonite containing biotite and lesser hornblende and cut by tourmaline aplite and a swarm of lamprophyre and apparently related variants of dark-colored sub-alkaline intermediate composition porphyritic dikes. The dikes contain euhedral biotite, amphibole, corroded quartz xenocrysts and, more rarely, clinopyroxenite or olivine in a groundmass of altered plagioclase and minor potassium feldspar. Generally, the Rock Creek and West Vulcan Creek area has higher radiometric levels than the surrounding region (Foley and Barker, 1986).

Rock Creek No. 6 consists of several silicified and iron-stained, northeast-striking shear zones exposed for 500 vertical feet in a steep, east-facing gully in a cirque wall. Steeply dipping quartz veins, containing banded jasper with hematite and narrow, parallel seams of pyrite-bearing fluorite greisen, occur in the altered quartz monzonite. Jasper bands up to 2 inches thick are concentrated in a 1 foot-wide central portion of the quartz veins, which pinch and swell to about 4 feet. Pitchblende was identified by the U.S. Bureau of Mines Reno Metallurgical Center in a high-grade sample of radioactive greisen that assayed 1,961 parts per million (ppm) uranium. Isolated float of highly radioactive jasper vein material was also found and samples assayed up to 0.76 percent uranium. Surrounding quartz monzonite cut by the shear zones is hydrothermally altered and contains chlorite and hematite with disseminated pyrite and clay minerals (samples assayed 253, 190, 565, and 18 ppm). Carbonate-altered biotite and olivine lamprophyre dike(s) underlie the vicinity with unknown orientations (Foley and Barker, 1986).

Gangue minerals include chlorite, clay minerals, hematite, banded jasper, quartz, sericite. Epidote and plagioclase generally altered to white mica and carbonate occur with opaque minerals including magnetite

and pyrrhotite.

Alteration:

Greisen, locally argillic, sooty fluorite also noted at several sites. Banded jasper, pervasive hematitic staining, and corroded quartz after silicification, were also noted. Quartz stockwork and veining occurs with silicification in shear zones; also noted were discrete zones of sericite, epidote, and chlorite alteration. Clay minerals and iron oxides occur in all vein showings and adjoining quartz monzonite wall rock (Foley and Barker, 1986).

Age of mineralization:

Quartz monzonite of the Darby pluton is reported to be Late Cretaceous (Miller and Bunker, 1975; Eakins and others, 1977; Wilson and others, 2015).

Generic deposit model:

Deposit model:

Granite-hosted veins with uranium generally much greater than thorium; minimal REE and tin; uranium does not concentrate in resistant minerals as indicated by heavy mineral survey (Foley and Barker, 1986); mineralized shear zones with structural control, spatial association with lamprophyre dikes; no clear comparable examples available.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Pitchblende was identified by the U.S. Bureau of Mines Reno Metallurgical Center in a high-grade sample of radioactive greisen that assayed 1,961 parts per million (ppm) uranium (Foley and Barker, 1986). Isolated float of highly radioactive jasper vein material was also found and samples assayed up to 0.76 percent uranium. Surrounding quartz monzonite cut by the shear zones is hydrothermally altered and contains chlorite and hematite with disseminated pyrite and clay minerals (samples assayed 253, 190, 565, and 18 ppm).

Production notes:

None.

Reserves:

No reserves.

Additional comments:

The West Vulcan and Rock Creek area was selected for study by the U.S. Bureau of Mines in 1979 as part of ongoing mineral land assessments in Alaska and land designations proposed by Congress, and because recent (1970s) private sector exploration had discovered sedimentary uranium in the Boulder Creek basin of southern Death Valley about 6 miles to the north (Dickinson and others, 1987). No further work was performed.

References:

Dickinson, K.A., Cunningham, K.D., and Ager, T.A., 1987, Geology and origin of the Death Valley Uranium deposit, Seward Peninsula, Alaska: Economic Geology, volume 82, p. 1558-1574.

Eakins, G.R., Jones, B.K., and Forbes, R.B., 1977, Investigation of Alaska's uranium potential: Alaska

Division of Geological & Geophysical Surveys Alaska Open-File Report 109, 213 p., 10 sheets, scale 1:250,000.

Foley, J.Y., and Barker, J.C., 1986, Uranium Occurrences in the Northern Darby Mountains, Alaska: U.S. Bureau of Mines Information Circular IC 9103, 27 p.

Miller, T.P., and Bunker, C.M., 1975, A Reconnaissance Study of the Uranium and Thorium Contents of Plutonic Rocks of the Southeastern Seward Peninsula, Alaska: U.S. Geological Survey Open File Report 75-217, 24 p.

Wilson, F.H., Hults, C.P., Mull, C.G, and Karl, S.M, compilers, 2015, Geologic map of Alaska: U.S. Geological Survey Scientific Investigations Map 3340, pamphlet 196 p., 2 sheets, scale 1:1,584,000, http://dx.doi.org/10.3133/sim3340.

Primary Reference: Foley and Barker, 1986

Reporter(s): J.C. Barker

Last report date: 2016-12-15

Site name(s): Rock Creek No. 7

Site type: Occurrence

ARDF no.: SO185

Latitude: 64.9578 **Quadrangle:** SO D-1

Longitude: 162.3491

Location description and accuracy:

Rock Creek No. 7 occurs on the crest of the northwest-facing valley wall above the right limit of upper Rock Creek. Elevations in the area of the occurrence range from near 1,000 feet up to 1,700 feet at the top of the ridge. Rock Creek is a tributary to the Tubutulik River, which is located east of the report area. Rock Creek is one of several creeks that drain the east flank of the north-trending Darby Mountains. The occurrence site is in NE1/4, NE1/4 sec. 20, T. 6 S., R. 18 W. of the Kateel River Meridian and coordinates are the approximate midpoint of several vein and alteration features on this northwest-facing slope.

Accuracy of the location is about 1,500 feet.

Commodities:

Main: U

Other: Bi, Mo, Pb

Ore minerals: Galena

Gangue minerals: Chlorite, clay minerals, epidote, hematite, magnetite, plagioclase, pyrrhotite, quartz, sericite

Geologic description:

The Darby pluton is relatively homogeneous, mostly quartz monzonite and minor granite. Locally there are segregations of quartz-deficient, potassium-rich rocks including syenite and alkali granite. The pluton is cut by rhyolite, aplite, and tourmaline-bearing pegmatite dikes. In the Vulcan Creek and adjacent Rock Creek area the rocks of the Darby pluton is quartz monzonite containing biotite and lesser hornblende and is cut by tourmaline aplite and a swarm of lamprophyre and apparently related variants of dark-colored sub-alkaline porphyritic dikes. The dikes contain euhedral biotite, amphibole, corroded quartz xenocrysts and, more rarely, clinopyroxenite or olivine in a dike groundmass of altered plagioclase and minor potassium feldspar. Generally, the Rock Creek and West Vulcan Creek area has higher radiometric levels than the surrounding region (Foley and Barker, 1986), but inclement weather prevented radiometric measurements at this occurrence.

This poorly exposed occurrence is a silicified hematitic and iron-stained, northeast-striking shear zone exposed near the crest of the northwest-facing slope above upper Rock Creek. The shear zone cuts propylitically-altered, medium-grained quartz monzonite. Because of the poor exposure, the dimensions of the occurrence are unknown. Hematite-rich quartz boulders occur on the slope and appear to be derived from the shear zone(s). Samples assayed 7 to 155 parts per million uranium (Foley and Barker, 1986).

Gangue minerals include chlorite, clay minerals, hematite, quartz, sericite were noted. Plagioclase generally altered to white mica, epidote, and carbonate occur with opaque minerals including magnetite and pyrrhotite.

Alteration:

A greisen quartz hematitic shear zone, locally argillic altered, is apparently present under surficial cover. Adjacent quartz monzonite exhibits propylitic alteration. Oxidation and clay minerals, after argillic alteration, infill between the vein and replacement lenses occurrences (Foley and Barker, 1986).

Age of mineralization:

Quartz monzonite of the Darby pluton is reported to be Late Cretaceous (Miller and Bunker, 1975; Eakins and others, 1977; Wilson and others, 2015).

Generic deposit model:

Deposit model:

Granite-hosted veins that contain generally much greater uranium than thorium and have minimal REE and tin. Uranium does not concentrate in resistant minerals as indicated by heavy mineral survey (Foley and Barker, 1986). Occurs as mineralized structurally controlled shear zones. There is a spatial association with lamprophyre dikes. No clear comparable deposit model examples are available.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Samples assayed 7 to 155 parts per million uranium (Foley and Barker, 1986).

Production notes:

None.

Reserves:

No reserves.

Additional comments:

The West Vulcan and Rock Creek area was selected for study by the U.S. Bureau of Mines in 1979 as part of ongoing mineral land assessments in Alaska and land designations proposed by Congress, and because recent (1970s) private sector exploration had discovered sedimentary uranium in the Boulder Creek basin of southern Death Valley about 6 miles to the north (Dickinson and others, 1987). No further work was performed.

References:

Dickinson, K.A., Cunningham, K.D., and Ager, 1987, Geology and Origin of the Death Valley Uranium Deposit, Seward Peninsula, Alaska: Economic Geology, volume 82, p. 1558-1574.

Eakins, G.R., Jones, B.K., and Forbes, R.B., 1977, Investigation of Alaska's uranium potential: Alaska Division of Geological & Geophysical Surveys Alaska Open-File Report 109, 213 p., 10 sheets, scale 1:250,000.

Foley, J.Y., and Barker, J.C., 1986, Uranium Occurrences in the Northern Darby Mountains, Alaska: U.S. Bureau of Mines Information Circular IC 9103, 27 p.

Primary Reference: Foley and Barker, 1986

Reporter(s): J.C. Barker

Last report date: 2016-12-15

Site name(s): Rock Creek No. 8

Site type: Occurrence

ARDF no.: SO186

Latitude: 64.9562 **Quadrangle:** SO D-1

Longitude: 162.3577

Location description and accuracy:

Rock Creek prospect 8 occurs on the steep northwest-facing valley wall above the right limit of upper Rock Creek. Elevations in the area range from about 1,500 feet up to 2,800 feet at the top of the cirque wall. Rock Creek is one of several creeks that drain the east flank of the north-trending Darby Mountains and is a tributary to the Tubutulik River, which is located east of the report area. The occurrence site is in NE1/4 sec. 20, T. 6 S., R. 18 W. of the Kateel River Meridian and coordinates are the approximate midpoint of several vein and alteration features on this northwest-facing slope.

Accuracy of the location is about 1,500 feet.

Commodities:

Main: U

Other: Bi, Mo, Pb

Ore minerals:

Gangue minerals: Chlorite, clay minerals, hematite, magnetite, pyrrhotite, quartz, sericite

Geologic description:

The Darby pluton is relatively homogeneous, mostly quartz monzonite and minor granite. Locally there are segregations of quartz-deficient, potassium-rich rocks including syenite and alkali granite. The pluton is cut by rhyolite, aplite, and tourmaline-bearing pegmatite dikes. In the Vulcan Creek and adjacent Rock Creek area the rocks of the Darby pluton is quartz monzonite containing biotite and lesser hornblende and is cut by tourmaline aplite and a swarm of lamprophyre and apparently related variants of dark-colored sub-alkaline porphyritic dikes. The dikes contain euhedral biotite, amphibole, corroded quartz xenocrysts and, more rarely, clinopyroxenite or olivine in a dike groundmass of altered plagioclase and minor potassium feldspar. Generally, the Rock Creek and West Vulcan Creek area has higher radiometric levels than the surrounding region (Foley and Barker, 1986).

Rock Creek No. 8 consists of several silicified and iron-stained, shear zones about 2,000 feet along strike and exposed high on the northwest-facing slope above upper Rock Creek. Radiometric readings were up to 5 times background over hematite-rich quartz boulders from east- and southeast-striking zones aligned in shallow steep gullies best exposed between elevations of 1,600 and 2,500 feet. There are at least two systems of veins exposed that trend to the ridge crest where they are exposed in place; each exhibits closely spaced quartz veins, quartzose replacement lens, and leached hematitic lenses with relic pyrite. One system strikes N 85 E, dips steeply to the north, and is 12 feet wide with individual hematitic quartz lenses up to 10 inches thick. Two chip samples were analyzed; one contained 447 parts per million (ppm) uranium and the other 430 ppm uranium. A second hematitic quartz-biotite system is spaced 10 feet away; this zone is 12 to15 feet wide and soil assayed 229 ppm uranium. Samples of hematite-rich quartz boulders downslope assayed 270 and 1,000 ppm uranium (Foley and Barker, 1986).

Alteration:

Greisen showing banded jasper, pervasive hematitic staining, and corroded quartz is locally argillic. Quartz stockwork and veining forms in shear zones; discrete zones of sericite development, epidote, and

chlorite alteration are apparent. Adjacent quartz monzonite exhibits propylitic alteration. Oxidation and clay minerals, after argillic alteration, infill between the vein and replacement lenses occurrences (Foley and Barker, 1986).

Age of mineralization:

Quartz monzonite of the Darby pluton is reported to be Late Cretaceous (Miller and Bunker, 1975; Eakins and others, 1977; Wilson and others, 2015).

Generic deposit model:

Deposit model:

Granite-hosted veins with uranium generally much greater than thorium; minimal REE and tin; uranium does not concentrate in resistant minerals as indicated by heavy mineral survey (Foley and Barker, 1986); mineralized shear zones with structural control, spatial association with lamprophyre dikes; no clear comparable examples available.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Radiometric readings were up to 5 times background over hematite-rich quartz boulders from east- and southeast-striking zones aligned in shallow steep gullies best exposed between elevations of 1,600 and 2,500 feet. There are at least two systems of veins exposed that trend to the ridge crest where they are exposed in place; each exhibits closely spaced quartz veins, quartzose replacement lens, and leached hematitic lenses with relic pyrite. One system strikes N 85 E, dips steeply to the north, and is 12 feet wide with individual hematitic quartz lenses up to 10 inches thick. Two chip samples were analyzed; one contained 447 parts per million (ppm) uranium and the other 430 ppm uranium. A second hematitic quartz-biotite system is spaced 10 feet away; this zone is 12 to15 feet wide and soil assayed 229 ppm uranium. Samples of hematite-rich quartz boulders downslope assayed 270 and 1,000 ppm uranium (Foley and Barker, 1986).

Production notes:

None.

Reserves:

No reserves.

Additional comments:

The West Vulcan and Rock Creek area was selected for study by the U.S. Bureau of Mines in 1979 as part of ongoing mineral land assessments in Alaska and land designations proposed by Congress, and because recent (1970s) private sector exploration had discovered sedimentary uranium in the Boulder Creek basin of southern Death Valley about 6 miles to the north (Dickinson and others, 1987). No further work was performed.

References:

Dickinson, K.A., Cunningham, K.D., and Ager, T.A., 1987, Geology and origin of the Death Valley Uranium deposit, Seward Peninsula, Alaska: Economic Geology, volume 82, p. 1558-1574.

Eakins, G.R., Jones, B.K., and Forbes, R.B., 1977, Investigation of Alaska's uranium potential: Alaska Division of Geological & Geophysical Surveys Alaska Open-File Report 109, 213 p., 10 sheets, scale 1:250,000.

Foley, J.Y., and Barker, J.C., 1986, Uranium Occurrences in the Northern Darby Mountains, Alaska: U.S. Bureau of Mines Information Circular IC 9103, 27 p.

Miller, T.P., and Bunker, C.M., 1975, A Reconnaissance Study of the Uranium and Thorium Contents of Plutonic Rocks of the Southeastern Seward Peninsula, Alaska: U.S. Geological Survey Open File Report 75-217, 24 p.

Wilson, F.H., Hults, C.P., Mull, C.G, and Karl, S.M, compilers, 2015, Geologic map of Alaska: U.S. Geological Survey Scientific Investigations Map 3340, pamphlet 196 p., 2 sheets, scale 1:1,584,000, http://dx.doi.org/10.3133/sim3340.

Primary Reference: Foley and Barker, 1986

Reporter(s): J.C. Barker

Last report date: 2016-12-15

Site name(s): Lucky Six Creek

Site type: Mine

ARDF no.: SP011

Latitude: 67.5841 **Quadrangle:** SP C-4

Longitude: 154.8833

Location description and accuracy:

This site is based on a 1904 report by Schrader of several mineral occurrences and minor placer gold mining on Lucky Six Creek. The prospects were apparently not visited by Schrader; his description was based on reports of prospectors. The exact location of these deposits cannot now be determined. Lucky Six Creek was examined by Kurtak and others (2002) and they found signs of placer mining along 50 feet of the creek but give no exact location. Arbitrarily this site is located in about the middle of the 4 miles of Lucky Six Creek, about 0.6 mile southwest of the center of section 18, R. 25 N., R. 18 E. (See also ARDF site SP012 which may be the same deposit.)

Commodities:

Main: Ag, Au

Other: Graphite

Ore minerals: Gold

Gangue minerals:

Geologic description:

Schrader (1904) reported that gold was discovered on Lucky Six Creek in 1898 and a few ounces of coarse placer gold was recovered. A small lens of high-grade silver ore and graphite was reported by prospectors prior to World War I (Smith, 1913). Kurtak and others (2002) examined the creek and found evidence of sluice mining for about 50 feet. Their panned samples did not contain any gold. (See also ARDF site SP012 which may be the same deposit.)

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer gold (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

Scant evidence of mining prior to 1904. No record of any mining since.

Production notes:

Lucky Six Creek produced a few ounces of gold prior to 1904.

Reserves:

None.

Additional comments:

Located within Gates of the Arctic National Park.

References:

Anderson, Eskil, 1945, Asbestos and jade occurrences in the Kobuk River region, Alaska: Alaska Territorial Department of Mines Pamphlet 3-R, 26 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Grybeck, D.J., and Nelson, S.W., 1981, Mineral deposit map of the Survey Pass quadrangle, Brooks Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1176-F, 1 sheet, scale 1:250,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Schrader, F.C., 1904, A reconnaissance in northern Alaska across the Rocky Mountains, along Koyukuk, John, Anaktuvuk, and Colville rivers and the Arctic coast to Cape Lisburne, in 1901, with notes by W.J. Peters: U.S. Geological Survey Professional Paper 20, 139 p.

Smith. P.S., 1913, The Noatak-Kobuk region, Alaska: U.S. Geological Survey Bulletin 536, 60 p.

Primary Reference: Grybeck and Nelson, 1981

Reporter(s): S.W. Nelson (Anchorage, Alaska); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (head Lucky Six Creek near Gull Pass)

Site type: Prospect

ARDF no.: SP012

Latitude: 67.628 **Quadrangle:** SP C-4

Longitude: 154.8167

Location description and accuracy:

The site is based on early descriptions of several mineral prospects and minor placer gold production on Lucky Six Creek (Schrader 1904). The prospects apparently were not visited by Schrader who based their location on reports by prospectors. Their exact location remains undetermined. The coordinates are that of a sample with metal values collected by Kurtak and others (2002). Their sample site is about 1.7 miles north of Gull Pass and about 0.5 mile east of the center of section 33, T. 26 N., R. 18 E. Kurtak's location is accurate but the old Schrader location is vague. Also see ARDF SP012, Lucky Six Creek, which is nearby and may refer to the same site.

Commodities:

Main: Ag, Au, Cu, Sb

Other:

Ore minerals: Bornite, chalcopyrite, malachite, pyrite, stibnite

Gangue minerals:

Geologic description:

Based solely on information from prospectors, Schrader (1904) reported that six or more quartz veins, 10 to 75 ft. thick, occur in a belt 6 miles long. Samples given to him by prospectors contained pyrite, chalcopyrite, bornite, malachite, and stibnite. The veins were reported to have been discovered in 1902-1903. The country rock in the area is marble interlayered with chlorite schist of the Devonian and Silurian Skajit Limestone (Nelson and Grybeck, 1980). Kurtak and others (2002) collected a sample of quartz-carbonate float with tetrahedrite(?), malachite, and azurite in Lucky Six Creek about 1.7 miles north of Gull Pass. The sample contained 43 parts per million (ppm) silver, 672 ppm arsenic, and 3,580 ppm antimony.

Alteration:

None.

Age of mineralization:

Silurian or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Unclear; only a vague early report of mineralization.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Undetermined

Site Status: Inactive

Workings/exploration:

Minor prospecting in the early 1900s. The area was examined by several government parties from the early 1980 to 2002; none found any significant mineralization.

Production notes:

None.

Reserves:

None.

Additional comments:

Located in Gates of the Arctic National Park.

References:

Grybeck, D.J., and Nelson, S.W., 1981, Mineral deposit map of the Survey Pass quadrangle, Brooks Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1176-F, 1 sheet, scale 1:250,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, Alaska: Bureau of Land Management Technical Report 50, 2 vols., paged by sections.

Nelson, S.W., and Grybeck, D.J., 1980, Geologic map of the Survey Pass quadrangle, Brooks Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1176-A, 2 sheets, scale 1:250,000.

Schrader, F.C., 1904, A reconnaissance in northern Alaska across the Rocky Mountains, along Koyukuk, John, Anaktuvuk, and Colville rivers and the Arctic coast to Cape Lisburne, in 1901, with notes by W.J. Peters: U.S. Geological Survey Professional Paper 20, 139 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): S.W. Nelson (Anchorage, Alaska); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (north of Arrigetch Peaks)

Site type: Occurrence

ARDF no.: SP015

Latitude: 67.4499 **Quadrangle:** SP B-3

Longitude: 154.1653

Location description and accuracy:

This occurrence is an elevation of about 3,700 feet near the head of an unnamed creek 3 miles northeast of the Arrigetch Peaks. It is near the southeast corner of section 32, T. 24 N., R. 22 E., The site corresponds to locality 32 of Grybeck and Nelson (1981) and area 1 of the SP2 site of Kurtak and others (2002).

Commodities:

Main: As, Cu, Sn, Zn

Other: Bi

Ore minerals: Arsenopyrite, chalcopyrite, magnetite, pyrite, pyrrhotite

Gangue minerals: Calc-silicates

Geologic description:

This occurrence consists of selected float samples of iron-stained Paleozoic schist and skarn. The source of the float probably is a contact-metamorphic zone adjacent to Devonian granite that crops out to the south. Selected samples contained up to 5,000 parts per million (ppm) arsenic, 20 ppm bismuth, and 1000 ppm tin (Grybeck and Nelson, 1981). This occurrence probably is similar in origin to other Devonian contact-metamorphic deposits in nearby areas of the Brooks Range (Newberry and others, 1986). Kurtak and others (2002) collected several samples in the vicinity, notably of magnetite-calc-silicate ribbon rock, with pyrite, chalcopyrite, pyrrhotite, and arsenopyrite. . Samples contained up to 4,492 ppm copper, 4,052 ppm tin, and 859 ppm bismuth, and 7,782 ppm zinc.

Alteration:

Calc-silicate minerals in skarn and related contact metamorphic rocks adjacent to a Devonian granite.

Age of mineralization:

Probably related to nearby Devonian granite.

Generic deposit model:

Deposit model:

Skarn (Cox and Singer, 1986; model 14b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

14b

Production Status: None

Site Status: Inactive

Workings/exploration:

The site was briefly visited and sampled during regional geologic mapping by the USGS in the late 1970s and visited and sampled by the Bureau of Land Management in about 2000.

Production notes:

None.

Reserves:

None.

Additional comments:

Located in the heart of a notable scenic part of the Gates of the Arctic National Park.

References:

Grybeck, D.J., and Nelson, S.W., 1981, Mineral deposit map of the Survey Pass quadrangle, Brooks Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1176-F, 1 sheet, scale 1:250,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, 2 vols., 845 p.

Newberry, R.J., Dillon, J.T., and Adams, D.D., 1986, Regionally metamorphosed calc-silicate-hosted deposits of the Brooks Range, northern Alaska: Economic Geology, v. 81, p. 1728-1752.

Primary Reference: Grybeck and Nelson, 1981

Reporter(s): S.W. Nelson (Anchorage, Alaska); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (south of Arrigetch Creek)

Site type: Occurrences

ARDF no.: SP016

Latitude: 67.4303 **Quadrangle:** SP B-3

Longitude: 154.0242

Location description and accuracy:

This site includes several occurrences that extend east for several miles along the east-trending contact of a granite. The area is about 5.8 miles southwest of the mouth of Arrigetch Creek. The coordinates are for the approximate center of the area in sec. 5, T. 23 N., R. 22 E. The location is accurate. The site corresponds to localities 33 through 35 of Grybeck and Nelson (1981).

Commodities:

Main: Ag, Cu, Pb, Sn, Zn

Other: As, Bi, F, W

Ore minerals: Chacopyrite, sphalerite

Gangue minerals: Calc-silicate minerals, magnetite

Geologic description:

This site consists of three contact-metamorphic, skarn deposits adjacent to Devonian granite (Grybeck and Nelson, 1981). At one locality several skarn bodies up to 700 m long and 70 m thick at a granite-carbonate contact contain lenses and pods of magnetite, and minor disseminated chalcopyrite, sphalerite and unspecified tungsten minerals. At another locality, heterogeneous contact-metamorphic rocks include fluorite-magnetite rock, quartz-epidote skarn, epidote-garnet skarn and sphalerite-epidote skarn. Selected samples contained up to 150 parts per million (ppm) silver, 1000 ppm bismuth, and more than 1 percent each of tin, lead, and zinc. A brief reconnaissance of a granite-phyllite contact revealed several tactite pods less than 5 meters wide. The most prominent consists of magnetite with copper staining. Grab samples contained up to 1000 ppm each of arsenic, copper, tin, and zinc. These occurrences probably are similar in origin to other Devonian contact-metamorphic deposits in nearby areas of the Brooks Range (Newberry and others, 1986).

Kurtak and others (2002) collected several samples of mineralized skarn and thin quartz veins for about a mile along the north side of the Devonian granite. Their samples contained up to 3,042 ppm copper, 269 ppm cobalt, and 1,080 ppm tin.

Alteration:

Calc-silicate minerals in skarn and related contact metamorphic rocks adjacent to Devonian granite.

Age of mineralization:

Devonian; related to the intrusion of Devonian pluton.

Generic deposit model:

Deposit model:

Skarn (Cox and Singer, 1986; model 14b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
14b

Production Status: None

Site Status: Inactive

Workings/exploration:
The sites were briefly visited and sampled during regional geologic mapping by the USGS in the late 1970s and again visited and sampled by the Bureau of Land Management in about 2000.

Production notes:
None.

Reserves:
None.

Additional comments:
Located in the heart of a notable scenic part of the Gates of the Arctic National Park.

References:
Grybeck, D.J., and Nelson, S.W., 1981, Mineral deposit map of the Survey Pass quadrangle, Brooks Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1176-F, 1 sheet, scale 1:250,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, 2 vols., 845 p.

Newberry, R.J., Dillon, J.T., and Adams, D.D., 1986, Regionally metamorphosed calc-silicate-hosted deposits of the Brooks Range, northern Alaska: Economic Geology, v. 81, p. 1728-1752.

Primary Reference: Grybeck and Nelson, 1981

Reporter(s): S.W. Nelson (Anchorage, Alaska); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Cynbad

Site type: Prospect

ARDF no.: SP033

Latitude: 67.118 **Quadrangle:** SP A-6

Longitude: 155.734

Location description and accuracy:

This prospect is at an elevation of about 3600 feet on a ridge 5 miles north of Avaraart Lake. It is in section 23, T. 20. N., R. 14 E., of the Kateel River Meridian. The location is and accurate to within 1000 ft. The site corresponds to locality 61 of Grybeck and Nelson (1981).

Commodities:

Main: Ag, Cu, Pb, Zn

Other:

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals:

Geologic description:

This prospect explores a silver-base metal volcanogenic massive sulfide deposits in a sequence of low to medium grade metamorphosed basaltic and rhyolitic rocks, submarine ash flow tuffs, and pelitic and carbonaceous sedimentary rocks known as the Ambler schist belt. The deposit is Devonian or Mississippian in age, based on fossil evidence and U-Pb radiometric dating (Hitzman and others, 1986). Numerous copper-stained zones in the schists have been explored by prospect pits and several diamond drill holes. The deposit is similar to, and probably an extension of, the deposits at SP032 (Grybeck and Nelson, 1981).

Two distinct mineralized zones were noted, separated stratigraphically by approximately 1,500 feet, which are referred to as the north and south mineral zones (Ellis, 1983).

The south mineral zone lies within a white schist unit about 150 feet thick overlying country rock schist and underlying a thick metasediment unit. Along the ridge an upper horizon 5 feet thick of disseminated and banded sulfide along with another lower zone of approximately 30 feet thick of banded and disseminated sulfides is present as outcrop and subcrop. The south mineral zone can be traced approximately 3,500 feet from the ridge to the east by gossan float and outcrop (Ellis, 1983).

The north mineral zone lies within a black schist unit approximately 100 feet thick overlying a country rock schist and underlying a siliceous rock unit approximately 100 feet thick. This unit is mineralized for at least 3000 feet where the zone is covered to the east by a large rock slide. To the east gossan boulder samples collected indicate massive sulfides of ore grade with a minimum thickness of 1 foot. Many boulders of mineralized black schist were noted in the rock slide. Along the 3000 feet strike of the black schist outcropping or sub-outcropping, mineralization of banded sulfides up to 1/4 inch to 7 inches thick along with disseminated sphalerite, galena, and pyrite. Rock chip samples collected from a massive sulfide lens contained from 2 to 14 percent lead, 1.6 to 5.5 ounces silver, 6 to 10 percent zinc, and 1.5 to 3.4 percent copper (Ellis, 1983).

Alteration:

Locally prominent copper-staining (Grybeck and Nelson, 1981).

Age of mineralization:

Syngenetic massive sulfide deposit in Devonian or Mississippian host rocks (Grybeck and Nelson, 1981).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

The deposit has been explored by a number of prospect pits and several diamond drill holes (Grybeck and Nelson, 1981).

Approximately 110 soil samples were collected during the early 1980’s over a previously discovered magnetic/geochemical anomalous zone. Results of this work showed an anomalous copper and lead trend, which is open ended to the north. This open-end anomaly is believed to be caused by a metal bearing meta-chert unit contained in rocks of the 'Middle Felsic Belt'. Rock chip samples collected from a massive sulfide lens contained from 2 to 14 percent lead, 1.6 to 5.5 ounces silver, 6 to 10 percent zinc, and 1.5 to 3.4 percent copper (Ellis, 1983).

Production notes:

None.

Reserves:

None.

Additional comments:

Prior to being named Cymbad (in 2014), this site was known as 'Unnamed (north of Avaraat Lake)'.

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Ellis, W.T., 1983, Ambler River Project, Alaska, Project Memorandum No. 10, 1983 Field Investigations, Sunshine Mining Company, 49 p. (Report held at Alaska Earth Sciences, Inc., Anchorage, AK).

Grybeck, D.J., and Nelson, S.W., 1981, Mineral deposit map of the Survey Pass quadrangle, Brooks Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1176-F, 1 sheet, scale 1:250,000.

Hitzman, M.W., Profett, J.M., Jr., Schmidt, J.M., and Smith, T.E., 1986, Geology and mineralization of the Ambler district, northwestern Alaska: Economic Geology, v. 81, p. 1592-1618.

Primary Reference: Grybeck and Nelson, 1981; Ellis, 1983

Reporter(s): S.W. Nelson (Anchorage, Alaska); A. Angel and V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-04

Site name(s): Sun; Main Sun; Hot

Site type: Prospects

ARDF no.: SP039

Latitude: 67.0704

Quadrangle: SP A-5

Longitude: 155.0431

Location description and accuracy:

This site includes several prospects in an approximately 12-square-mile area northeast of Beaver Creek. The best known and most studied is the Sun prospect. The coordinates of the Sun prospect are about 0.3 mile south of the center of section 1, T. 19 N., R. 17 E., of the Kateel River Meridian. The location is accurate to within about 500 feet.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other: Ba

Ore minerals: Arsenopyrite, bornite, chalcopyrite, enargite, galena, sphalerite

Gangue minerals: Barite, chlorite, ferroan calcite, ferroan dolomite, quartz

Geologic description:

This site includes several prospects in an approximately 12-square-mile area northeast of Beaver Creek. The best known and most studied is the Sun prospect (called 'Hot' by Noranda). The Sun deposit consists of stratiform, banded, massive to semi-massive sulfides in a series of elongate, southwest-plunging, lenticular bodies along three distinct mineral horizons. An upper horizon is silver, lead, and zinc rich, a middle horizon is copper rich, and a lower horizon is copper and zinc rich. According to Zdepski (1980), the Sun prospect is in a 5,000-foot-thick sequence of Devonian felsic to andesitic volcanic, volcaniclastic and intercalated pelitic sedimentary rocks separated into upper and lower units by calcareous metabasite beds of variable thickness. The upper unit of metarhyolite and related rocks contains all of the identified massive sulfides; the lower unit is dominantly pelitic schist and metarhyolite.

As described by Andover Ventures (2008), the Sun deposit was found in the mid 1970s by Sunshine Mining Company and has been variously studied by Anaconda Minerals, Noranda Mining, and Teck Cominco. The Sun deposit consists of 13 SUN claims and 12 HOT claims and has been extensively drilled. As of June 2007, Andover had staked 68, 160-acre claims adjacent to the Sun deposit and drilled 20 holes in 2007 (Andover Ventures, 2007; 2008). The results for 13 of the holes have been released. Some notable intercepts include: 10.94 meters of 2.34 percent copper, 0.77 percent lead, 5.98 percent zinc, 68.1 grams of silver per ton, and 0.266 gram of gold per tonne; 5.08 meters with 4.34 percent copper, 0.58 percent lead, 2.76 percent zinc, 99.1 grams of silver per ton, and 0.199 gram of gold per tonne; 37.01 meters of 1.17 percent copper, 1.85 percent lead, 7.26 percent zinc, 44.0 grams of silver per ton and 0.179 gram of gold per tonne; and 11.0 meters of 1.07 percent copper, 5.38 percent lead, 16.54 percent zinc, 88.6 grams of silver per tonne, and 0.210 gram of gold per tonne.

Andover drilled 6 holes in 2011 (Andover Ventures, 2011 [July 21]; 2011 [August 12]; 2011 [August 31]. Some notable intercepts were: 1) 16.5 meters with 1.60 percent copper, 3.49 percent lead, 10.25 percent zinc, 86.6 grams of silver per tonne, and 0.24 grams of gold per tonne; 2) 1.60 meters with 6.08 percent copper, 1.08 percent lead, 3.81 percent zinc, 692.9 grams of silver per tonne, and 1.792 grams of silver per tonne; and 3) 10.65 meters with 2.56 percent copper, 0.81 percent led, 4.47 percent zinc, 63.8 grams of silver per tonne, and 0.216 grams of gold per tonne.

Including the 6 holes drilled by Andover Ventures in 2011, the Sun deposit has had 76 holes drilled on it

that total about 49,000 feet. Andover drilled 27 of the holes; the other were by previous operators including Anaconda, Noranda, Sunshine Mining Company, Cominco, and Bear Creek Mining Company. The deposit extends along strike for more than 1 kilometer and is open to the northeast and down dip.

Andover (2011 [Corporate presentation]) cites a 1977, Anaconda preliminary feasibility study that gives: 1) an inferred resource amenable to open-pit mining of 2.399 million tons with an average grade of 1.93 percent copper, 4.51 percent zinc, 2.39 ounces of silver per ton, and 1.20 percent lead; and 2) an inferred resource of 17.891 million tons amenable to underground mining with an average grade of 1.91 percent copper, 4.46 percent zinc, 2.37 ounces of silver per ton, and 1.18 percent lead.

A 2013 updated resource estimate was published. The copper-zinc-silver-lead-gold resources, which are comprised of massive sulfide and related mineralization, are estimated to total 2,165,000 tonnes (2,387,000 tons) at 1.42 percent copper, 1.06 percent lead, 4.11 percent zinc, 57.6 grams of silver per tonne and 0.21 gram of gold per tonne (3.9 percent copper equivalent). The inferred resources are 11,648,000 tonnes (12.84 million tons) at 1.14 percent copper, 1.37 percent lead and 3.91 percent zinc, 76.8 grams of silver per tonne and 0.24 gram of gold per tonne (3.9 percent copper equivalent) (Gustin and Ronning, 2013).

Alteration:

There is a discordant chloritic alteration zone at the northeastern end of the Main Sun deposit that consists primarily of chlorite with lesser talc, siderite, ankerite, and barite and contains minor disseminated pyrrhotite and chalcopyrite. This alteration zone occurs below what may be the upper sulfide horizon, and it has a maximum known thickness of 20 meters (Gustin and Ronning, 2013).

Age of mineralization:

Devonian, based on radiometric and fossil determinations (Gustin and Ronning, 2013).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Active?

Workings/exploration:

Including the 6 holes drilled by Andover Ventures in 2011, the Sun deposit has had 76 holes drilled on it that total about 49,000 feet. Andover drilled 27 of the holes; the others going back into the 1970s were by previous operators including Anaconda, Noranda, Sunshine Mining Company, Cominco, and Bear Creek Mining Company.

Andover Mining Corp. drilled 20 core holes in 2012, identifying at least six new prospects. Resampling of some mineralized intervals of historic (pre-Andover) drill core was also completed in 2012. A 43-101 technical report was published with an updated resource estimate in 2013. The mineral resources were modeled and estimated in accordance with Canadian Institute of Mining, Metallurgy and Petroleum ('CIM') definitions. The copper-zinc-silver-lead-gold resources, which are comprised of massive sulfide and related mineralization, are estimated to total 2,165,000 tonnes (2,387,000 tons) at 1.42 percent copper, 1.06 percent lead, 4.11 percent zinc, 57.6 grams of silver per tonne and 0.21 gram of gold per tonne (3.9 percent copper equivalent). The inferred resources are 11,648,000 tonnes (12.84 million tons) at 1.14 percent copper, 1.37 percent lead and 3.91 percent zinc, 76.8 grams of silver per tonne and 0.24 gram of gold per tonne (3.9 percent copper equivalent) (Gustin and Ronning, 2013).

Production notes:

None.

Reserves:

Andover (2011 [Corporate presentation]) cites a 1977, Anaconda preliminary feasibility study that gives: 1) an inferred resource amenable to open-pit mining of 2.399 million tons with an average grade of 1.93 percent copper, 4.51 percent zinc, 2.39 ounces of silver per ton, and 1.20 percent lead; and 2) an inferred resource of 17.891 million tons tons amenable to underground mining with a grade of 1.91 percent copper, 4.46 percent zinc, 2.37 ounces of silver per ton, and 1.18 percent lead.

A National Instrument 43-101, prepared by Mine Development Associates of Reno, Nev., provided the first NI 43-101-compliant mineral resource estimate for Sun. The report was completed on September 30, 2013 (Gustin and Ronning, 2013).

Using a cut-off of $75 per tonne in-ground value, the combined Main Sun and Southwest Sun deposits indicated resources are estimated to total 2,165,000 tonnes (2,387,000 tons) at 1.42 percent copper, 1.06 percent lead, 4.11 percent zinc, 57.6 grams of silver per tonne and 0.21 gram of gold per tonne (3.9 percent copper equivalent). The inferred resources are 11,648,000 tonnes (12.84 million tons) at 1.14 percent copper, 1.37 percent lead and 3.91 percent zinc, 76.8 grams of silver per tonne and 0.24 gram of gold per tonne (3.9 percent copper equivalent). This resource estimation indicates a minimum deposit size as the Main Sun remains open to the northeast and down dip and the Southwest Sun remains open to the southwest and down dip. The copper equivalent grades were calculated based on metal prices of $3 per pound copper, 95 cents per pound lead, 95 cents per pound zinc, $25 per ounce silver and $1,300 per ounce gold, and assume 100 percent recoveries (Gustin and Ronning, 2013).

The resource estimation utilized the database of 97 drill holes totaling 19,123 meters. Andover Mining Corp. has drilled 48 of the holes, totaling 10,311 meters. The remainder are historic drill holes drilled by previous operators, including Cominco (Teck Resources), Anaconda, Sunshine, Noranda and Bear Creek (Kennecott) (Gustin and Ronning, 2013).

Additional comments:

The prospect Picnic Creek was removed from this record and made its own record because drilling has shown the deposit is not continuous between the two. The site name 'Hot' was used by Noranda (W.T. Ellis, Vice President, Alaska Earth Sciences, oral commun., 2014).

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Andover Ventures, Inc., 2007, Andover - Sun Property, 2007 Surveyed drill holes: (October, 11, 2007) http://www.andoverventures.com/_resources/sun_Dec_2007.pdf (as of April 1, 2012).

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Andover Ventures, 2011, Andover completes 2011 drill program, Sun property, Alaska: (News release, July 19, 2011) http://www.andovermining.com/wp-content/uploads/2011/12/nr_2011_07_19.pdf (as of April 1, 2012).

Andover Ventures, 2011, Andover reports 16.5 meter intercept of 6.6 percent copper equivalent in initial results from the 2011 drill program at Sun property, Alaska: (News release, July 27, 2011) http://www.andovermining.com/wp-content/uploads/2011/12/nr_2011_07_27.pdf (as of April 1, 2012).

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Andover Ventures, 2011, Andover reports final results from the 2011 drill program at Sun property, Alaska: (News release, August 31, 2011) http://www.andovermining.com/wp-content/uploads/2011/12/nr_2011_08_31.pdf (as of April 1, 2012).

Andover Ventures, 2011, Andover adds 9,120 acres to land position in the Ambler mining district, Alaska: (News release, December 5, 2011) http://www.andovermining.com/wp-content/uploads/2011/12/nr_2011_12_05.pdf (as of April 1, 2012).

Andover Mining Corp., 2012, Corporate presentation: http://www.andovermining.com/wp-content/uploads/2011/12/Andover-Mining-Corp.-Presentation-02-2012-Final.pdf (as of February 12, 2012).

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garland, R.E., Eakins, G.R., Trible, T.C., and McClintock, W.W., 1975, Geochemical analysis of rock and stream-sediment samples from Survey Pass A-4, A-5, A-6, B-4, B-5, and B-6 quadrangles: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-67, 4 p., 4 sheets, scale 1:63,360.

Grybeck, D.J., and Nelson, S.W., 1981, Mineral deposit map of the Survey Pass quadrangle, Brooks Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1176-F, 1 sheet, scale 1:250,000.

Gustin, M.M., and Ronning, Peter, 2013, Technical Report on the Sun Project, Brooks Range, Alaska, 136 p.: (posted on www.sedar.com, Oct. 3, 2013) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00019735&fileName=/csfsprod/data147/filings/02118405/00000001/C%3A%5CSEDAR%5CFILINGS%5CAOX%5CAOXSunTechnicalReport.pdf (as of December 4, 2014).

Marrs, C.D., 1978, Geology of the Sun massive sulfide deposit, Ambler district, Alaska [abs.]: Northwest Mining Association, 84th Annual Convention, Spokane, Washington, Nov. 29-Dec. 2, 1978.

Sicherman, H.A., Russell, R.H., and Fikkan, P.R., 1976, The geology and mineralization of the Ambler district, Alaska: Spokane, Wash., Bear Creek Mining Company, 22 p.

Smith, T.E., Profett, J.M., and Heatwole, D.A., 1979, Ambler schist belt of northwest Alaska--Host terrane for volcanogenic base metal massive sulfide deposits of mid-Paleozoic age [abs.]: Geoscience Forum, 7th, Whitehorse, Yukon Territory, December 1979, Abstracts, p. 6.

Smith, T.E., Profett, J.M., Heatwole, D.A., and Seklemian, R.W., 1977, Geologic setting of base metal massive sulfide deposits, Ambler district, northwest Alaska [abs.]: Alaska Geological Society Symposium, 6th, Anchorage, April 1977, Abstracts with Program, p. 41-42.

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Primary Reference: Gustin and Ronning, 2013

Reporter(s): S.W. Nelson (Anchorage, Alaska); D.J. Grybeck (Contractor, USGS); A. Angel and V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-08

Site name(s): SW Sun

Site type: Prospect

ARDF no.: SP044

Latitude: 67.066 **Quadrangle:** SP A-5

Longitude: 155.052

Location description and accuracy:

This prospect is located 9.6 miles south of Akurekvik Pass, in NE1/4NW1/4 of section 12, T. 19 N., R. 17 E., of the Kateel River Meridian. This location is accurate to within 500 feet.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Arsenopyrite, bornite, chalcopyrite, enargite, galena, pyrite, pyrrhotite, sphalerite, tennantite

Gangue minerals: Barite, chlorite, ferroan calcite, ferroan dolomite, quartz, talc

Geologic description:

Southwest (SW) Sun was discovered in 1974 by the discovery of gossan by Sunshine Mining Company. The SW Sun prospect is characterized by volcanogenic massive-sulfide mineralization. The property is located at the eastern end of the Ambler district. The deposit is comprised of multiple individual lenses that are spatially related; two primary horizons of massive-sulfide mineralization have been identified. The massive sulfides are comprised primarily of sphalerite, tennantite, galena, chalcopyrite, bornite, enargite, pyrite, pyrrhotite, and arsenopyrite. Based on drilling, the SW deposit is currently known to be comprised of two thin massive-sulfide horizons, with the lower one again being less continuous (Gustin and Ronning, 2013).

SW Sun, approximately 2,888 feet southwest of Main Sun (SP039), was thought for a long time to be the offset extension of Main Sun. However, drilling to the west of the Tour Ridge Fault has not confirmed this relationship. Southwest Sun may be a separate hydrothermal center, based on the lack of physical connection to Main Sun and on the presence of talc alteration in the footwall rocks (Gustin and Ronning, 2013).

Mineralization occurs in a northeast-trending belt of felsic metavolcanic and metasedimentary rocks generally dipping 30 degrees to 45 degrees southeast and extending about 13 kilometers from Beaver Creek on the west to Picnic Creek on the east. The volcanic rock package is up to 1.5 kilometers thick and is both overlain and underlain by quartz-chlorite-mica schist. Known massive-sulfide mineralization is limited to the upper portion of the felsic volcanic rocks. Almost all of the mineralization lies beneath glacial cover, with exposures at only three locations (Marrs, 1978).

Massive-sulfide mineralization at the SW Sun is primarily hosted within the felsic schist (Dsf) and sparsely porphyritic rhyolite (Dr) units of the Ambler Sequence. At Sun, the Ambler Sequence is comprised almost entirely of lithologies found in the sequence elsewhere in the district, with the notable exception of the distinctive rhyolite porphyry (Dbs), which is rare elsewhere (although this unit does occur in the Beaver Creek Valley 9.6 kilometers to the west of Sun). Volcanic rocks constitute about 84 percent of the Ambler Sequence at SW Sun. The deposit lies on the north limb of an overturned syncline (Gustin and Ronning, 2013).

Mineralization occurs near a local thickening in the felsic to andesitic volcanic and volcaniclastic rocks of the Ambler Sequence, where the sequence is dissected by the Jewel Creek drainage. The mineralized portion of the Ambler Sequence has been mapped for 5,800 meters along strike and varies in thickness from

750 to 1,500 meters. Significant thicknesses of mineralization have been traced by drilling including across some 2,700 meters including Picnic Creek, Main Sun, and SW Sun (Gustin and Ronning, 2013).

Alteration:

Talc alteration is present in footwall rocks (Gustin and Ronning, 2013).

Age of mineralization:

Devonian, based on age of host rock (Gustin and Ronning, 2013).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Active?

Workings/exploration:

Diamond core drilling was completed by the Ambler Mining Company between 1975-1981. At SW Sun two sulfide horizons totaling 3.2 meters (10.5 feet) were encountered in drillhole Sun 14 while three horizons totaling up to 7.3 meters (24.8 feet) were encountered in drillholes Sun 28 and Sun 29 to the southwest. The uppermost horizon in the three holes comprised: 0.8 meter (2.5 feet) of 2.73 percent copper, 3.15 percent lead, 6.60 percent zinc, and 265.3 grams of silver per tonne in Sun 14; 6.2 meters (20.4 feet) of 0.10 percent copper, 3.04 percent lead, 5.96 percent zinc and 190.8 grams of silver per tonne in Sun 28; and 1.3 meters (4.2 feet) of 1.83 percent copper, 0.29 percent lead, 4.16 percent zinc and 20.3 grams of silver per tonne in Sun 29 (Gustin and Ronning, 2013).

Recent work by Andover Mining Corp. in 2007 and 2008 includes about 800 soil samples focused mostly on SW Sun. The initial and follow-up soil sampling program identified base-metal anomalies extending for three kilometers to the west of the SW Sun mineralized zone, along the southern edge of the felsic rock package (Gustin and Ronning, 2013).

In 2011, Andover Mining Corp. drilled three exploration holes at SW Sun; all encountered volcanogenic massive sulfide mineralization, and thereby extended the mineralized intersections by a strike length of 0.5 kilometer (Gustin and Ronning, 2013).

Production notes:

None.

Reserves:

A National Instrument 43-101, prepared by Mine Development Associates of Reno, Nevada for Andover Mining Corp., provided the first NI 43-101-compliant mineral resource estimate for Sun and SW Sun. The report was completed on September 30, 2013 (Gustin and Ronning, 2013).

Using a cut-off of $75 per tonne in-ground value, the combined Main Sun and Southwest Sun deposits indicated resources are estimated to total 2,165,000 tonnes (2,387,000 tons) at 1.42 percent copper, 1.06 percent lead, 4.11 percent zinc, 57.6 grams of silver per tonne and 0.21 gram of gold per tonne (3.9 percent copper equivalent). The inferred resources are 11,648,000 tonnes (12.84 million tons) at 1.14 percent copper, 1.37 percent lead and 3.91 percent zinc, 76.8 grams of silver per tonne and 0.24 gram of gold per tonne (3.9 percent copper equivalent). This resource estimation indicates a minimum deposit size as the Main Sun remains open to the northeast and down dip and the Southwest Sun remains open to the southwest and down dip. The copper equivalent grades were calculated based on metal prices of $3 per pound copper, 95 cents per pound lead, 95 cents per pound zinc, $25 per ounce silver and $1,300 per ounce gold, and

assume 100 percent recoveries (Gustin and Ronning, 2013).
The resource estimation utilized the database of 97 drill holes totaling 19,123 meters. Andover Mining Corp. has drilled 48 of the holes, totaling 10,311 meters. The remainder are historic drill holes drilled by previous operators, including Cominco (Teck Resources), Anaconda, Sunshine, Noranda and Bear Creek (Kennecott) (Gustin and Ronning, 2013).

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garland, R.E., Eakins, G.R., Trible, T.C., and McClintock, W.W., 1975, Geochemical analysis of rock and stream-sediment samples from Survey Pass A-4, A-5, A-6, B-4, B-5, and B-6 quadrangles: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-67, 4 p., 4 sheets, scale 1:63,360.

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Marrs, C.D., 1978, Geology of the Sun massive sulfide deposit, Ambler district, Alaska [abs.]: Northwest Mining Association, 84th Annual Convention, Spokane, Washington, Nov. 29-Dec. 2, 1978.

Sicherman, H.A., Russell, R.H., and Fikkan, P.R., 1976, The geology and mineralization of the Ambler district, Alaska: Spokane, Wash., Bear Creek Mining Company, 22 p.

Smith, T.E., Profett, J.M., and Heatwole, D.A., 1979, Ambler schist belt of northwest Alaska--Host terrane for volcanogenic base metal massive sulfide deposits of mid-Paleozoic age [abs.]: Geoscience Forum, 7th, Whitehorse, Yukon Territory, December 1979, Abstracts, p. 6.

Smith, T.E., Profett, J.M., Heatwole, D.A., and Seklemian, R.W., 1977, Geologic setting of base metal massive sulfide deposits, Ambler district, northwest Alaska [abs.]: Alaska Geological Society Symposium, 6th, Anchorage, April 1977, Abstracts with Program, p. 41-42.

Zdepski, J.M., 1980, Stratigraphy, mineralogy and zonal relations of the Sun massive-sulfide deposit,

Primary Reference: Gustin and Ronning, 2013

Reporter(s): A. Angel and V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-04

Site name(s): Picnic Creek; Picnic

Site type: Prospect

ARDF no.: SP045

Latitude: 67.086 **Quadrangle:** SP A-5

Longitude: 155.018

Location description and accuracy:

This prospect is located 8.2 miles south of Akurekvik Pass, SW 1/4 and 0.3 mile southwest from the center of section 31, T. 20 N., R.18 E., of the Kateel River Meridian. Picnic Creek is approximately 1 kilometer north of the Sun deposit (SP039) at an elevation of approximately 3,400 feet. This location is accurate to within 500 feet.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other: Ba

Ore minerals: Arsenopyrite, bornite, chalcopyrite, enargite, galena, sphalerite

Gangue minerals: Barite, chlorite, ferroan calcite, ferroan dolomite, quartz

Geologic description:

The Picnic Creek deposit was part of the general Sun site (SP039) until the 2012 update, however, drilling shows Picnic Creek to be discontinuous at depth from Sun (W.T. Ellis, Vice Pres., Alaska Earth Sciences, oral communication, 2014).

At the Picnic Creek prospect, located in the headwaters of Picnic Creek, approximately 1 kilometer north of the northern part of the drilled Sun Deposit (SP039), altered and iron stained gossanous rocks outcrop in a roughly 50 meter by 100 meter area. There is extensive talus covering. Ferrocrete gossan are currently forming from natural ground water springs, indicating weathering sulfides may be present under the talus cover (Gustin and Ronning, 2013).

The geology of Picnic Creek is characterized by a low-angle, extensional Picnic Creek fault with spoon-shaped geometry that terminates a belt of northeast-trending felsic metavolcanic and metasedimentary rocks generally dipping 30 degrees to 45 degrees southeast. The volcanic rock package is up to 1.5 kilometers thick and is both overlain and underlain by quartz-chlorite-mica schist. Known massive-sulfide mineralization is limited to the upper portion of the felsic volcanic rocks, extending about 2.4 kilometers along strike from the Picnic Creek saddle to west of drill hole Sun-14. Almost all of the mineralization lies beneath glacial cover, with exposures at only three locations (Marrs,1978).

Four horizons of sulfide mineralization have been recognized at the Picnic Creek prospect area. Grab samples of oxidized rocks have run up to 0.26 percent copper, 250 part per million (ppm) lead, 450 ppm zinc, 4.5 grams of silver per tonne, 0.42 grams of gold per tonne (Andover Mining Corp., 2012).

Alteration:

Chloritic (Gustin and Ronning, 2013).

Age of mineralization:

Devonian, based on age of host rock (Gustin and Ronning, 2013).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Bear Creek discovered the Picnic Creek massive-sulfide prospect, located in the northern part of the current Sun project, in 1966 and drilled five holes at the prospect from 1975 to 1983. This drilling encountered copper, lead, zinc, and silver mineralization. Exploration as consisted of field mapping, sampling of rock and soil, and diamond core drilling as part of the exploration efforts conducted at Sun. The majority of the work was completed during the mid-1970s through early 1980s (Gustin and Ronning, 2013).

Four horizons of sulfide mineralization have been recognized at the Picnic Creek prospect area. Grab samples of oxidized rocks have run up to 0.26 percent copper, 250 part per million (ppm) lead, 450 ppm zinc, 4.5 grams of silver per tonne, 0.42 grams of gold per tonne (Andover Mining Corp., 2012).

Production notes:

None.

Reserves:

None, a 2013 resource estimate was made for nearby Sun (SP039) (Gustin and Ronning, 2013).

Additional comments:

Exploration and discovery of volcanogenic massive-sulfide deposits and carbonate-hosted copper deposits were initiated by Bear Creek Mining Company ('Bear Creek'), the exploration arm of Kennecott Copper Corporation ('Kennecott'), in 1956, although the Ambler district had prior exploration and limited production of placer gold since the 1890s, production of copper in the early 1900s, and exploration for gold, uranium, and copper in the late 1940s. By 1966, Bear Creek had located geochemical anomalies at all of the major prospects now recognized in the Ambler district. Sunshine Mining Company ('Sunshine') entered the district in 1973, followed by Noranda Exploration Company ('Noranda'), as operator for a consortium that included GCO Minerals Company and Houston Oil & Minerals), the Anaconda Company ('Anaconda'), the Ambler Mining Company (a partnership of Sunshine and Anaconda), Cominco American Resources Inc. ('Cominco'), Falconbridge, and Union Carbide. By 1986, only Kennecott and Cominco remained active in the district. As recently as 2007, Teck Resources Limited, who acquired Cominco in 2001, still held property in the Ambler district, as did NovaGold Resources Inc., the regional native corporation for northwest Alaska, and Andover Mining Corp. No production has occurred in the Ambler district since the early 1900s (Gustin and Ronning, 2013).

References:

Andover Mining Corp., 2012, Andover Identifies Six New VMS Prospects on Sun Property, Ambler Mining District, Alaska: (News release posted on www.sedar.com, Aug. 8, 2012) http://www.sedar.com/GetFile.do?lang=EN&docClass=8&issuerNo=00019735&fileName=/csfsprod/data133/filings/01940800/00000001/C%3A%5CSEDAR%5CFILINGS%5CAOX%5CAOXNewsReleasereVMS.pdf (as of December 4, 2014).

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Gustin, M.M., and Ronning, Peter, 2013, Technical Report on the Sun Project, Brooks Range, Alaska, 136 p.: (posted on www.sedar.com, Oct. 3, 2013)

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Primary Reference: Gustin and Ronning, 2013

Reporter(s): A. Angel and V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-04

Site name(s): STU

Site type: Prospect

ARDF no.: SP046

Latitude: 67.074 **Quadrangle:** SP A-5

Longitude: 155.225

Location description and accuracy:

The STU prospect is located 0.1 mile east-southeast from the center of section 6, T. 19 N., R. 17 E., of the Kateel River Meridian. The prospect is located at approximately 900 feet elevation. This location is accurate to within 500 feet.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other: Ba

Ore minerals: Arsenopyrite, bornite, chalcopyrite, enargite, galena, pyrite, pyrrhotite, sphalerite, tennantite

Gangue minerals: Barite, chlorite, ferroan calcite, ferroan dolomite, quartz

Geologic description:

The STU prospect is located about 8 kilometers west of the Sun project (SP039). The prospect is characterized by volcanogenic massive-sulfide mineralization. The property is located at the eastern end of the Ambler district. The massive sulfides are comprised primarily of sphalerite, tennantite, galena, chalcopyrite, bornite, enargite, pyrite, pyrrhotite, and arsenopyrite. Mineralization occurs in a northeast-trending belt of felsic metavolcanic and metasedimentary rocks. Massive-sulfide mineralization is primarily hosted within the felsic schist (Dsf) and sparsely porphyritic rhyolite (Dr) units of the Ambler Sequence. (Hitzman and others, 1982,Gustin and Ronning, 2013).

At STU, strong alteration and gossan have been mapped for approximately 100 meters along strike before disappearing beneath cover. There is extensive talus covering. Grab samples from the STU area returned values of up to 2.04 percent copper, 0.95 percent lead, 1.21 percent zinc, 64 grams of silver per tonne, and 0.49 grams of gold per tonne (Andover Mining Corporation, 2012).

Alteration:

Iron oxide alteration (Andover Mining Corporation, 2012).

Age of mineralization:

Devonian, based on age of host rock (Hitzman and others, 1982, Gustin and Ronning, 2013).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Exploration as consisted of field mapping and sampling of rock and soil, completed mostly during the mid 1970's through early 1980s. Andover completed one diamond core drillhole in 2012 at STU in addition to mapping and sampling. The drillhole included: 1) 8.1 meters of 0.49 percent copper, 0.71 percent lead, 2.75 percent zinc, 33.5 grams of silver per tonne, and 0.197 grams of gold per tonne (including 1.8 meters of 0.78 percent copper, 1.22 percent lead, 6.55 percent zinc, 81.4 grams of silver per tonne, and 0.478 grams of gold per tonne); and 2) 0.9 meters of 1.52 percent copper, 2.07 percent lead, 6.31 percent zinc, 71.8 grams of silver per tonne, and 0.637 grams of gold per tonne (Andover Mining Corporation, 2012).

Production notes:

None.

Reserves:

None, a 2013 resource estimate was made for nearby Sun (SP039) (Gustin and Ronning, 2013).

Additional comments:

References:

Andover Mining Corp., 2012, Andover Identifies Six New VMS Prospects on Sun Property, Ambler Mining District, Alaska: (News release posted on www.sedar.com, Aug. 8, 2012) http://www.sedar.com/GetFile.do?lang=EN&docClass=8&issuerNo=00019735&fileName=/csfsprod/data133/filings/01940800/00000001/C%3A%5CSEDAR%5CFILINGS%5CAOX%5CAOXNewsReleasereVMS.pdf (as of December 4, 2014).

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Hitzman, M.W., Smith, T.E., and Proffett, J.M., 1982, Bedrock geology of the Ambler district, southwestern Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys, Geologic Report 75, 2 sheets.

Gustin, M.M., and Ronning, Peter, 2013, Technical Report on the Sun Project, Brooks Range, Alaska, 136 p.: (posted on www.sedar.com, Oct. 3, 2013) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00019735&fileName=/csfsprod/data

Primary Reference: Gustin and Ronning, 2013

Reporter(s): A. Angel and V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-04

Site name(s): SAL

Site type: Prospect

ARDF no.: SP047

Latitude: 67.075 **Quadrangle:** SP A-5

Longitude: 155.232

Location description and accuracy:

The SAL prospect is located 0.1 mile east-northeast from the center of section 6, T. 19 N., R. 17 E., of the Kateel River Meridian. Located approximately 8 kilometers to the west of the Sun deposit (SP039) at approximately 700 feet elevation. This location is accurate to within 500 feet.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other: Ba

Ore minerals:

Gangue minerals: Barite, ferroan calcite, ferroan dolomite, quartz

Geologic description:

The SAL prospect is located about 8.5 kilometers west of the Sun project (SP039). The prospect is characterized by volcanogenic massive-sulfide mineralization. The property is located at the eastern end of the Ambler district. The massive sulfides are comprised primarily of sphalerite, tennantite, galena, chalcopyrite, bornite, enargite, pyrite, pyrrhotite, and arsenopyrite. Mineralization occurs in a northeast-trending belt of felsic metavolcanic and metasedimentary rocks. Massive-sulfide mineralization is primarily hosted within the felsic schist (Dsf) and sparsely porphyritic rhyolite (Dr) units of the Ambler Sequence (Hitzman and others, 1982, Gustin and Ronning, 2013).

At SAL, strong alteration with strong iron staining within the highly prospective rock package has been mapped for approximately 200 meters along strike before disappearing underneath cover. There is extensive talus covering. Grab samples from gossan and altered rocks in the area have returned assay values of up to 1.8 percent copper, 1.48 percent lead, 1.34 percent zinc, 42 grams of silver per tonne, and 0.54 grams of gold per tonne (Andover Mining Corporation, 2012a).

Alteration:

Iron oxide alteration (Andover Mining Corporation, 2012a).

Age of mineralization:

Devonian, based on age of host rock (Hitzman and others, 1982, Gustin and Ronning, 2013).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Exploration has consisted of field mapping and sampling of rock and soil, completed mostly during the mid 1970s through early 1980s. Andover Mining Corporation completed one diamond core drillhole in 2012 at SAL, which targeted outcropping mineralization that was mapped and sampled by Andover's field team during the 2012 reconnaissance efforts at the Sun District. The drillhole included 2.1 meters of 0.69 percent copper, 0.84 percent lead, 2.99 percent zinc, 19.9 grams of silver per tonne, and 0.126 grams of gold per tonne (Andover Mining Corporation, 2012b).

Production notes:

None.

Reserves:

None, a 2013 resource estimate was made for nearby Sun (SP039) (Gustin and Ronning, 2013).

Additional comments:

References:

Andover Mining Corp., 2012a, Andover Identifies Six New VMS Prospects on Sun Property, Ambler Mining District, Alaska: (News release posted on www.sedar.com, Aug. 8, 2012) http://www.sedar.com/GetFile.do?lang=EN&docClass=8&issuerNo=00019735&fileName=/csfsprod/data133/filings/01940800/00000001/C%3A%5CSEDAR%5CFILINGS%5CAOX%5CAOXNewsReleasereVMS.pdf (as of December 4, 2014).

Andover Mining Corp., 2012b, Andover Announces Discovery of a Second New Massive Sulfide System at its Wholly Owned Sun District, Ambler Mineral Belt, Alaska: (News release posted on www.sedar.com, Sept. 24, 2012) http://www.sedar.com/GetFile.do?lang=EN&docClass=8&issuerNo=00019735&fileName=/csfsprod/data135/filings/01962930/00000001/C%3A%5CSEDAR%5CFILINGS%5CAOX%5CAOXNewsRelease24Sept2012.pdf (as of December 8, 2014).

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Gustin, M.M., and Ronning, Peter, 2013, Technical Report on the Sun Project, Brooks Range, Alaska, 136 p.: (posted on www.sedar.com, Oct. 3, 2013) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00019735&fileName=/csfsprod/data

Primary Reference: Gustin and Ronning, 2013

Reporter(s): A. Angel and V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-08

Site name(s): Unnamed (on Red Mountain)

Site type: Mine

ARDF no.: SV014

Latitude: 59.35 **Quadrangle:** SV B-4

Longitude: 151.49

Location description and accuracy:

The Red Mountain deposits consist of at least 30 known occurrences within a seven-square-mile area of ultramafic rocks. The center of the ultramafic rocks is section 28, T. 9 S., R. 13 W., of the Seward Meridian, which is about seven air miles southeast of Seldovia, Alaska. The area is accessable by a gravel road from Seldovia through the Windy River valley. The location is accurate, though degree of accuracy was not reported.

Commodities:

Main: Cr

Other:

Ore minerals: Chromite

Gangue minerals:

Geologic description:

The Red Mountain ultramafic complex covers about 7 square miles and is part of the informally named Border Ranges ultramafic and mafic complex of Burns (1985). The Jurassic Border Ranges complex is thought to be the dismembered basal section of an island arc complex (Burns, 1985) which extends from the tip of the Kenai Peninsula to east of Sutton, Alaska.

The dunite body is a klippe thrust over the Cretaceous McHugh Complex graywackes and slates. The margin of the Red Mountain klippe is serpentinized and the gross overall structure of the klippe is an elongated basin.

The Red Mountain ultramafic body is mostly dunite with some pyroxenite and garnet-pyroxenite layers (Guild, 1942). Chromite layers and lens up to 300 feet long and 60 feet wide are found only within the dunite. Generally, the layers strike northwest and dip steeply near the margins of the klippe and are nearly flat lying near the center of the body.

There are over 30 identified chromite occurrences that occur in thin lens bands and pod within the dunite layers of the ultramafic body. Small scale folds and small scale normal faults commonly disrupt the chromite layers. The Cr/Fe ratio of the chromite generally varies from 2.6 to 3.6; at least 90 percent of the chromite is with these limits (Gill, 1922).

Alteration:

Serpentzation occurs along the margin of the ultramafic body.

Age of mineralization:

Jurassic; based on the age of the ultramafic body that hosts the deposit.

Generic deposit model:

Deposit model:

Podiform chromite (Cox and Singer, 1986; model 8a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
8a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

The area was discovered about 1910 to 1915, and some minor development and production occurred in 1920 (Brooks, 1921). During WW II, the Bureau of Mines drilled over thirty diamond drill holes to evaluate the deposits. From 1942 to 1944, the Chrome Queen mine produced 6,650 tons of 40 to 42 percent chromite ore.

Ongoing exploration continued through the late 1980s. Anaconda Minerals drilled six diamond drill holes in about 1982 and 83 which tested the Horseshoe Stringer Zone and the Turner Stringer Zone (Bill Ellis, 1999, Personal communication). Anaconda Minerals also flew regional airborne geophysics in the early 1980s.

Production notes:

Total production from 1943 to 1958 was 26,000 tonnes of ore containing 38 to 43 percent chrome (Foley and Barker, 1985).

Reserves:

From the Red Mountain area about 26,000 tonnes of ore containing from 38 to 43 percent chromite were produced between 1943 and 1958. The remaining reserve are estimated to be 1.5 million tonnes of contained chromic oxide in 33 deposits (Foley, 1992). About 88,000 tonnes of chromic oxide are contained in 20 relative high-grade deposits with more than 20 percent chromite. The bulk of the reserves, 1.35 million tonnes are in three low-grade deposits that contain 5 to 6 percent chromic oxide (Foley, 1992). These are the Turner Stringer Zone, (1.13 million tonnes chromic oxide), the Star Stringer Zone (189,000 tonnes chromic oxide) and the Horseshoe Stringer Zone (26,000 tonnes chromic oxide) (Foley, 1992).

Additional comments:

There is little information regarding the actual mining of this deposit.

The 03/09/1999 version of this record misquoted the Foley,1992, reference, which lists abbreviations of mt as metric tons not million tons. In addition, production notes for Chrome Queen mine and Star No. 4 mine (SV015) were moved to SV015.

References:

Bain, H.F., 1946, Alaska's minerals as a basis for industry: U.S. Bureau of Mines Information Circular 7379, 89 p.

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Bird, M.L., 1978, Electron-microprobe study of chromitites associated with alpine ultramafic complexes and some genetic implications: U.S. Geological Survey Open-File Report 78-119, 53 p.

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Brooks, A.H., 1921, The future of Alaska mining, in Martin, G.C., and others, Mineral resources of Alaska, 1917: U.S. Geological Survey Bulletin 714-A, p. 5-57.

Burns, L.E., 1985, The Border Ranges ultramafic and mafic complex, south-central Alaska; Cumlative fractionates of island-arc volcanics: Canadian Journal of Earth Science, v. 22, p.1020-1038.

Cobb, E.H., 1972, Metallic mineral resources map of the Seldovia quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-397, 1 sheet, scale 1:250,000.

Cobb, E.H., 1979, Summary of references to mineral occurrences (other than minerals fuels and construction materials) in the Seldovia quadrangle, Alaska: U.S. Geological Survey Open-file Report 80-87, 47 p.

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Foley, J.Y., 1992, Ophiolite and other ultramafic metallogenic provinces in Alaska (west of the 141th meridian): U.S. Geological Survey Open-File Report 92-20-B, 55 p.

Foley, J.Y., and Barker, J.C., 1985, Chromite deposits along the Border Ranges fault; Part 1 -- Field investigations and descriptions of chromite deposits: U.S. Bureau of Mines Information Circular 8990, 57 p.

Gill, A.C., 1922, Chromite of Kenai Peninsula, Alaska: U.S. Geological Survey Bulletin 742, 52 p.

Guild, P.W., 1942, Chromite deposits of Kenai Peninsula, Alaska: U.S. Geological Survey Bulletin 931-G, p. 139-175.

Primary Reference: Gill, 1922

Reporter(s): Jeff A. Huber (Anchorage); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Kenai Chrome; Star #4; Chrome Queen

Site type: Mine

ARDF no.: SV015

Latitude: 59.378 **Quadrangle:** SV B-4

Longitude: 151.476

Location description and accuracy:

The Kenai Chrome mine and the Chrome Queen mine are located in section 21, T. 9 S., R. 13 W., of the Seward Meridian. The site of the Kenai Chrome mine is labeled on the 1:63,360 topographic quadrangle. The site is near the head of the Windy River in the southern half of section 21 at approximately 1,400’ elevation. The location is accurate, within about 50 meters.

Commodities:

Main: Cr

Other:

Ore minerals:

Gangue minerals:

Geologic description:

The Red Mountain ultramafic complex covers about 7 square miles and is part of the informally named Border Ranges ultramafic and mafic complex of Burns (1985). The Jurassic Border Ranges complex is thought to be the dismembered basal section of an island arc complex (Burns, 1985) which extends from the tip of the Kenai Peninsula to east of Sutton, Alaska.

The dunite body is a klippe thrust over the Cretaceous McHugh Complex graywackes and slates. The margin of the Red Mountain klippe is serpentinized and the gross overall structure of the klippe is an elongated basin.

The Kenai Chrome mine is located on the Star No. 4 claim at an elevation of 2,600 feet on the north side of the ultramafic body. The chromite seams can be traced for almost 1,000 feet but it is less than a foot thick for over half this distance (Guild, 1941). The main ore body was 625 feet long and had a maxium thickness of 9.8 feet. The strike of the layering is N 10 W and the dip varies from 35 W to 70 W except where minor folding has caused variations. Several small faults strike more or less at right angle to the chromite banding. The Cr/Fe ratio of the chromite generally varies from 2.6 to 3.6; at least 90 percent of the chromite is with these limits (Gill, 1922).

Alteration:

Age of mineralization:

Jurassic; based on the age of the ultramafic body that hosts the deposit.

Generic deposit model:

Deposit model:

Podiform chromite (Cox and Singer, 1986; model 8a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

8a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

The area was discovered about 1910 to 1915, and some minor development and production occurring in 1920 (Brooks, 1921). During WW II, the Bureau of Mines drilled over thirty diamond drill holes to evaluate the deposits. In 1942 through 1944, production from the Chrome Queen mine totaled 6,650 tons of 40 to 42 percent chromic oxide ore. Star No.4 produced 15,000 tons at 46 percent chromic oxide about 1954, from 490 feet of underground workings. Ore from the Star No. 4 averaged 40 to 46 percent chromic oxide. On-going exploration continued through the late 1980s. Anaconda Minerals drilled 6 diamond drill holes about 1982 and 83 which tested the Horseshoe Stringer Zone and the Turner Stringer Zone (Bill Ellis, 1999, personal communication). Anaconda Minerals also flew regional airborne geophysic over the body in the early 1980s.

Production notes:

From the Red Mountain area about 26,000 tonnes of ore containing from 38 to 43 percent chromic oxide were produced between 1943 and 1958 (Foley, 1992). From 1943 to 1958, the Chrome Queen mine produced 6,650 tonnes and the Star No. 4 mine produced 19,350 tonnes (Foley and Barker, 1985).

Reserves:

The remaining reserve are estimated to be 1.5 million tonnes of contained chromic oxide in 33 deposits (Foley, 1992). About 88,000 tonnes chromic oxide are contained in 20 relative high-grade deposits with more than 20 percent chromite. The bulk of the reserves, 1.35 million tonnes are in three low -grade deposits that contain 5 to 6 percent chromic oxide (Foley, 1992). These are the Turner Stringer Zone, (1.13 million tonnes chromic oxide), the Star Stringer Zone (189,000 tonnes chromic oxide) and the Horseshoe Stringer Zone (26,000 tonnes chromic oxide) (Foley, 1992).

Additional comments:

The 03/09/1999 version of this record misquoted the Foley,1992, reference, which lists abbreviations of mt as metric tons not million tons. Production notes on Chrome Queen mine and Star No. 4 mine were moved to this record from record SV015 'Unanmed (Red Mountain)'.

References:

Brooks, A.H., 1921, The future of Alaska mining, in Martin, G.C., and others, Mineral resources of Alaska, 1917: U.S. Geological Survey Bulletin 714-A, p. 5-57.

Burns, L.E., 1985, The Border Ranges ultramafic and mafic complex, south-central Alaska; Cumlative fractionates of island-arc volcanics: Canadian Journal of Earth Science, v. 22, p.1020-1038.

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Foley, J.Y., 1992, Ophiolite and other ultramafic metallogenic provinces in Alaska (west of the 141th meridian): U.S. Geological Survey Open-File Report 92-20-B, 55 p.

Foley, J.Y., and Barker, J.C., 1985, Chromite deposits along the Border Ranges fault; Part 1 -- Field investigations and descriptions of chromite deposits: U.S. Bureau of Mines Information Circular 8990, 57 p.

Gill, A.C., 1922, Chromite of Kenai Peninsula, Alaska: U.S. Geological Survey Bulletin 742, 52 p.

Guild, P.W., 1942, Chromite deposits of Kenai Peninsula, Alaska: U.S. Geological Survey Bulletin 931-G,

p. 139-175.

Primary Reference: Gill, 1922

Reporter(s): Jeff A. Huber (Anchorage); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Shotgun; Mose

Site type: Prospect

ARDF no.: TA007

Latitude: 60.386 **Quadrangle:** TA B-6

Longitude: 158.0687

Location description and accuracy:

The Shotgun prospect is in the southern part of the Shotgun Hills, a rugged, glaciated upland at the head of the King Salmon River. The prospect is near the center of the NW1/4 section 27, T. 4 N., R. 51 W., of the Seward Meridian. It is on the crest and eastern slope of a northwest-trending ridge at an elevation of about 2,500 feet. The location is accurate to within 500 feet.

Commodities:

Main: Au

Other: As, Bi, Ce, Cu, Te, W, Zn

Ore minerals: Arsenopyrite, bismuth, Bi-Te sulfides, chalcocite, chalcopyrite, copper, covellite, gold, lollingite, marcasite, pyrite, pyrrhotite, scheelite, sphalerite

Gangue minerals: Albite, carbonate, quartz, sericite, tourmaline

Geologic description:

This prospect was discovered in the 1980s in a regional exploration program by Cominco Alaska in joint venture with ENSTAR. They named this prospect Mose and completed surface mapping, sampling, and drilled six shallow diamond drill holes. In the 1990s, ENSTAR's interest was sold to NovaGold Resources Inc., the prospect was renamed Shotgun, and renewed exploration took place (NovaGold Resources Inc., 2000).

The Shotgun prospect is an intensely quartz-veined, felsic porphyry stock that sharply crosscuts biotite hornfels developed in mid-Cretaceous clastic sedimentary rocks of the Kuskokwim Group (Rombach, 2000). As exposed along the ridge crest and downslope to the east, the stock is an irregularly shaped composite intrusion that is about 1,000 feet long in a northwest direction and over 500 feet long in a northeast direction. The hornfels near the stock and across the ridge crest to the southwest commonly is breccia healed by a tourmaline-rich matrix and locally cut by veinlets that contain arsenopyrite, pyrite, and some chalcopyrite. In the stock, some zones near the contact are extensively silicified; quartz replacement is massive and complete in these zones. Elsewhere, the stock is cut by quartz veins that in places form an intense, anastomosing stockwork. Albite-sericite-quartz +/- carbonate replacement of host intrusive rocks accompanies the quartz veining. The deposit is deeply oxidized and iron-staining is widespread. Ore minerals identified at Shotgun include arsenopyrite, primary native gold and bismuth, Bi-Te sulfides, chalcopyrite, lollingite, pyrrhotite, pyrite, scheelite, sphalerite, and supergene covellite, chalcocite, native copper, and marcasite (Rombach, 2000).

Vapor-rich and saline-rich fluid inclusions coexist in the quartz veins. In order of abundance, the vapor-rich inclusions contain water, carbon dioxide, and methane; these inclusions homogenize to vapor at about 360 degrees C. The saline-rich inclusions have salinities of 40 to greater than 60 weight percent NaCl equivalent and homogenize to liquid at 280 to more than 600 degrees C (Rombach, 2000).

Surface rock samples define a large geochemical anomaly with several areas where gold values exceed 1 part per million. Examples of drill hole intercepts include 233 feet grading 0.077 ounce of gold per ton, 399 feet grading 0.050 ounce of gold per ton, and 43 feet grading 0.155 ounce of gold per ton (NovaGold Resources Inc., 2000; all drill hole intercepts are listed online at http://www.nrigold.com/shotgun.htm; Dec

2000). Preliminary metallurgical tests indicate that gold recoveries of more than 93 percent can be achieved using conventional cyanidation. Airborne and ground magnetometer surveys have been used in conjunction with extended mapping and sampling to evaluate the potential for additional mineralization in surrounding areas. As of March 28, 2007, NovaGold Resources, Inc. (2007) reports that the Shotgun prospect has 32.8 million tonnes of resources with a grade of 0.93 gram of gold per ton.

A large granitic pluton makes up the core of the Shotgun Hills. The contact between this pluton and the hornfels that surrounds the Shotgun prospect coincides with a northwest-trending linear swale and drainage less than 0.5 mile north of the prospect. The shallow-seated intrusive environment south of this contact (extensive hornfels locally cut by fine-grained porphyry) compared to that to the north, suggests that this contact is a large fault, dropped down to the south. K/Ar and Ar/Ar dating of intrusive rocks and mineralization in the Shotgun prospect area indicate that magmatism and mineralization is latest Cretaceous in age, about 68 to 70 Ma (Rombach, 2000; Travis Hudson, unpublished data, 2000).

TNR Gold Corporation optioned Shotgun (Mose) from NovaGold Resources, Inc. in 2003. A running history of TNR Gold's work to April 2007 can be seen in several news releases and project information at their web site (TNR Gold Corp., 2007). In 2011 and 2012, TNR collected 3D IP resistivity and chargeability geophysical surveys at Shotgun. In 2012, three drill holes totaling 814 meters were completed (Van Wyck and Armitage, 2013).

TNR Gold Corp. commissioned GeoVector Management Inc. ('GeoVetor') to produce a resource estimate on the Property in 2013. Geovector reported an Inferred Resource of 20,734,313 tonnes at 1.06 grams of gold per tonne for a total of 705,960 ounces gold using a 0.5 gram of gold per tonne cut-off grade (TNR Gold Corp., 2013; Athey and Werdon, 2017).

Alteration:

Silicification and albite-sericite-quartz +/- carbonate replacement of host intrusive rocks (Rombach, 2000).

Age of mineralization:

Latest Cretaceous, 68 to 70 Ma, based on K/Ar and Ar/Ar dating of intrusive rocks and mineralization (Rombach, 2000).

Generic deposit model:

Deposit model:

Gold-bearing quartz-stockwork veining in felsic porphyry.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

This prospect was discovered in the 1980s in a regional exploration program by Cominco Alaska in joint venture with ENSTAR. They named this prospect Mose and completed surface mapping, sampling, and drilled six shallow diamond drill holes. In the 1990s, ENSTAR's interest was sold to NovaGold Resources Inc., the prospect was renamed Shotgun, and renewed exploration took place. This exploration included extensive new diamond drilling in 1998 that included 20 drill holes totaling 10,192 feet. Airborne and ground magnetometer surveys have been used in conjunction with extended mapping and sampling to evaluate the potential for additional deposits in surrounding areas. Drilling results from this year included 14 drill holes intersecting over 20 meters that averaged over 1 gram of gold per tonne with the largest intercept at 121.5 meters at 1.41 grams of gold per tonne in drill hole 98-09 (Rombach, 2000).

TNR Gold Corporation optioned Shotgun (Mose) from NovaGold Resources, Inc. in 2003. A running history of TNR Gold's work to April 2007 can be seen in several news releases and project information at their web site (TNR Gold Corp., 2007). Initial exploration under this agreement was in September 2003 and

included surface geologic mapping and an airborne magnetic survey. TNR Gold Corporation's exploration work during the summer of 2004 included surface geologic mapping and sampling at Shotgun (Mose) and other prospects including Shot (TA031), King (TA030), and Beats Me (TA029). In the summer of 2005, the TNR Gold Corporation exploration program included drilling 6 holes to further refine and expand the resource at Shotgun (Mose) and evaluate other prospects in the area. In 2006, drilling from one drill hole (06-43) intersected 210.5 meters of 1.28 grams of gold per tonne (Harrop, 2008).

In 2011 and 2012, TNR collected 3D IP resistivity and chargeability geophysical surveys at Shotgun. In 2012, three drill holes totaling 814 meters were completed. A resource estimate and technical report followed in 2013. An Inferred Resource of 20,734,313 tonnes at 1.06 grams per tonne for a total of 705,960 ounces gold using a 0.5 gram of gold per tonne cut-off grade was estimated. Mineralization, as defined by a 3D computer model, is approximately 360 meters long trending at 55 degrees, and extends from the ground surface to a depth of up to 240 meters. Mineralization remains open at depth (Van Wyck and Armitage, 2013).

TNR Gold Corp. commissioned GeoVector Management Inc. ('GeoVetor') to produce a resource estimate on the Property in 2013. Geovector reported an Inferred Resource of 20,734,313 tonnes at 1.06 grams of gold per tonne for a total of 705,960 ounces gold using a 0.5 gram of gold per tonne cut-off grade (TNR Gold Corp., 2013; Athey and Werdon, 2017).

Production notes:

None.

Reserves:

In 2012, three drill holes totaling 814 meters were completed. A resource estimate and technical report followed in 2013. An Inferred Resource of 20,734,313 tonnes at 1.06 grams per tonne for a total of 705,960 ounces gold using a 0.5 gram of gold per tonne cut-off grade was estimated. Mineralization, as defined by a 3D computer model, is approximately 360 meters long trending at 55 degrees, and extends from the ground surface to a depth of up to 240 meters. Mineralization remains open at depth (Van Wyck and Armitage, 2013).

TNR Gold Corp. commissioned GeoVector Management Inc. ('GeoVetor') to produce a resource estimate on the Property in 2013. Geovector reported an Inferred Resource of 20,734,313 tonnes at 1.06 grams of gold per tonne for a total of 705,960 ounces gold using a 0.5 gram of gold per tonne cut-off grade (TNR Gold Corp., 2013; Athey and Werdon, 2017).

Additional comments:

In 2010, TNR Gold Corp. announced an increase to 100 percent undivided ownership interest in the Shotgun project through the acquisition of NovaGold Resources outstanding 50 percent (TNR Gold Corp., 2010).

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Harrop, J., 2008, Technical Report on the Shotgun - Winchester Project, SW Alaska: http://sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00004948&fileName=/csfsprod/data87/filings/01228299/00000001/p%3A%5Cdwnlds%5CTNRGoldTechRepMar11.pdf (posted on www.sedar.com, March 11, 2008, as of December 3, 2014).

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Rombach, C.S., 2000, Genesis and mineralization of the Shotgun deposit, southwestern Alaska, in Tintina gold belt; Concepts, exploration, and discoveries: British Columbia and Yukon Chamber of Mines,

Cordilleran Roundup, Special Volume 2, p. 181-196.

TNR Gold Corporation, 2007: http://www.tnrgoldcorp.com (as of April 2007).

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Van Wyck, N., and Armitage, A., 2013, Technical Report on the Shotgun Gold Project, Southwest Alaska, prepared for TNR Gold Corp. (www.sedar.com, published May 27, 2013): http://sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00004948&fileName=/csfsprod/data143/filings/02069651/00000001/l%3A%5CSEDAR%5CTNRGoldCorp%5CTechnicalReportandConsents%5CTechnicalReport.pdf (as of December 12, 2014).

Primary Reference: Rombach, 2000

Reporter(s): Travis L. Hudson (Applied Geology, Inc.); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Taylor Creek

Site type: Mine

ARDF no.: TA008

Latitude: 60.8741 **Quadrangle:** TA D-4

Longitude: 157.3437

Location description and accuracy:

Taylor Creek is the main drainage on the southeast side of the Taylor Mountains. Taylor Creek flows east and north from the highest peak (3,581 feet in elevation) for 3.8 miles Gold has been placer mined along at least the upper 3 miles of Taylor Creek, although prospects have been noted as far as 1.5 miles below the mouth of Fork Creek, a south tributary. The location is at the principal mine buildings in the NW1/4 of section 18, T. 9 N., R. 46 W., of the Seward Meridian. This is locality 11 of Cobb (1972 [MF 384]; 1976 [OF 76-606]).

Commodities:

Main: Au

Other: Ag, Hg, Mn, Sn

Ore minerals: Cassiterite, cinnabar, gold, pyrite

Gangue minerals:

Geologic description:

Placer gold mining has taken place along at least the upper 3 miles of Taylor Creek, although prospects have been noted as far as 1.5 miles below the mouth of Fork Creek, a south tributary (Cady and others, 1955, Plate 1). The alluvial gravels are about 10 feet thick, the pay streak is about 250 feet wide, and bedrock is mid-Cretaceous clastic sedimentary rocks of the Kuskokwim Group.

The heavy-mineral concentrates contain cinnabar and cassiterite; pyrite is abundant in concentrates from below the mouth of Fork Creek (Cady and others, 1955, p. 119). Cady and others (1955) reported that the Taylor Creek mine had produced a total of $90,000 worth of gold (about 2,500 ounces), mainly in 1950 and 1951. The mine has been active at different times since Cady and others' report, including small-scale mining and prospecting through the 1990s (M. Henning, personal communication, 2000). The Bureau of Land Management sampled the Taylor Creek placer deposit in 2004 (Ellefson and others, 2005). Two panned-concentrate samples contained 7.66 and 15.2 parts per million (ppm) gold, 0.25 and 0.24 ppm silver, 9.15 and 10.8 ppm mercury, 2280 and 1270 ppm manganese, 19 and 34 ppm tin, and less than 0.01 ppm tantalum.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: Yes; small

Site Status: Active

Workings/exploration:
Placer gold mining has taken place along at least the upper 3 miles of Taylor Creek, although prospects have been noted as far as 1.5 miles below the mouth of Fork Creek, a south tributary (Cady and others, 1955, Plate 1). An airstrip, water ditch, and mine buildings are present. Taylor Creek has been explored for a distance of about 1.5 miles downstream of the mouth of Fork Creek. The mine has been active at different times since Cady and others' report, including small-scale mining and prospecting through the 1990s (M. Henning, oral communication, 2000). Sampled by the Bureau of Land Management in 2004.

Production notes:
Cady and others (1955) reported that the Taylor Creek mine had produced a total of $90,000 worth of gold (about 2,500 ounces), mainly in 1950 and 1951. There has been an undocumented amount of production since 1951.

Reserves:
None.

Additional comments:

References:

Cady, W.M., Wallace, R.E., Hoare, J.M., and Webber, E.J., 1955, The central Kuskokwim region, Alaska: U.S. Geological Survey Professional Paper 268, 132 p.

Cobb, E.H., 1972, Metallic mineral resources map of the Taylor Mountains quadrangle: U.S. Geological Survey Miscellaneous Field Studies Map MF-384, 1 sheet, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Dillingham, Sleetmute, and Taylor Mountains quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-606, 92 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Ellefson, R. M., Hoppe, J. E., Kurtak, J. M., and Meyer, M. P., 2005, Mineral investigations in the Aniak mining district, southwestern Alaska, 2004 field season: Bureau of Land Management Open File Report, 100, 44 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Primary Reference: Cady and others, 1955

Reporter(s): Travis L. Hudson (Applied Geology, Inc.)

Last report date: 2007-04-10

Site name(s): Sleitat

Site type: Prospect

ARDF no.: TA010

Latitude: 60.0439 **Quadrangle:** TA A-3

Longitude: 157.0882

Location description and accuracy:

The Sleitat prospect is centered on a saddle at an elevation of 1,725 feet, between the two high peaks of Sleitat Mountain. The prospect is near the center of section 31, T. 1 S, R. 45 W. The location is accurate.

Commodities:

Main: Sn, W

Other: Ag, Bi, Cu, Ta, W

Ore minerals: Arsenopyrite, bismite, cassiterite, chalcopyrite, ferrotantalite, loellingite, pyrite, sphalerite, stannite, wolframite

Gangue minerals: Clay, muscovite, quartz, topaz, tourmaline, zinnwaldite

Geologic description:

The occurrence of granite and peripheral gold-bearing quartz veins was reported on Sleitat Mountain by Mertie (1938), but subsequent exploration has shown that the principal mineralization is a tin-, tungsten-, and silver-bearing sheeted greisen system (Farnstrom, 1991; Burleigh, 1991; Hudson and Reed, 1997, Ellis, 2006). The greisen deposit was discovered during a Cominco Alaska regional exploration program in 1983, and subsequently evaluated in the mid-1980s by detailed surface mapping and sampling, and 9 drill holes (Farnstrom, 1991). Solomon Resources Ltd. staked 3,520 acres on the Sleitat prospect in the summer of 2005 (Brett Resources Inc., 2006). They subsequently worked out a joint venture agreement with Brett Resources, Inc., and geologic and geochemical field work began in Sept. 2005. In 2005, Brett commissioned a comprehensive NI 43-101 report on the deposit by William T. Ellis (2006), who analyzed and compiled the previous data on the deposit and did some limited verification sampling. In 2006, Brett drilled 5 holes.

A composite granite stock that hosts most of the greisen sharply crosscuts and thermally metamorphoses mid-Cretaceous clastic sedimentary rocks of the Kuskokwim Group. The stock has a discontinuous border zone of medium-grained biotite granite and biotite-muscovite granite, and a core of fine-grained zinnwaldite granite. Felsic porphyry dikes crosscut hornfels peripheral to the stock. A K/Ar age of 56.8 +/- 2.8 Ma on muscovite from a late veinlet was reported by Burleigh (1991). The cassiterite-bearing, greisen sheets trend east-west and are developed within the biotite-muscovite granite, zinnwaldite granite, and hornfels.

The greisen zones include nearly vertical quartz-topaz-tourmaline +/- white mica veins and tabular bodies that vary from inches to 20 feet in thickness and coalesce to greater thicknesses in places. They are mainly concentrated in the north half of the stock; a second zone along the south border includes some greisen sheets in peripheral hornfels. The individual greisen sheets are granular, massive, separated by less-altered granite, have disseminated clay-lined voids, and have cores that locally contain a few inches of coarse-grained quartz veins with concentrations of up to 50-60 percent cassiterite (Burleigh, 1991). Cassiterite is disseminated in the greisen, concentrated in cores of greisen veins, and is in quartz-topaz veins that fill fractures in hornfels. Cassiterite-bearing veins in hornfels are up to 1.5 feet wide and a few hundred feet long. Small amounts of wolframite are disseminated in the greisen but it also occurs with arsenopyrite in quartz veins, especially in hornfels peripheral to greisen zones. Arsenopyrite is common in the greisen and veins. Up to 5 percent loellingite with inclusions of bismite has been identified as disseminations in biotite-

muscovite granite (Burleigh, 1991). Sphalerite is a minor but common constituent of the greisen and some stannite and chalcopyrite are associated with the sphalerite. One small grain of ferrotantalite was identified during SEM analysis of the greisen (Burleigh, 1991). Individual greisen zones locally have high tin grades. For example, one 47.7-foot drill intercept averaged 1.56 percent tin, and included a 5-foot-thick section grading 12.6 percent tin and 5.7 ounces of silver per ton (Farnstrom, 1991; Burleigh, 1991). Four of the five holes drilled by Brett Resources (2006) in 2006 intersected mineralization comparable to the earlier Cominco results. The 2006 drilling including 104 meters with 0.24 percent tin and 6.48 grams of silver per ton, and 66 meters with 0.29 percent tin and 14.10 percent silver.

The Sleitat prospect is a deeply eroded tin-bearing system. The sheeted greisens, particularly those on the north side of the stock, are expected to diminish in size and in intensity of cassiterite mineralization at depth. However, mineralization in the relatively wide hornfels zone on the south side of the stock may indicate that the upper contact of the granite body is not steeply dipping there, or that a mineralizing zinnwaldite granite cupola could be present at depth (Hudson and Reed, 1997). Burleigh (1991) showed that much of the eroded tin-bearing material had migrated downslope and along the small streams that head in the Sleitat highland.

Burleigh (1991) estimated that the Sleitat deposit contained a total of 28.6 million tons of ore with an average grade of 0.37 percent tin, 0.04 percent tungsten, and 17 ppm silver. However, Ellis (2006) cautioned that these figures while not necessarily wrong, do not meet current industry standards for determining mineral resources.

Alteration:

Greisenization, late clay development, oxidation including iron- and scorodite-staining.

Age of mineralization:

Early Tertiary. A composite granite stock that hosts most of the greisen sharply crosscuts and thermally metamorphoses mid-Cretaceous clastic sedimentary rocks of the Kuskokwim Group. A K/Ar age of 56.8 +/- 2.8 Ma on muscovite from a late veinlet was reported by Burleigh (1991).

Generic deposit model:

Deposit model:

Sn greisen deposits (Cox and Singer, 1986; model 15c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

15c

Production Status: None

Site Status: Active

Workings/exploration:

The Sleitat prospect was discovered and explored by Cominco Alaska in the 1980s. This work included detailed surface mapping, sampling, and some diamond drilling (Farnstrom, 1991). In 1989, the U.S. Bureau of Mines conducted additional surface examinations, geochemical sampling, surface magnetometer and radiometric surveys, and a panned-concentrate survey in nearby drainages (Burleigh, 1991). Solomon Resources Ltd. staked 3,520 acres on the Sleitat prospect in the summer of 2005 (Brett Resources Inc., 2006). They subsequently worked out a joint venture agreement with Brett Resources, Inc., and geologic and geochemical field work began in Sept. 2005. In 2005, Brett commissioned a comprehensive NI 43-101 report on the deposit by William T. Ellis (2006) who analyzed and compiled the previous data on the deposit and did some limited verification sampling. Subsequently, Brett drilled 5 holes in 2006.

Production notes:

None.

Reserves:

Burleigh (1991) estimated that the Sleitat deposit contains a total of 28.6 million tons of ore with an average grade of 0.37 percent tin, 0.04 percent tungsten, and 17 ppm silver. However, Ellis (2006) cautioned that these figures, while not necessarily wrong, do not meet current industry standards for determining mineral resources.

Additional comments:

References:

Brett Resources Inc., 2006, Brett's Alaska Tin Drilling Yields Encouraging Intercepts: http://www.brettresources.com/s/NewsReleases.asp?ReportID=152664&_Type=News-Releases&_Title=Bretts-Alaska-Tin-Drilling-Yields-Encouraging-Intercept (News Release, Oct 6, 2006)

Burleigh, R.E., 1991, Evaluation of the tin-tungsten greisen mineralization and associated granite at Sleitat Mountain, southwestern Alaska: U.S. Bureau of Mines Open-File Report 35-91, 41 p.

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Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Dillingham, Sleetmute, and Taylor Mountains quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-606, 92 p.

Ellis, W.T., 2006, Technical report on the Sleitat Mountain tin-silver deposit, southwest Alaska, NI 43-101 report: Unpublished Technical Report for Brett Resources, Inc., 57 p. (posted on www.sedar.com, April 10, 2008).

Farnstrom, H.E., 1991, Sleitat: A new tin-silver prospect in southwestern Alaska: Alaska Miner, v. 19, p. 12-14.

Hudson, T.L., and Reed, B.L., 1997, Tin deposits of Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 450-465.

Primary Reference: Ellis, 2006

Reporter(s): Travis L. Hudson (Applied Geology, Inc.); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Unnamed (near peaks of Little Taylor Mountains)

Site type: Occurrence

ARDF no.: TA020

Latitude: 60.8494 **Quadrangle:** TA B-6

Longitude: 157.1924

Location description and accuracy:

This occurrence is on the crest of the Little Taylor Mountains, 3.1 miles southeast of the junction of Fork and Taylor creeks. The occurrence is near peak 2,100 at an elevation of about 2,100 feet, in the SW1/4 of section 24, T. 9 N., R. 45 W., of the Seward Meridian. This occurrence was included under the name 'Little Taylor Mts.' by Cobb (1976 [OF 76-606]).

Commodities:

Main: Au?

Other: As, Cu

Ore minerals: Arsenopyrite, gold, pyrite

Gangue minerals: Quartz, sericite

Geologic description:

Several Cretaceous or Tertiary felsic dikes or sills cut mid-Cretaceous clastic sedimentary rocks of the Kuskokwim Group in the higher parts of the Little Taylor Mountains (Cady and others, 1955, p. 71, plates 1 and 6). At a locality a little northwest of the summit of the Little Taylor Mountains, the felsic dikes or sills trend northwest, and dip southwest, parallel to the bedding of the enclosing sedimentary rocks. The felsic intrusions and the enclosing sedimentary rocks are strongly silicified and pyritized. 'Traces of copper' were also noted by Cady and others (1955, p. 122) in the Little Taylor Mountains. In 2005, T. K. Bundtzen (oral communication, 2005) found thin, arsenopyrite-bearing quartz veins in or near felsic intrusives on the southwest flank of the mountains at an elevation of about 1850 in SW1/4 sec. 24, T9N, R45W of the Seward Meridian. Gold is not specifically noted but possibly is present, probably in the quartz veins.

Alteration:

Silicification, pyritization, and sericitization.

Age of mineralization:

Late Cretaceous or early Tertiary, the age of the felsic plutons in southwest Alaska that intrude the mid-Cretaceous clastic sedimentary rocks of the Kuskokwim Group.

Generic deposit model:

Deposit model:

Gold?-bearing altered felsic intrusive rocks.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only some surface examination and sampling.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cady, W.M., Wallace, R.E., Hoare, J.M., and Webber, E.J., 1955, The central Kuskokwim region, Alaska: U.S. Geological Survey Professional Paper 268, 132 p.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Dillingham, Sleetmute, and Taylor Mountains quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-606, 92 p.

Primary Reference: Cady and others, 1955

Reporter(s): Travis L. Hudson (Applied Geology, Inc.)

Last report date: 2007-04-10

Site name(s): Shot

Site type: Prospect

ARDF no.: TA021

Latitude: 60.3694 **Quadrangle:** TA B-6

Longitude: 158.1524

Location description and accuracy:

This prospect is in the southern Shotgun Hills near the top of an upland west of the headwaters of an unnamed north tributary to the King Salmon River. It is in the NW1/4 section 9, T. 3 N., R. 51 W., of the Seward Meridian. The location is accurate to within 1/4 mile.

Commodities:

Main: Ag, Au, Sn

Other: As, B, Bi, Cu, Hg, Pb, Sb

Ore minerals: Arsenopyrite, gold, malachite

Gangue minerals: Quartz, tourmaline

Geologic description:

Clark and others (1970) collected rock samples for about 5,000 feet along the crest of this upland. Several of these samples have weakly to strongly anomalous concentrations of silver (to 7 parts per million (ppm)), arsenic, boron, bismuth, copper, lead, antimony, tin, gold (to 0.1 ppm), and mercury. Bedrock is mostly hornfels in mid-Cretaceous clastic sedimentary rocks of the Kuskokwim Group. Clark and others (1970) describe this hornfels as strongly limonite stained and cut by numerous small quartz veins rarely exceeding 1/8 inch in width. Some of the quartz veins carry minor amounts of arsenopyrite and arsenopyrite is also locally disseminated in the hornfels. Some scorodite and malachite are locally present.

Cominco examined the prospect during a reconnaissance exploration program in the early 1980s (Travis Hudson, personal knowledge, 2005). Felsic intrusives cut hornfels and intense tourmaline alteration is locally developed. Shot was originally considered a tin-silver prospect and stream sediments, panned concentrates, and rock samples do contain anomalous tin values. Rock samples collected during initial exploration contained up to 510 ppb gold. TNR Gold Corporation (2005) explored this prospect in 2005 as part of their district exploration program centered on the Shotgun prospect (TA007). TNR drilled 301 meters in 2005 (TNR Gold Corp., 2014). In 2008, a revised NI 43-101 technical report was published (Harrop, 2008). In 2013, another NI 43-101 Technical Report was published (Van Wyck and Armitage, 2013).

Alteration:

Silicification and tourmalinization (Rombach, 2000).

Age of mineralization:

Probably Latest Cretaceous, the age of intrusive rocks and mineralization in the similar Shotgun (TA007) prospect nearby (Rombach, 2000).

Generic deposit model:

Deposit model:

Quartz veins in hornfels and felsic intrusive rocks; possibly polymetallic veins? (Cox and Singer, 1986, model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active?

Workings/exploration:

Originally found during regional mapping by the U.S. Geological Survey in the late 1960s Examined by Cominco Exploration in 1981 during an initial reconnaissance of the area. TNR Gold Corporation was exploring this prospect in 2005 as part of their district exploration program centered on the Shotgun prospect (TA007).

TNR drilled 301 meters in 2005 (TNR Gold Corp., 2014). In 2008, a revised NI 43-101 technical report was published (Harrop, 2008). In 2013, another NI 43-101 technical report was published (Van Wyck and Armitage, 2013).

Production notes:

None.

Reserves:

Though the Shot prospect does not have any calculated resources or reserves, a resource estimate on the nearby Shotgun prospect (TA007) was completed in 2013 (Van Wyck and Armitage, 2013).

Additional comments:

In 2010, TNR Gold Corp. announced an increase to 100 percent undivided ownership interest in the Shotgun project through the acquisition of NovaGold Resources outstanding 50 percent (TNR Gold Corp., 2010).

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Clark, A.L., Condon, W.H., Hoare, J.M., and Sorg, D.H., 1970, Analyses of rock and stream-sediment samples from the Taylor Mountains C-8 Quadrangle, Alaska: U.S. Geological Survey Open-File Report 70-80, 110p., 1 sheet, scale 1:63,360.

Harrop, J., 2008, Technical Report on the Shotgun-Winchester Project, SW Alaska, prepared for TNY Gold Corp.: http://sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00004948&fileName=/csfs7prod/data87/filings/01228299/00000001/p%3A%5Cdwnlds%5CTNRGoldTechRepMar11.pdf (posted on www.sedar.com, March 11, 2008, as of December 3, 2014).

Rombach, C.S., 2000, Genesis and mineralization of the Shotgun deposit, southwestern Alaska, in Tintina gold belt; Concepts, exploration, and discoveries: British Columbia and Yukon Chamber of Mines, Cordilleran Roundup, Special Volume 2, p. 181-196.

TNR Gold Corporation, 2005: www.tnrgoldcorp.com/nr102505.pdf (October, 2005).

TNR Gold Corp, 2010, 100% Interest Negotiated on Shotgun Gold Project, Alaska: http://www.tnrgoldcorp.com/index.php/news/2010-news/137-100-interest-negotiated-on-shotgun-gold-project-alaska, News Release dated September 20, 2010 (as of July 21, 2014).

TNR Gold Corp., 2014, Shotgun Gold Project Presentation: http://www.tnrgoldcorp.com/images/pdf/TNR_Shotgun.pdf (as of December 3, 2014).

Van Wyck, N., and Armitage, A., 2013, Technical Report on the Shotgun Gold Project, Southwest Alaska, prepared for TNR Gold Corp. (www.sedar.com, published May 27, 2013): http://sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00004948&fileName=/csfsprod/data143/filings/02069651/00000001/l%3A%5CSEDAR%5CTNRGoldCorp%5CTechnicalReportandConsents%5CTechnicalReport.pdf (as of December 2, 2014).

Primary Reference: Harrop, 2008

Reporter(s): Travis L. Hudson (Applied Geology, Inc.); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-12

Site name(s): Unnamed (in Taylor Mountains)

Site type: Occurrence

ARDF no.: TA023

Latitude: 60.9235 **Quadrangle:** TA D-4

Longitude: 157.4491

Location description and accuracy:

This occurrence is high in the Taylor Mountains about 1.2 miles west of peak 3581 (the highest peak in the Taylor Mountains) and about 0.1 mile north of elevation 3007. It is about 0.3 mile south of the center of section 28, T. 10 N., R,. 46 W. The location is accurate.

Commodities:

Main: B

Other: As, Cu, U

Ore minerals: Tourmaline

Gangue minerals: Quartz

Geologic description:

Black tourmaline and quartz-tourmaline rock partly to completely replace porphyritic biotite granite of the Cretaceous Taylor Mountains pluton (Travis Hudson, unpublished field data, 2005) Coarse euhedral tourmaline aggregates are well developed along a northwest-trending vertical fracture or fault in the granite. The tourmaline-rich zone is at least several feet wide; float blocks of tourmaline and quartz-tourmaline rock are up to 4 or 5 feet thick. These blocks are scattered on the surface in a line for about one to two hundred feet. The host granite has large euhedral K-feldspar phenocrysts up to 8 to 10 centimeters long in a fine- to medium-grained equigranular groundmass. The Bureau of Land Management sampled this occurrence in 2004 (Ellefson and others, 2005). Two rock samples contained 100 and 300 parts per million (ppm) arsenic, 107 and 106 ppm copper, less than 5 and 15 ppm tin, less than 0.01 tantalum, and 2.96 and 15.3 ppm uranium. These samples contained only 10 and 70 ppm boron and are therefore not representative of the tourmaline-rich rocks at this locality. T. K. Bundtzen (personal communication, 2005) also sampled these tourmaline-rich rocks in 2005.

Alteration:

Tourmaline and quartz replacement of porphyritic biotite granite.

Age of mineralization:

Late Cretaceous, the age of the Taylor Mountains granite pluton.

Generic deposit model:

Deposit model:

Tourmaline and quartz-tourmaline replacement in granite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only limited surface sampling.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Ellefson, R. M., Hoppe, J. E., Kurtak, J. M., and Meyer, M. P., 2005, Mineral investigations in the Aniak mining district, southwestern Alaska, 2004 field season: Bureau of Land Management Open File Report, 100, 44 p.

Primary Reference: Ellefson and others, 2005

Reporter(s): Travis L. Hudson (Applied Geology, Inc.)

Last report date: 2005-10-10

Site name(s): Unnamed (west of upper Taylor Creek)

Site type: Mine

ARDF no.: TA024

Latitude: 60.872

Quadrangle: TA D-4

Longitude: 157.4382

Location description and accuracy:

This mine is in the headwaters of an unnamed north tributary to Kiknik Creek. A small saddle separates the mine from the headwaters of upper Taylor Creek (TA008) to the east. The mine, which was active as of August 2005, is in the NW1/4, section 16, T. 9 N., R. 46 W. of the Seward Meridian.

Commodities:

Main: Au

Other: Ag, Sn, W

Ore minerals: Gold, magnetite, scheelite, wolframite

Gangue minerals:

Geologic description:

Like Taylor Creek (TA008) to the east, this placer is in a drainage that marks the approximate boundary between hornfels associated with the Taylor Mountain pluton and non-metamorphosed clastic sedimentary rocks of the Kuskokwim Group. Bedrock in the mine area is non-metamorphosed Kuskokwim Group sedimentary rocks. In some recent years to at least 2005, open cut mining has taken place on this creek early in the summer when water is available.

The BLM sampled this deposit in 2004 (Ellefson and others, 2005). Their 2-pan, concentrate sample contained 40 to 60 very fine to fine gold colors. After removal of visible gold, this sample contained 305 parts per million (ppm) gold, 60.1 ppm silver, 267 ppm mercury, 1,660 ppm manganese, 2,350 ppm tin, less than 0.01 ppm tantalum, and 820 ppm tungsten. Two samples of sluice concentrate contained 556 and greater than 1,500 ppm silver, 37.1 and 171 ppm mercury, 5,130 and greater than 10,000 ppm manganese, 1,400 and 2,330 ppm tin, 0.6 ppm tantalum, and 15.7 and 36 percent tungsten. Abundant wolframite with minor magnetite and scheelite were identified in the concentrate samples.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

In some recent years to at least 2005, open cut mining has taken place on this creek early in the summer when water is available. The BLM sampled this placer in 2004.

Production notes:

In recent years and through 2005, this mine produced a small amount of gold each year. The concentrates also contain some tin and tungsten but neither commodity is recovered or marketed.

Reserves:

Unknown but probably some (in 2005).

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Ellefson, R. M., Hoppe, J. E., Kurtak, J. M., and Meyer, M. P., 2005, Mineral investigations in the Aniak mining district, southwestern Alaska, 2004 field season: Bureau of Land Management Open File Report, 100, 44 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Primary Reference: This record

Reporter(s): Travis L. Hudson (Applied Geology, Inc.)

Last report date: 2007-04-10

Site name(s): Unnamed (on Whitewater Creek)

Site type: Occurrence

ARDF no.: TA025

Latitude: 60.8707 **Quadrangle:** TA D-4

Longitude: 157.5539

Location description and accuracy:

This occurrence is at an elevation of about 500 feet on Whitewater Creek on the south flank of the Taylor Mountains. It is in section 14, T. 9 N., R. 47 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Whitewater Creek heads in the south contact zone of the Taylor Mountain granite pluton. The bedrock in the area is mostly hornfels developed from graywacke and shale of the Cretaceous Kuskokwim Group (Travis Hudson, unpublished field data, 2005). The Bureau of Land Management sampled the alluvial sediments at this location in the summer of 2004 (Ellefson and others, 2005). A stream-sediment sample contained 1,395 parts per billion gold A two-pan, panned-concentrate sample contained 6 very fine colors of gold. After removing the visible gold, this sample contained 2.25 parts per million (ppm) gold; tin and tantalum were below the detection limits of 5 ppm and 0.01 ppm respectively.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986, model 39a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Inactive

Workings/exploration:

The only documented work in this area is reconnaissance sampling by the Bureau of Land Management in the summer of 2004.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Ellefson, R. M., Hoppe, J. E., Kurtak, J. M., and Meyer, M. P., 2005, Mineral investigations in the Aniak mining district, southwestern Alaska, 2004 field season: Bureau of Land Management Open File Report, 100, 44 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Primary Reference: Ellefson and others, 2005

Reporter(s): Travis Hudson (Applied Geology, Inc.)

Last report date: 2007-04-10

Site name(s): Unnamed (on Kiknik Creek)

Site type: Occurrence

ARDF no.: TA026

Latitude: 60.8549 **Quadrangle:** TA D-5

Longitude: 157.5504

Location description and accuracy:

Kiknik Creek is the major drainage southwest of the Taylor Mountains. This placer occurrence is on Kiknik Creek at an elevation of about 440 feet. It is about 1.3 miles upstream from the mouth of Whitewater Creek and about 0.5 mile west of the center of section 24, T. 9 N., R. 47 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

This placer gold occurrence is in alluvial sediments mostly derived from clastic sedimentary rocks of the Kuskokwim Group in the headwaters of Kiknik Creek. This occurrence is about 1.5 miles downstream of the confluence of Kiknik Creek and an unnamed north tributary with a rich headwater placer (TA024). The Bureau of Land Management collected a stream- sediment sample that contained 0.192 part per million (ppm) gold and a panned-concentrate contained 5.55 ppm gold (Ellefson and others, 2005).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Inactive

Workings/exploration:

The only documented work in this area is reconnaissance sampling by the Bureau of Land Management in the summer of 2004.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Ellefson, R. M., Hoppe, J. E., Kurtak, J. M., and Meyer, M. P., 2005, Mineral investigations in the Aniak mining district, southwestern Alaska, 2004 field season: Bureau of Land Management Open File Report, 100, 44 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Primary Reference: This record

Reporter(s): Travis L. Hudson (Applied Geology, Inc.)

Last report date: 2005-10-10

Site name(s): Unnamed (headwaters of the Nushagak River)

Site type: Prospect

ARDF no.: TA027

Latitude: 60.6733 **Quadrangle:** TA C-1

Longitude: 156.1333

Location description and accuracy:

This prospect is on a ridge north of the head of the Nushagak River. It is at an elevation of about 1,675 feet about 0.4 miles north of the center of section 28, T. 7 N., R. 39 W.

Commodities:

Main: Au?

Other:

Ore minerals: Gold?

Gangue minerals: Quartz

Geologic description:

Sparse quartz veins up to a few centimeters wide cut graywacke and shale of the Cretaceous Kuskokwim Group at their contact with a granitic intrusion (Travis Hudson, unpublished field data, 2005). A small prospect pit has been dug but it does not expose outcrop. A composite, quartz vein sample was collected in 2005 by the U.S. Geological Survey.

Alteration:

Age of mineralization:

Late Cretaceous or Early Tertiary; probably related to the adjacent felsic intrusion which cuts the Cretaceous Kuskokwim Group.

Generic deposit model:

Deposit model:

Quartz veins in sedimentary rocks at contact with granitic intrusion.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

A small prospect pit has been dug on the contact of Kuskokwim Group and granitic rocks at this occurrence; outcrop is not exposed.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference: This record

Reporter(s): Travis L. Hudson (Applied Geology, Inc.)

Last report date: 2005-10-10

Site name(s): King

Site type: Prospect

ARDF no.: TA028

Latitude: 60.3319 **Quadrangle:** TA B-6

Longitude: 158.1362

Location description and accuracy:

The King prospect is in the isolated upland north of the upper King Salmon River, the highest point of which is marked by VABM King. The exact location of the prospect on the upland is unknown and is somewhat arbitrarily plotted at VABM King in the SE1/4 section 21, T. 3 N., R. 51 W., of the Seward Meridian. The prospect is probably within a mile of VABM King. The location is probably accurate to within a mile.

Commodities:

Main: Au

Other: Ag, Sn

Ore minerals: Gold

Gangue minerals: Quartz, tourmaline

Geologic description:

Cominco discovered and explored this prospect during a reconnaissance exploration program in the early 1980s (Travis Hudson, personal knowledge, 2005). The prospect is in an area of hornfels developed from the sedimentary rocks of the Cretaceous Kuskokwim Group. Felsic intrusions cut the hornfels and intense tourmaline alteration is locally developed. The prospect was originally considered to be a silver prospect. However, stream sediments and rock samples contain anomalous tin values and some contain anomalous gold values. TNR Gold Corporation (2005) was exploring this prospect in 2005 as part of their district exploration program centered on the Shotgun prospect (TA007).

In 2005, TNR drilled 145 meters at King (TNR Gold Corp., 2014). This drilling was targeting three talus samples that were collected on the north side of the mountain, which ran over 1 gram of gold per tonne. Prospecting and mapping in 2007 looked at a vein and breccia zone on the south side of the mountain where twelve rock samples were collected. Of these twelve samples, eight contained 0.208 to 2.985 grams of gold per tonne as stated in the NI 43-101 technical report by J. Harrop (2008). In 2013, another 43-101 Technical Report was published (Van Wyck and Armitage, 2013).

Alteration:

Silicification and tourmalinization (Rombach, 2000).

Age of mineralization:

Probably Latest Cretaceous, the age of intrusive rocks and mineralization in the nearby Shotgun (TA007) prospect area (Rombach, 2000).

Generic deposit model:

Deposit model:

Quartz veins in hornfels and felsic intrusive rocks.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Joe Piekenbrock discovered this prospect in 1981 during an initial reconnaissance of the area for Cominco Exploration. Cominco mapped and sampled the prospect in the early 1980s (Travis Hudson, personal knowledge, 2005).

In 2005, TNR drilled 145 meters at King (TNR Gold Corp., 2014). This drilling was targeting three talus samples that were collected on the north side of the mountain which ran over 1 gram of gold per tonne. Prospecting and mapping in 2007 looked at a vein and breccia zone on the south side of the mountain where twelve rock samples were collected. Of these twelve samples, eight contained 0.208 to 2.985 grams of gold per tonne as stated in the NI 43-101 technical report by J. Harrop (2008). In 2013, another 43-101 Technical Report was published (Van Wyck and Armitage, 2013).

Production notes:

None.

Reserves:

Though the King prospect does not have any calculated resources or reserves, a resource estimate on the nearby Shotgun prospect (TA007) was completed in 2013 (Van Wyck and Armitage, 2013).

Additional comments:

In 2010, TNR Gold Corp. announced an increase to 100 percent undivided ownership interest in the Shotgun project through the acquisition of NovaGold Resources outstanding 50 percent (TNR Gold Corp., 2010).

References:

Harrop, J., 2008, Technical Report on the Shotgun-Winchester Project, SW Alaska, prepared for TNY Gold Corp.: http://sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00004948&fileName=/csfsprod/data87/filings/01228299/00000001/p%3A%5Cdwnlds%5CTNRGoldTechRepMar11.pdf (posted on www.sedar.com, March 11, 2008, as of December 3, 2014).

Rombach, C.S., 2000, Genesis and mineralization of the Shotgun deposit, southwestern Alaska, in Tintina gold belt; Concepts, exploration, and discoveries: British Columbia and Yukon Chamber of Mines, Cordilleran Roundup, Special Volume 2, p. 181-196.

TNR Gold Corporation, 2005: www.tnrgoldcorp.com/nr102505.pdf (as of October, 2005).

TNR Gold Corp, 2010, 100% Interest Negotiated on Shotgun Gold Project, Alaska: http://www.tnrgoldcorp.com/index.php/news/2010-news/137-100-interest-negotiated-on-shotgun-gold-project-alaska, News Release dated September 20, 2010 (as of July 21, 2014).

TNR Gold Corp., 2014, Shotgun Gold Project Presentation: http://www.tnrgoldcorp.com/images/pdf/TNR_Shotgun.pdf (as of December 3, 2014).

Van Wyck, N., and Armitage, A., 2013, Technical Report on the Shotgun Gold Project, Southwest Alaska, prepared for TNR Gold Corp. (www.sedar.com, published May 27, 2013): http://sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00004948&fileName=/csfsprod/data143/filings/02069651/00000001/l%3A%5CSEDAR%5CTNRGoldCorp%5CTechnicalReportandConsents%5CTechnicalReport.pdf (as of December 2, 2014).

Primary Reference: TNR Gold Corp., 2005

Reporter(s): Travis L. Hudson (Applied Geology, Inc.); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-12

Site name(s): Winchester; Beats Me

Site type: Prospect

ARDF no.: TA029

Latitude: 60.2825 **Quadrangle:** TA B-6

Longitude: 158.1023

Location description and accuracy:

This prospect is on an upland south of the upper King Salmon River, possibly in section 10 and/or 11, T. 2 N., R. 51 W. The site of this prospect is arbitrarily chosen to be the summit of this upland at elevation 1606; it is probably within a mile of the true location of this prospect. The accuracy of this location has not been reported.

Commodities:

Main: Au

Other:

Ore minerals: Arsenopyrite, gold

Gangue minerals: Quartz

Geologic description:

Cominco Exploration discovered this prospect in the early 1980s (Travis Hudson, personal knowledge, 2005). It is in an upland area of hornfels developed from sedimentary rocks of the Cretaceous Kuskokwim Group that are cut by felsic dikes. Quartz stockwork veining and arsenopyrite mineralization are locally well-developed. Stream sediments in the area have anomalous gold values and several rock samples contain over 1 part per million gold. TNR Gold Corporation (2005) continued exploration of this prospect and core drilled in the summer of 2005. TNR announced the results of their 2005 drilling in October 2005. The six holes totaled 1754.3 feet and most went through medium-grained felsic intrusive rock into sedimentary rocks of the Cretaceous Kuskokwim Group. The felsic intrusive rocks were commonly anomalous in gold associated with arsenic, bismuth, copper, and tungsten. The highest grade interval in the holes was 1.60 grams of gold per ton over 14.3 meters; this included a 2.13 meter interval with 2.93 grams of gold per ton. The holes were drilled on a geochemical anomaly 500 by 1200 in area along the ridge. There is little outcrop in the area. TNR Gold Corporation (2007) drilled eleven more holes in 2006 with emphasis on the Winchester zone where they now have seven holes along a cross section through the zone and a clearer understanding of the geology of the deposit. The mineralization continues to be associated with light-gray felsic intrusive sills and is not restricted to brecciated zones or veins.

In 2010, TNR Gold Corp. announced an increase to 100 percent undivided ownership interest in the Shotgun project through the acquisition of NovaGold Resources outstanding 50 percent (TNR Gold Corp., 2010). In 2011 and 2012, TNR collected 3D IP resistivity and chargeability geophysical surveys at Winchester. A resource estimate for Shotgun and technical report followed in 2013 (Van Wyck and Armitage, 2013).

Alteration:

Silicification.

Age of mineralization:

Probably Latest Cretaceous, the age of intrusive rocks and mineralization in the nearby Shotgun (ARDF number TA007) prospect.

Generic deposit model:

Deposit model:

Arsenopyrite-bearing quartz veins in hornfels and felsic intrusive rocks.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The Winchester prospect was mapped and sampled by TNR Gold Corporation in 2005 and 6 holes were drilled that totaled 1754.3 feet. TNR drilled 11 more holes in 2006 with emphasis on the Winchester zone where they now have 7 holes along a cross section through the zone and a clearer understanding of the geology of the deposit.

In 2010, TNR Gold Corp. announced an increase to 100 percent undivided ownership interest in the Shotgun project through the acquisition of NovaGold Resources outstanding 50 percent (TNR Gold Corp., 2010). In 2011 and 2012, TNR collected 3D IP resistivity and chargeability geophysical surveys at Winchester. A resource estimate for Shotgun and technical report followed in 2013 (Van Wyck and Armitage, 2013).

Production notes:

None.

Reserves:

See ARDF site TA007 for 2012 resource estimate for the Shotgun Project; however, drillholes from King where not included in that estimate (TNR Gold Corp., 2008).

Additional comments:

References:

TNR Gold Corporation, 2005, www.tnrgoldcorp.com/nr102505.pdf (October, 2005).

TNR Gold Corporation, 2007, http://www.tnrgoldcorp.com/tnr_projectsc.asp (as of April, 2007).

TNR Gold Corp, 2010, 100% Interest Negotiated on Shotgun Gold Project, Alaska: http://www.tnrgoldcorp.com/index.php/news/2010-news/137-100-interest-negotiated-on-shotgun-gold-project-alaska, News Release dated September 20, 2010 (as of July 21, 2014).

Van Wyck, N., and Armitage, A., 2013, Technical Report on the Shotgun Gold Project, Southwest Alaska, prepared for TNR Gold Corp. (www.sedar.com, published May 27, 2013).

Primary Reference: TNR Gold Corp., 2005

Reporter(s): Travis L. Hudson (Applied Geology, Inc.); V. C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Kusk; Forlorn Hills

Site type: Prospect

ARDF no.: TA030

Latitude: 60.2695 **Quadrangle:** TA B-5

Longitude: 157.7671

Location description and accuracy:

This prospect is on an isolated upland south of the middle section of the Salmon River. It is near elevation 2280, about 0.4 mile north of the center of section 15, T. 2 N., R. 49 W.

Commodities:

Main: Sn

Other:

Ore minerals: Cassiterite

Gangue minerals: Quartz

Geologic description:

A zone of surface rubble about 50 feet long and 10 to 15 feet wide is marked by pieces of quartz-veined stockworks and breccia (Travis Hudson, unpublished field data, 2005). The upland in the area consists of hornfels developed in clastic sedimentary rocks of the Cretaceous Kuskokwim Group; porphyroblastic hornfels with cordierite and/or andalusite porphyroblasts is common. Sparse quartz and quartz-tourmaline veining is locally developed. Intrusive rocks are not exposed on hills 2280, 1866, and 1610. Float from a few-centimeter-thick felsic dike was found at an elevation of about 500 feet on the southwest flank of hill 1750. Cominco Exploration identified cassiterite and high-grade tin values in the quartz breccia.

Alteration:

Silicification of hornfels.

Age of mineralization:

Probably Early Tertiary, the age of the tin mineralization at the nearby Sleitat Mountain prospect (TA010).

Generic deposit model:

Deposit model:

Quartz vein breccia in hornfels.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Surface examination and rock sampling. This prospect was originally discovered by and staked during a reconnaissance exploration program by Cominco Exploration in the early 1980s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference: This record

Reporter(s): Travis L. Hudson (Applied Geology, Inc.)

Last report date: 2005-10-10

Site name(s): Triple Z; ASARCO; Tok; Dennis

Site type: Prospect

ARDF no.: TC001

Latitude: 63.3702 **Quadrangle:** TC B-4

Longitude: 142.5104

Location description and accuracy:

The prospect is on a north-facing hillside about 5 miles northeast of Tetlin Junction. It is at an elevation of about 3,000 feet in section 3, T. 19 N., R. 15 E. The location is known to within a mile.

Commodities:

Main: Au, Cu, Mo

Other: As, Bi

Ore minerals: Chalcopyrite?, gold, molybdenite, pyrite

Gangue minerals:

Geologic description:

As originally explored by ASARCO, the prospect was said to consist of silicified and deeply leached Tertiary quartz porphyry hypabyssal intrusive and extrusive rocks that contain disseminated molybdenite and copper sulfide minerals (Singer and others, 1976). The area consists of Tertiary felsic volcanic rocks surrounded by undivided granitic rocks (Foster, 1970). It is within the eastern Yukon-Tanana Y1 subterrane of Foster and Keith (1994). Cities Services Mineral Corp. drilled three holes in the prospect in 1971, and then dropped the project (David Hedderly-Smith, oral communication, 1998). A rhyolite flow near the ASARCO prospect has an age of 55-60 Ma (Newberry and others, 1996).

In 2011, Contango Ore Inc. (2012) was active on the property, calling it the Triple Z prospect, and sampled rocks and soils. Rock samples contained up to 9.07 grams of gold per tonne with anomalous copper, arsenic, and bismuth. Drilling is planned in 2012.

Alteration:

Alteration types include intense silicification and leaching of the hypabyssal intrusive (Singer and others, 1976).

Age of mineralization:

Early Tertiary (55-60 Ma), based on the prospect's similarity to the Taurus prospect (TC027) and the Pushbush prospect (TC024) nearby, as well as a radiometric date on a rhyolite flow near the prospect (Newberry and others, 1996).

Generic deposit model:

Deposit model:

Porphyry Cu deposit (Cox and Singer, 1986; model 21a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

21a

Production Status: None

Site Status: Undetermined

Workings/exploration:

Surface rock and geochemical sampling, some undocumented drilling in 1970 and 1971. In 2011, Contango Ore Inc. (2012) was active on the property as the Triple Z prospect and sampled rocks and soils.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., and Eberlein, G.D., 1980, Summaries of data on and lists of references to metallic and selected nonmetallic mineral deposits in the Big Delta and Tanacross quadrangles, Alaska: U.S. Geological Survey Open-File Report 80-1086, 77 p.

Contango Ore Inc., 2012, Corporate overview: http://www.contangoore.com/presentations/20120206.pdf, February, 2012.

Eberlein, G.D., Chapman, R.M., Foster, H.L., and Gassaway, J.S., 1977, Map and table describing known metalliferous and selected nonmetalliferous mineral deposits in central Alaska: U.S. Geological Survey Open-File Report 77-168-D, 132 p., 1 sheet, scale 1:1,000,000.

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Foster, H.L., and Keith, T.E.C., 1994, Geology of the Yukon-Tanana area of east-central Alaska: in Plafker, G. and Berg, H.C., eds, The geology of North America, vol. G-1, The geology of Alaska: Geological Society of America, p. 205-240.

Gill, R., 1977, Geology and mineral deposits of the southwest quarter of the Tanacross D-1 quadrangle, Alaska: Golden, Colorado School of Mines, M.Sc. thesis, 129 p.

Newberry, R.J., Layer, P.W., Burleigh, R.E., and Solie, D.N., 1996, New 40Ar/39Ar dates for intrusions and mineral prospects in the eastern Yukon-Tanana terrane, Alaska - Regional patterns and significance, in Gray, J.E., and Riehle, J.R., eds., Geological Studies in Alaska by the U.S. Geological Survey, 1996: U.S. Geological Survey Professional Paper 1595, p. 131-159.

Singer, D.A., Curtin, G.C., and Foster, H.L., 1976, Mineral resources map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-767-E, 1 sheet, scale 1:25,000.

Primary Reference: Contango Ore Inc., 2012

Reporter(s): C.E. Cameron (ADGGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Mount Fairplay

Site type: Prospects

ARDF no.: TC008

Latitude: 63.6888 **Quadrangle:** TC C-3

Longitude: 142.2599

Location description and accuracy:

The Fairplay prospects are in a large block of claims that covered about 20 square miles near Mount Fairplay and were active in the 1970s. The center of the activity is in section 14, T. 22 N., R. 16 E., of the Copper River Meridian, about 2 miles northwest of the summit of Mount Fairplay. The location is accurate.

Commodities:

Main: Au, Mo, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, molybdenite, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

There was considerable activity northwest of Mount Fairplay in the 1970s and a large block of claims was staked by WGM, Inc. Details are lacking but the work apparently consisted mainly of surface mapping, sampling, and geochemistry. More recent activity is possible, but apparently not extensive.

The Fairplay prospect is on the northern contact of the Mount Fairplay pluton whose surface exposure is about 4 miles in diameter (Foster, 1970; Kerin, 1976; Adams, 2009). The Mount Fairplay pluton is a Late Cretaceous to early Tertiary alkaline complex with well-developed ring structures. The pluton intrudes biotite schist and gneiss, probably of Mississippian and older age, and bimodal felsic and mafic volcanic rocks, probably of Late Cretaceous age. The Mount Fairplay complex was emplaced in three phases between 59 and 67 Ma: 1) an early alkaline ring phase that consists of diorite and several syenite units on the north side of the complex, 2) a later alkaline ring-dike phase that consists of several syenite units and perthosite on the south side of the complex; and 3) a calc-alkaline core that consists of hornblende-biotite quartz monzonite. The Fairplay prospects are in the Late Cretaceous felsic volcanic rocks just beyond the northern contact of the Mount Fairplay complex, that near this prospect is a hornblende-biotite quartz monzonite.

As described by Adams (2009), the Fairplay prospect includes both vein-type and disseminated mineralization. Samples contain anomalous copper, molybdenum, lead, and zinc. Kerin (1976) noted that three samples contained from 40 to 120 parts per billion gold. Singer and others (1976) suggested that the deposit is a copper-molybdenum porphyry.

Alteration:

Hydrothermal alteration (Singer and others, 1976).

Age of mineralization:

Late Cretaceous based on the age of the host rock and a possible genetic tie to the Mount Fairplay pluton.

Generic deposit model:

Deposit model:

Porphyry Cu-Mo deposit? (Cox and Singer, 1986; model 21a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

21a

Production Status: None

Site Status: Undetermined

Workings/exploration:

There was considerable activity northwest of Mount Fairplay in the 1970s and a large block of claims was staked by WGM, Inc. Details are lacking but the work apparently consisted mainly of surface mapping, sampling, and geochemistry. More recent activity is possible, but apparently not extensive.

Production notes:

None.

Reserves:

None.

Additional comments:

Part of the Mt. Fairplay region lies on Doyon Ltd. selected lands. For more information, contact Doyon Ltd., Fairbanks, Alaska.

References:

Adams, David, 2009, Geologic report on the Drakan project, Fortymile Mining District, Alaska: Technical Report DK08 43-101 for Fire River Gold Corporation, 49 p. (posted on www.sedar.com, February 23, 2009).

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Kerin, L.J., 1976, The reconnaissance petrology of the Mount Fairplay igneous complex: Fairbanks, University of Alaska, M.Sc. thesis, 95 p

Newberry, R.J., Layer, P.W., Burleigh, R.E., and Solie, D.N., 1996, New 40Ar/39Ar dates for intrusions and mineral prospects in the eastern Yukon-Tanana terrane, Alaska - Regional patterns and significance, in Gray, J.E., and Riehle, J.R., eds., Geological Studies in Alaska by the U.S. Geological Survey, 1996: U.S. Geological Survey Professional Paper 1595, p. 131-159.

Singer, D.A., Curtin, G.C., and Foster, H.L., 1976, Mineral resources map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-767-E, 1 sheet, scale 1:25,000.

U.S. Bureau of Mines, 1984, Mt. Fairplay report: U.S. Bureau of Mines, Fairbanks, Alaska, unpublished data on file at Geologic Materials Center, Box 13, Eagle River, Alaska, 17 p.

Wilson, F.H., Smith, J.G., and Shew, Nora, 1985, Review of radiometric data from the Yukon crystalline terrane, Alaska and Yukon Territory: Canadian Journal of Earth Sciences, v. 22, p. 525-537.

Primary Reference: Adams, 2009

Reporter(s): C.E. Cameron (ADGGS); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): South Pika; Fishhook

Site type: Prospect

ARDF no.: TC009

Latitude: 63.8071 **Quadrangle:** TC D-1

Longitude: 141.3389

Location description and accuracy:

The South Pika prospect, formerly called the Fishhook prospect, is located in a saddle northeast of hill 4455 at the headwaters of the Sixtymile River, west of Fishhook Bend. The prospect location has been updated from previous reporting to where a northeast trending gold soil anomaly was trenched in the northeast corner of section 4, T. 23 N., R. 21 E. of the Copper River Meridian.

Commodities:

Main: Ag, Au

Other: Barite, Cu, Mo, Pb, Sb

Ore minerals: Chalcopyrite, galena, gold, molybdenite, pyrite, silver, stibnite, sulfosalts

Gangue minerals: Hematite, quartz

Geologic description:

The dominant lithology within the South Pika prospect area is augen gneiss having a possible igneous protolith (Mertie, 1931; Foster, 1970). This protolith has a possible emplacement age (inferred from dating other exposures in the region) of Devonian to Mississippian (360 Ma), with resets in the Late Jurassic (190 Ma) and Early to Mid-Cretaceous (135-107 Ma) time (Dusel-Bacon and Aleinikoff, 1985). Cretaceous-Tertiary, fine-grained biotite granite, granodiorite, monzodiorite, and a coarse-grained alkali granite intrude the augen gneiss and are exposed in small outcrops at the prospect. Tertiary (?) volcanics are also present (Gill, 1977).

Local structures are dominated by numerous, high-angle, northeast-trending fault zones. Many subordinate fault zones in the area parallel the northeast strike and possibly reflect underlying igneous activity (Curt Freeman, unpublished data, 1998). A prominent northeast-trending fault cross-cutting South Pika is characterized by pervasive silicification and rare hydrothermal breccias, surrounded by a broader zone of strong clay alteration of feldspar augen porphyroblasts and matrix feldspar. Surrounding the clay alteration is a narrow zone of sericite alteration where schistose matrix biotite has been replaced by fine-grained muscovite. Reverse faults of unknown age are interpreted where graphitic and actinolite-chloritic schists are exposed (Siron and Grady, 2011).

The mineralization at South Pika appears to be structurally controlled by the northeast trending faults. Minerals include chalcopyrite, galena, gold, molybdenite, pyrite, silver, sulfosalts, and stibnite. The more highly mineralized areas occur as breccias along the northeast-trending faults. The Cretaceou-Tertiary plutonic rocks also contain elevated values of lead, silver, barium, antimony, and gold. Anomalous bismuth along some of the faults suggests a plutonic-source fluid (Curt Freeman, unpublished data, 1998). The strongly silicified augen gneiss at the core of the alteration zones exhibit a variety of textures, from solid massive silica, brecciated textures to vuggy silica. Two localities of silicified hydrothermal breccias have been identified. Each breccia contains rounded silica nodules with concentric rings of silica contained in silica groundmass. Disseminated and weathered sulfide minerals (pyrite) are present (Siron and Grady, 2011).

Meter-scale quartz veins are exposed throughout the prospect. These veins strike north to northeast and appear coincident with the main structural trend. Their origin is unclear, however, they are rarely

mineralized and are thought to have formed during reactivation of old structures during metamorphism. A gossanous barite-galena-silver-(gold) vein, containing highly anomalous gold, is oriented along a northeast-trending structure and is exposed near the 4455 foot summit. An additional galena-silver vein in float was uncovered at the base of the silicified fault to the west and is possibly a genetically related mineralized structure (Siron and Grady, 2011).

Alteration:

Alteration at South Pika is mostly along northeast-trending faults and is characterized by pervasive silicification and rare hydrothermal breccias, surrounded by a broader zone of clay alteration of feldspar augen porphyroblasts and matrix feldspar. Surrounding the clay alteration is a narrow zone of sericite alteration where schistose matrix biotite has been replaced by fine-grained muscovite (Siron and Grady, 2011).

Age of mineralization:

Mineralization was likely synchronous with faulting and magmatism during Late Cretaceous (70 to 68 Ma), indicated from dated hydrothermal mica (Allan and others, 2015).

Generic deposit model:

Deposit model:

Creede epithermal veins? (low-sulfidation epithermal) (Cox and Singer, 1986; model 25b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

25b?

Production Status: None

Site Status: Inactive

Workings/exploration:

In the mid-1970s Cities Service Minerals Corporation (Cities Services) conducted regional reconnaissance exploration in the Tanacross quadrangle area. Several soil samples and rock samples were collected over the South Pika prospect area at this time (Hedderly-Smith, 2009). This prospect was examined as a porphyry copper deposit at that time, but no significant grades of copper were found (J.M. Messing, oral communication, 1998).

In 1978, one shallow drill hole was put in, but did not encounter significant mineralization. In the late 1980s to 1990s, soil and rock-chip sampling, geologic mapping, and a ground-based magnetometer survey were conducted (Curt Freeman, unpublished data, 1998).

In 2008 Full Metal Minerals (FMM), in a joint venture with BHP Billington, conducted follow-up ridge and spur soil sampling on historic Cities Services data and completed a 31,000 line-kilometer high-resolution airborne magnetic survey covering 1.05 million hectares of the Tanacross quadrangle encompassing the South Pika prospect. The survey shows a moderately high susceptibility anomaly bordering the edge of coincident anomalous gold-in-soil anomaly at South Pika (Siron and Grady, 2011).

FMM completed more reconnaissance-style soil and rock sampling and geologic mapping in 2010 which was followed by gridded soil sampling, targeting anomalous gold mineralization. A total of 625 soil samples and 77 rock samples were collected over South Pika. Additionally, four trenches were dug totaling 99 bulk-rock samples. Soil samples from the saddle at South Pika range between trace and 1.09 parts per million (ppm) gold, averaging 0.108 ppm gold. Overall, the characteristic of this soil anomaly exhibits subdued pathfinder element distributions, however, elevated signatures are evident (arsenic: up to 151 ppm; copper: up to 492 ppm; molybdenum: up to 40 ppm; lead: up to 2310 ppm). The northeast-trending barite-galena-silver-(gold) vein near hill 4455 carries upwards of 1.01 ppm gold and 52.1 ppm silver in rock samples and anomalous gold-in-soil over this vein is approximately 100 meters wide and traceable over 1,600 meters along strike (Siron and Grady, 2011).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Allan, M.M., Mortensen, J.K., Sanchez, Matias, Hart, C.J.R., 2015, The role of the Sixtymile-Pika fault system on Late Cretaceous magmatism and hydrothermal mineralization, western Yukon and eastern Alaska, in Geological Society of America, Abstracts with Programs, vol. 47, no. 4, p. 18.

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dusel-Bacon, Cynthia, and Aleinikoff, J.N., 1985, Petrology and tectonic significance of augen gneiss from a belt of Mississippian granitoids in the Yukon-Tanana terrane, east-central Alaska: Geological Society of America Bulletin, v. 96, p. 411-425.

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Gill, R., 1977, Geology and mineral deposits of the southwest quarter of the Tanacross D-1 quadrangle, Alaska: Golden, Colorado School of Mines, M.Sc. thesis, 129 p.

Hedderly-Smith, D.A., 2009, Report on 2008 Work in the Tanacross Quadrangle, East-Central Alaska by the BHP-Full Metal Minerals Joint-Venture, prepared for Full Metal Minerals, 214 p. (Report held by Full Metal Minerals, Vancouver, British Columbia).

Mertie, J.B., Jr., 1931, A geologic reconnaissance of the Dennison Fork district, Alaska: U.S. Geological Survey Bulletin 827, 44 p.

Siron, Chris and Grady, Jesse, 2011, 2010 Rolling Thunder Exploration Report, Eastern Fortymile District, Alaska, prepared for Full Metal Minerals, 78 p. (Report held by Full Metal Minerals, Vancouver, British Columbia).

Primary Reference: Siron and Grady, 2011

Reporter(s): C.E. Cameron (ADGGS), N.V. King (Alaska Earth Sciences)

Last report date: 2016-03-15

Site name(s): Pika Canyon

Site type: Prospect

ARDF no.: TC023

Latitude: 63.8267 **Quadrangle:** TC D-1

Longitude: 141.4061

Location description and accuracy:

The Pika Canyon prospect is located in a saddle that is at the headwaters of a tributary of Dude Creek to the west and a tributary of Liberty Creek to the east. The prospect location covers about 1/2 square mile and has been updated from previous reporting based on recent work where mineralization in rocks and soils has been found in the southeast corner of section 30, T. 24 N., R. 21 E. of the Copper River Meridian.

Commodities:

Main: Ag, Au

Other: Cu, Pb

Ore minerals: Chalcopyrite, galena, malachite, pyrite, sphalerite?

Gangue minerals: Quartz

Geologic description:

The dominant lithology at the Pika Canyon prospect is augen gneiss having a possible igneous protolith (Mertie, 1931; Foster, 1970). This protolith has a possible emplacement age (inferred from dating other exposures in the region) of Devonian to Mississippian (360 Ma), with resets in the Late Jurassic (190 Ma) and Early to Mid-Cretaceous (135-107 Ma) time (Dusel-Bacon and Aleinikoff, 1985). A series of plugs and dikes which range in composition from diorite to monzodiorite intrude the augen gneiss. Based on cross-cutting relationships and minimal alteration within these units, these intrusions are interpreted to be syn- to post-mineralization in age. The mapped intrusions directly correspond with magnetic highs in the regional 1:50,000 scale magnetic survey conducted by Full Metal Minerals-BHP Billington (King and Tedeschi, 2012). Based on similarities to nearby dated plutons, the Pika Canyon intrusions are likely members of the Prospector Mountain Suite formed during the development of a volcanic arc during the Late Cretaceous (Selby and Creaser, 2001).

The alteration in the greater Pika Canyon area is patchy and somewhat irregular, but generally occurs in somewhat concentric zones of potassic, phyllic, and propylitic alteration (Gill, 1977). Significant brecciation and extensive alteration occurs along the contact of the diorite dike with the augen gneiss located in the saddle of Pika Canyon, indicating it was a conduit for hydrothermal fluids. Mineralization at Pika Canyon consists of gold-silver rich quartz vein stockwork in augen gneiss at and near the contact with the diorite dike. Alteration of the augen gneiss is zoned based on distance from the diorite contact. Distally, alteration is weak consisting of biotite destruction replaced by fine grained sericite and iron oxides. Weak alteration grades into strong to moderate sericite and silicification towards the contact. Silicification is most commonly manifested as thin sheeted veins and stockwork exploiting foliation, but occasionally crosscuts primary fabric, including augens. These foliation parallel veins range in thickness from 1 to 10 millimeters and occasionally contain jarosite and iron oxides, indicative of the former presence of sulfide minerals. Typically these veins are clear to bluish in color and are very fine grained (King and Tedeschi, 2012).

Alteration:

The alteration in the greater Pika Canyon area is patchy and somewhat irregular, but generally occurs in somewhat concentric zones of potassic, phyllic, and propylitic alteration (Gill, 1977).

In the saddle of Pika Canyon alteration of the augen gneiss is zoned based on distance from the diorite contact. Distally, alteration is weak consisting of biotite destruction replaced by fine grained sericite and iron oxides. Weak alteration grades into strong to moderate sericite and silicification towards the contact. Silicification is most commonly manifested as thin sheeted veins and stockwork exploiting foliation, but occasionally crosscuts primary fabric, including augens (King and Tedeschi, 2012).

Age of mineralization:

Mineralization was likely synchronous with faulting and magmatism during Late Cretaceous (70 to 68 Ma), indicated from dated hydrothermal mica (Allan and others, 2015).

Generic deposit model:

Deposit model:

Creede epithermal veins? (low-sulfidation epithermal) (Cox and Singer, 1986; model 25b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

25b?

Production Status: None

Site Status: Inactive

Workings/exploration:

During 1974 to 1976, soil, rock chip, and stream-sediment sampling were conducted on the prospect, as well as a ground magnetic survey on a 200- by 500-foot grid (Gill, 1977, p. 2).

In 2008 Full Metal Minerals (FMM) and BHP Billington completed a regional 1:50,000 scale magnetic survey that covered the Pika Canyon area. Magnetic highs at Pika Canyon correspond with mapped monzodiorite and diorite intrusions (King and Tedeschi, 2012).

FMM completed ridge and spur soil sampling and geologic mapping over the Pika Canyon prospect in the early part of the summer in 2011. Positive gold and silver results in these soil samples led to a soil grid put in place the same year over the Pika Canyon area with 190 more soil samples collected. With limited outcrop available, trenching over an area with altered float led to the discovery of the diorite dike with mineralized and brecciated contact zones with the augen gneiss (King and Tedeschi, 2012).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Allan, M.M., Mortensen, J.K., Sanchez, Matias, Hart, C.J.R., 2015, The role of the Sixtymile-Pika fault system on Late Cretaceous magmatism and hydrothermal mineralization, western Yukon and eastern Alaska, in Geological Society of America, Abstracts with Programs, vol. 47, no. 4, p. 18.

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dusel-Bacon, Cynthia, and Aleinikoff, J.N., 1985, Petrology and tectonic significance of augen gneiss from a belt of Mississippian granitoids in the Yukon-Tanana terrane, east-central Alaska: Geological Society of America Bulletin, v. 96, p. 411-425.

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Gill, R., 1977, Geology and mineral deposits of the southwest quarter of the Tanacross D-1 quadrangle, Alaska: Golden, Colorado School of Mines, M.Sc. thesis, 129 p.

King, N. and Tedeschi, M., 2012, 2011 Technical Report for Rolling Thunder Project, East-Central, Alaska, prepared for Full Metal Minerals, 73 p. (Report held by Full Metal Minerals, Vancouver, British Columbia).

Mertie, J.B., Jr., 1931, A geologic reconnaissance of the Dennison Fork district, Alaska: U.S. Geological Survey Bulletin 827, 44 p.

Selby, D. and Creaser, R.A., 2001, Late and Mid-Cretaceous mineralization in the northern Canadian Cordillera: Constraints from Re-Os molybdenite dates: Economic Geology, vol. 96, p. 1461-1467.

Primary Reference: King and Tedeschi, 2012

Reporter(s): C.E. Cameron (ADGGS), N.V. King (Alaska Earth Sciences)

Last report date: 2016-02-25

Site name(s): Silver Lining; Draken

Site type: Prospect

ARDF no.: TC026

Latitude: 63.6474 **Quadrangle:** TC C-3

Longitude: 142.286

Location description and accuracy:

The Silver Lining prospect is about 2.8 miles southwest of the top of Mount Fairplay and is exposed in a road cut beside the Taylor Highway. In early 2010, it was on a block of 6 claims called the Draken project that covered all of section 34 and the east half of section 33 of T. 22 N., R. 16 E. The Silver Lining prospect is about 0.3 mile north of the center of section 34. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Pb

Other: As, Sb, Zn

Ore minerals: Arsenopyrite, azurite, chalcophanite, chalcopyrite, chrysocolla, galena, malachite, scorodite, stibiconite

Gangue minerals: Clay, limonite, quartz

Geologic description:

Various companies explored in the Mount Fairplay area through the 1970s and 1980s, apparently with indifferent results. The Silver Lining prospect was discovered by two prospectors in 1990 in road cuts beside the Taylor Highway and a large group of claims were staked around it (Adams, 2009). However, by 1999 all the claims were abandoned. In 2006, six claims that covered the Silver Lining prospect and all of section 34 and the east half of section 33 of T. 22 N., R. 16 E. were staked by Anglo Alaska Gold Corporation as the Draken property. Fire River Gold Corporation acquired a 100 percent interest in the property in 2009.

The Silver Lining prospect is in the central portion of the Mount Fairplay pluton whose surface area is about 4 miles in diameter (Foster, 1970; Kerin, 1976; Adams, 2009). The Mount Fairplay pluton is a Late Cretaceous to early Tertiary alkaline complex with well-developed ring structures. The pluton intrudes biotite schist and gneiss, probably of Mississippian and older age, and bimodal felsic and mafic volcanic rocks, probably of Late Cretaceous age. The Mount Fairplay complex was emplaced in three phases between 59 and 67 Ma: 1) an early alkaline ring phase that consists of diorite and several syenite units on the north side of the complex; 2) a later alkaline ring phase that consists of several syenite units and perthosite on the south side of the complex; and 3) a calc-alkaline core phase that consists of hornblende-biotite quartz monzonite. The Silver Lining prospect is well within the quartz monzonite core, although several nearby unnamed prospects inside the Draken claims are in hornblende-biotite syenite.

The mineralization at the Silver Lining prospect is mainly gold-sulfide-quartz veins, with some indication of disseminated mineralization. High-grade samples contain up to 0.25 ounce of gold per ton along with high, silver, arsenic, bismuth, copper, lead, and antimony. The sulfide minerals include arsenopyrite, chalcopyrite, pyrite, and galena. The veins are 1 to 4 cm thick, strike about 35 to 60 degrees northeast, and dip 65 to 75 degrees northwest. The veins are oxidized at the surface and contain secondary copper and arsenic oxides and silicates.

Alteration:

Apparently not prominent but some clay alteration along the veins.

Age of mineralization:
Late Cretaceous or early Tertiary based on the age of the host rock.

Generic deposit model:

Deposit model:
Low sulfide, gold-quartz veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:
Various companies explored in the Mount Fairplay area through the 1970s and 1980s, apparently with indifferent results. The Silver Lining prospect was discovered by two prospectors in 1990 in road cuts beside the Taylor Highway and a large group of claims were staked around it (Adams, 2009). However, by 1999 all the claims were abandoned. In 2006, six claims that covered the Silver Lining prospect and all of section 34 and the east half of section 33 of T. 22 N., R. 16 E. were staked by Anglo Alaska Gold Corporation as the Draken property. Fire River Gold Corporation acquired a 100 percent interest in the property in 2009. Through early 2010, the work has been almost entirely surface sampling of the veins, limited ground geophysics, soil geochemistry, and geologic mapping.

Production notes:
None.

Reserves:
None.

Additional comments:

References:
Adams, David, 2009, Geologic report on the Drakan project, Fortymile Mining District, Alaska: Technical Report DK08 43-101 for Fire River Gold Corporation, 49 p. (posted on www.sedar.com, February 23, 2009).

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Kerin, L.J., 1976, The reconnaissance petrology of the Mount Fairplay igneous complex: Fairbanks, University of Alaska, M.Sc. thesis, 95 p

Wilson, F.H., Smith, J.G., and Shew, Nora, 1985, Review of radiometric data from the Yukon crystalline terrane, Alaska and Yukon Territory: Canadian Journal of Earth Sciences, v. 22, p. 525-537.

Primary Reference: Adams, 2009

Reporter(s): C.E. Cameron (ADGGS); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Taurus; East Taurus; West Taurus

Site type: Prospect

ARDF no.: TC027

Latitude: 63.6474 **Quadrangle:** TC C-1

Longitude: 141.263

Location description and accuracy:

The Taurus prospect has two main centers of interest, West Taurus and East Taurus. Most of the work has been done at East Taurus at the coordinates of for this site. West Taurus is about 3,000 meters to the west. East Taurus is about 12.5 miles east-southeast of Prindle Volcano and about 0.6 mile northwest of the center of section 36, T. 22 N., R. 21 E.

Commodities:

Main: Au, Cu, Mo

Other:

Ore minerals: Azurite, chalcocite, chalcopyrite, covellite, magnetite, molybdenite, pyrite

Gangue minerals: Fluorite, quartz, sericite, tourmaline

Geologic description:

From 1970, when Taurus was discovered during a reconnaissance geochemical survey, to 1996, a succession of companies, notably International Minerals and Chemical Corp., Duval Minerals, Rioamex, City Services Minerals Corp., Noranda, and Cross Canada, explored the property with mapping and sampling, ground and aerial geophysical surveys, several geochemical programs, and by 30 drill holes (Harrington, 2010). By 1996, Taurus East had become the focus of interest and 8 holes were drilled there. In 2008, Senator Minerals Inc. drilled 3 more holes at East Taurus that totaled 3,179 feet. As of early 2011, Senator Minerals holds the property (Senator Minerals, Inc., 2011).

The Taurus property has two main centers of porphyry-type mineralization, West Taurus and East Taurus (Harrington, 2010). The property is underlain in part by a metamorphic basement complex possibly of Late Precambrian or early Paleozoic age that consists of biotite gneiss, augen gneiss, biotite schist, and quartzite, intruded by Cretaceous granodiorite (Foster, 1970). Two Early Tertiary stocks who outcrop areas roughly coincide with East and West Taurus intrude the metamorphic rocks and the granodiorite. Secondary biotite in one intrusion has been dated by K-Ar methods at 57 +/- 2 Ma (Nokleberg and others, 1995).

Two major faults have been identified. The Tourmaline fault strikes northeasterly and appears to have left-lateral movement with a possible displacement of up to 6.5 kilometers. The McCord Creek fault trends east across the claims. Porphyry intrusions, which host the mineralization at East and West Taurus, are near the McCord Creek fault, suggesting that the fault controlled their emplacement. Many northeast trending lineaments have been interpreted using satellite images and topographic maps (Leriche, 1995, p. 452).

The Taurus porphyry copper mineralization appears to be related to widespread, small bodies of early Tertiary, quartz monzonite porphyry, quartz latite, feldspar-quartz porphyry, intrusive breccia, quartz porphyry and dacite porphyry. Intrusive breccia crops out along the southern border of an altered, Late Cretaceous granodiorite pluton on the eastern side of the property. Quartz monzonite porphyry occurs along the southern contacts of the altered granodiorite, and intrusive breccia is in the central part of the property (Leriche, 1995; Harrington, 2010)).

The East Taurus ore body consists of an upper leached cap underlain by supergene and hypogene zones. The leached cap is up to 150 feet thick and shows pervasive argillic alteration due to groundwater leaching. The leached cap shows pervasive silicification, and quartz-sericite, and quartz-magnetite alteration. The

supergene and hypogene zones are marked by phyllic, silicic, propylitic, and potassic alteration (Leriche, 1995, Harrington, 2010).

Mineralization in the leached cap at East Taurus consists of minor remnant pyrite, chalcopyrite, and molybdenite in quartz stockworks and silicified zones. The supergene zone varies in thickness from 70 to 150 feet and contains chalcocite, covellite, pyrite, chalcopyrite, and molybdenite. The chalcocite is in fractures and in quartz veinlets. In the lower hypogene zone, pyrite, chalcopyrite, and molybdenite are disseminated along fractures and in the center of quartz veinlets (Leriche, 1995).

Some notable intercepts in the 2008 drilling at East Taurus are: 1) 772 feet of 0.309 percent copper, 0.036 percent molybdenum, and 0.245 grams of gold per tonne; 2) 179 feet of 0.258 percent copper, 0.026 percent molybdenum, and 0.149 grams of gold per tonne; 57 feet of 0.232 percent copper, 0.004 percent molybdenum, and 0.015 grams of gold per tonne (Harrington, 2010). The mineralization at East Taurus is open in all directions as well as below the deepest 1,400-foot drill hole.

Mineralization in the West Taurus area consists of pyrite and subordinate chalcopyrite, covellite, chalcocite, malachite, and azurite. Molybdenite is found in quartz-filled fractures in sericitically altered, quartz latite. Chalcopyrite and molybdenite are in fracture fillings near the Tourmaline and McCord Creek faults (Leriche, 1995, p. 454).

In 1993, Noranda indicated that the East Taurus zone contained a reserve of 23 million tons with an average grade of 0.3 percent copper and 0.039 percent molybdenum (Leriche, 1995). The 1996, 2008, and earlier drilling provided sufficient information for an estimate to modern standards of the size of the deposit. Harrington (2010) estimated that East Taurus has an inferred mineral resource of 75.2 million tons with an average grade of 0.275 copper, 0.032 percent molybdenum, and 0.166 gram of gold per tonne.

Alteration:

The leached cap, which is up to 150 feet thick, shows pervasive argillic alteration due to groundwater leaching. Other alteration types in the leached cap consist of pervasive silicification, quartz-sericite, and quartz-magnetite alteration. Supergene and hypogene zones are accompanied by phyllic, silicic, propylitic, and potassic alteration (Leriche, 1995, p. 453).

Age of mineralization:

Secondary biotite from one of the stocks associated with the mineralization has been dated by K-Ar techniques methods as 57 +/- 2 Ma (Nokleberg and others, 1995).

Generic deposit model:

Deposit model:

Porphyry Cu-Mo-Au deposit (Cox and Singer, 1986; model 21a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

21a

Production Status: None

Site Status: Active

Workings/exploration:

From 1970, when Taurus was discovered during a reconnaissance geochemical survey, to 1996, a succession of companies, notably International Minerals and Chemical Corp., Duval Minerals, Rioamex, City Services Minerals Corp., Noranda, Resource Associates of Alaska, and Cross Canada, explored the property with mapping and sampling, ground and aerial geophysical surveys, several geochemical programs, and by 30 drill holes (see Harrington, 2010 for the details of this work). By 1996, Taurus East had become the focus of interest and 8 holes were drilled there. In 2008, Senator Minerals Inc. drilled 3 more holes at East Taurus that totaled 3,179 feet. As of early 2011, Senator Minerals holds the property (Senator Minerals, Inc., 2011).

Production notes:

None.

Reserves:

In 1993, Noranda indicated that the East Taurus zone contained a reserve of 23 million ton with an average grade of 0.3 percent copper and 0.039 percent molybdenum (Leriche, 1995). The 1996, 2008, and earlier drilling provided sufficient information for an estimate to modern standards of the size of the deposit. Harrington (2010) estimated that East Taurus has an inferred mineral resource of 75.2 million tons with an average grade of 0.275 copper, 0.032 percent molybdenum, and 0.166 gram of gold per tonne.

Additional comments:

See also the Pushbush prospect (TC024) and the ASARCO prospect (TC001).

References:

Cobb, E.H., and Eberlein, G.D., 1980, Summaries of data on and lists of references to metallic and selected nonmetallic mineral deposits in the Big Delta and Tanacross quadrangles, Alaska: U.S. Geological Survey Open-File Report 80-1086, 77 p.

Eberlein, G.D., Chapman, R.M., Foster, H.L., and Gassaway, J.S., 1977, Map and table describing known metalliferous and selected nonmetalliferous mineral deposits in central Alaska: U.S. Geological Survey Open-File Report 77-168-D, 132 p., 1 sheet, scale 1:1,000,000.

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Gill, R., 1977, Geology and mineral deposits of the southwest quarter of the Tanacross D-1 quadrangle, Alaska: Golden, Colorado School of Mines, M.Sc. thesis, 129 p.

Harrington, Edward, 2010, Technical report on the Taurus property, Fairbanks Recording District, Alaska, U.S.A.: Unpublished NI43-101 report for Senator Minerals Inc., 133 p. (posted on www.sedar.com, Jan. 4, 2011)

Leriche, P.D., 1995, Taurus copper-molybdenum porphyry deposit, east-central Alaska: in Schroeter, T.G., ed., Porphyry Deposits of the Northwestern Cordillera: Canadian Institute of Mining, Metallurgy, and Petroleum Special Volume 46, p. 451-457.

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Senator Minerals Inc., 2011, Taurus property, southeastern Alaska: http://www.senatorinc.com/Properties/Taurus/taurus.htm (as of Feb 11, 2011). ,

Singer, D.A., Curtin, G.C., and Foster, H.L., 1976, Mineral resources map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-767-E, 1 sheet, scale 1:25,000.

Primary Reference: Harrington, 2010

Reporter(s): C.E. Cameron (ADGGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Stibnite Creek; Tok Antimony; Stibnite; A Lucky Leak; Gamblin; Caulk

Site type:

Mine

ARDF no.: TC029

Latitude: 63.2484 **Quadrangle:** TC A-6

Longitude: 143.7959

Location description and accuracy:

The Stibnite Creek deposit is about 1.5 mile upstream from the mouth of Stibnite Creek, a tributary to the Tok River. It is about 0.5 mile south of the center of section 13, T. 17 N., R. 8 E., of the Copper River Meridian. The location is accurate.

Commodities:

Main: Au, Sb

Other:

Ore minerals: Pyrite, stibnite

Gangue minerals: Calcite, muscovite, quartz

Geologic description:

The Tok Antimony deposit, also called Boulder Creek, Stibnite, A Lucky Leak, and Stibnite Creek, was discovered in the early 1900s. A 12-foot adit was driven in 1914. In 1940, several tons of ore from the prospect were stockpiled by Boulder Creek awaiting transport. All of it was washed away by the river and was never processed (Ebbley and Wright, 1948). There was some mining from an open cut with a bulldozer in 1976 (York, 1980).

Stibnite Creek is one of several similar deposits in a mineral belt about 4 miles long that is called the Tushtena project by the current (2010) operator, Triton Gold Ltd. (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). Work along the belt began in 1976 when Resource Associates of Alaska began geochemical sampling in the area. They soon staked claims over the Discovery Zone prospect (TC034) at the north end of the belt in what then was classified as massive-sulfide mineralization. Their work continued through 1987 in conjunction with several partners and consisted of geologic mapping, rock and soil sampling, and geophysical surveys along what became a belt of deposits. They drilled 17 holes along the belt in 1986 and 8 holes in 1987, totaling 3,390 meters. From 1998 to 2001, Inmet Mining Corporation and Pacific Northwest Resources Company did addition mapping, rock and soil surveys, and they drilled 8 more diamond drill holes totaling 1,489 meters. Two of these holes were drilled at the Stibnite Creek Mine at what is now the south end of the belt. The property was idle until 2007 when James DeMarchi staked 40 claims over the belt and transferred them to Tushtena Resources Ltd. In 2008, they entered into a joint agreement with Triton Gold.

The rocks along the belt consist of two main units: the Devonian to Precambrian, Macomb Belt unit to the east and the Devonian Tushtena Pass unit to the west. They are separated by the Itra Fault, a regional scale, shallowly to moderately dipping thrust fault (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). The Macomb Belt rocks consist mainly of felsic metatuff and volcaniclastic rocks, and sericite-carbonate-quartz phyllonite. The Tushtena Pass unit consists of schist and phyllite, metadiorite, and lithic tuff.

There are two main styles of mineralization along the belt: 1) hanging-wall, bonanza-style vein systems; and 2) footwall, sulfide stockwork and breccia vein systems. The hanging-wall, vein-type mineralization

has an arsenic-lead-zinc association with narrow or no alteration envelopes and is characterized by quartz-carbonate-sulfide-gold-mica veins. The footwall, stockwork-breccia zones have a gold-rich core and peripheral antimony-rich mineralization. The deposits are correlative with others along the Tintina gold belt; the key characteristics are the low angle faults that trap the mineralization and the carbonaceous rocks that provide the right chemistry for deposition.

The mineralization at the Stibnite Creek Mine consists of quartz-stibnite-arsenopyrite veins and breccias along a shear zone that is probably part of a series of en echelon structures that splay off the Itra Fault (DiMarchi and others, 1987; Fonseca, 2009; Newkirk and others, 1986; York, 1980). The mineralization is in schist, gneiss and mylonite of the Macomb Belt. The host rocks are pervasively but variably altered to ankerite; this alteration is probably related to the Itra fault, not to the mineralization. The gold-bearing veins have narrow envelopes of sericitic alteration and silicification. Four types of veins occur at the Stibnite Creek Mine: 1) quartz-chlorite+/-sericite fracture fillings; 2) barren ankerite+/- quartz veinlets unrelated to the gold mineralization; 3) barren, white, drusy quartz stockworks; and 4) quartz-stibnite-pyrite+/-arsenopyrite veins that locally contain masses of crystalline stibnite. Two holes were drilled on the Stibnite Creek prospect; the best interval was 4.1 feet that contained 700 parts per billion gold, 2,260 parts per million (ppm) arsenic, and 7.40 ppm silver.

Alteration:

Ankeritic and sericitic alteration; silicification.

Age of mineralization:

About 70 to 105 Ma by analogy if Tintina Belt-style mineralization.

Generic deposit model:

Deposit model:

Tintina Belt-style, gold-arsenopyrite-stibnite quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes; small

Site Status: Active

Workings/exploration:

The Tok Antimony deposit, also called Boulder Creek, Stibnite, A Lucky Leak, and Stibnite Creek, was discovered in the early 1900s. A 12-foot adit was driven in 1914. In 1940, several tons of ore from the prospect were stockpiled by Boulder Creek awaiting transport. All of it was washed away by the river and was never processed (Ebbley and Wright, 1948). There was some mining from an open cut with a bulldozer in 1976 (York, 1980).

Stibnite Creek is one of several similar deposits in a mineral belt about 4 miles long that is called the Tushtena project by the current (2010) operator, Triton Gold Ltd. (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). Work along the belt began in 1976 when Resource Associates of Alaska began geochemical sampling in the area. They soon staked claims over the Discovery Zone prospect (TC034) at the north end of the belt in what then was classified as massive-sulfide mineralization. Their work continued through 1987 in conjunction with several partners and consisted of geologic mapping, rock and soil sampling, and geophysical surveys along what became a belt of deposits. They drilled 17 holes along the belt in 1986 and 8 holes in 1987, totaling 3,390 meters. From 1998 to 2001, Inmet Mining Corporation and Pacific Northwest Resources Company did addition mapping, rock and soil surveys, and they drilled 8 more diamond drill holes totaling 1,489 meters. Two of these holes were drilled at the Stibnite Creek Mine at what is now the south end of the belt. The property was idle until 2007 when James DeMarchi staked 40 claims over the belt and transferred them to Tushtena Resources Ltd. In 2008, they entered into a joint agreement with Triton Gold.

Production notes:

Several tons of high grade ore were stockpiled at the site in 1940, but were washed away by the river before it could be transported (Ebbley and Wright, 1948). There was some mining from an open cut with a bulldozer in 1976; the amount of production, if any, is uncertain (York, 1980).

Reserves:

None.

Additional comments:

References:

Brooks, A.H., 1916, Antimony deposits of Alaska: U.S. Geological Survey Bulletin 649, 67 p.

Cobb, E.H., and Eberlein, G.D., 1980, Summaries of data on and lists of references to metallic and selected nonmetallic mineral deposits in the Big Delta and Tanacross quadrangles, Alaska: U.S. Geological Survey Open-File Report 80-1086, 77 p.

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Joesting, H.R., 1942, Strategic mineral occurrences in interior Alaska: Alaska Territorial Department of Mines Pamphlet 1, 46 p.

Moffit, F.H., 1938, Geology of the Slana-Tok district, Alaska: U.S. Geological Survey Bulletin 904, 54 p.

Moffit, F.H., 1944, Mining in the northern Copper River region, Alaska: U.S. Geological Survey Bulletin 943-B, p. 25-47.

Newkirk, S. R., Muntzert, J. K., Puchner, C. C., Hanneman, N. L., and Flanders, R. W., 1986, AR JV 1986 Annual Report - Volume 1. Resource Associates of Alaska Inc. Internal Report, 141 p

Singer, D.A., Curtin, G.C., and Foster, H.L., 1976, Mineral resources map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-767-E, 1 sheet, scale 1:25,000.

York, T.M., 1980, Geology of the Tok antimony mine, Tok, Alaska: Golden, Colorado School of Mines, M.Sc. thesis, 94 p.

Primary Reference: Ebbley and Wright, 1948; Fonseca, 2009

Reporter(s): C.E. Cameron (ADGGS); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Section 35

Site type: Occurrence

ARDF no.: TC032

Latitude: 63.6398 **Quadrangle:** TN C-3

Longitude: 142.2642

Location description and accuracy:

This occurrence is about 2.7 miles south-southwest of the top of Mount Fairplay; it is at an elevation of about 4,000 feet, about 0.4 mile southwest of the center of section 35, T. 22 N., R. 16 E. The location is accurate.

Commodities:

Main: Be, La, Nb, Th, U, Y, Zr

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Various companies explored in the Mount Fairplay area from the 1970s to the 1990s, apparently with indifferent results. The Section 35 prospect dates from work begun in 2006, when Anglo Alaska Gold Corporation staked 6 claims known as the Draken project; the claims included the nearby Silver Lining prospect (TC026). Fire River Gold Corporation acquired the Draken claims in 2009. The Section 35 occurrence (which is just outside the Draken claims) was identified in their sampling.

The Section 35 prospect is in the outer portion of the Mount Fairplay pluton whose outcrop area is about 4 miles in diameter (Foster, 1970; Kerin, 1976; Adams, 2009). The pluton is a Late Cretaceous to early Tertiary alkaline complex with well-developed ring structures. It intrudes biotite schist and gneiss, probably of Mississippian and older age and bimodal felsic and mafic volcanic rocks, probably of Late Cretaceous age. The Mount Fairplay complex was emplaced in three phases between 59 and 67 Ma: 1) an early alkaline ring phase that consists of diorite and several syenite units on the north side of the complex; 2) a later alkaline ring phase that consists of several syenite units and perthosite on the south side of the complex; and 3) a calc-alkaline core phase that consists of hornblende-biotite quartz monzonite. The Section 35 occurrence is in a protoclastic hornblende-biotite syenite on the south side of the complex.

A sample of fine-grained syenite contained 16 parts per million beryllium, 172 ppm lanthanum, 145 ppm niobium, 235 ppm thorium, 157 ppm uranium, 33 ppm yttrium, and 291 ppm zirconium (Adams, 2009). The syenite is part of a ring dike complex with accessory apatite, fluorite, and monazite. Adams (2009) noted that some samples from the Silver Lining prospect (TC026), about a mile to the northwest, also contained anomalous uranium, thorium, and rare-earth elements.

Alteration:

None noted.

Age of mineralization:

Late Cretaceous or early Tertiary based on the age of the plutonic host rock.

Generic deposit model:

Deposit model:

REE in syenitic plutonic rocks.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only surface sampling and mapping.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Adams, David, 2009, Geologic report on the Drakan project, Fortymile Mining District, Alaska: Technical Report DK08 43-101 for Fire River Gold Corporation, 49 p. (posted on www.sedar.com, Feb 23, 2009).

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Kerin, L.J., 1976, The reconnaissance petrology of the Mount Fairplay igneous complex: Fairbanks, University of Alaska, M.Sc. thesis, 95 p

Wilson, F.H., Smith, J.G., and Shew, Nora, 1985, Review of radiometric data from the Yukon crystalline terrane, Alaska and Yukon Territory: Canadian Journal of Earth Sciences, v. 22, p. 525-537.

Primary Reference: Adams, 2009

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Two Mile

Site type: Prospect

ARDF no.: TC033

Latitude: 63.665 **Quadrangle:** TC C-3

Longitude: 142.2742

Location description and accuracy:

The Two Mile prospect is about 1.8 miles west-northwest of the summit of Mount Fairplay. It is beside the Taylor Highway near the northeast corner of section 27, T. 22 N., R. 16 E. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Pb

Other: As, Sb, Zn

Ore minerals: Chalcopyrite, galena, molybdenite, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

Several companies have explored in the Mount Fairplay area since 1970 (Adams, 2009; Kerin, 1976). The history of the Two Mile prospect is uncertain but there are fairly well known prospects along the Taylor Highway to the north, the Fairplay prospect (TC008), and to the south, the Silver Lining prospect (TC 026), which was active as of early 2010. It is likely that the Two Mile prospect has been staked at one time or another but it status in early 2010 was unknown.

The Two Mile prospect is in core zone of the Mount Fairplay pluton whose outcrop area is about 4 miles in diameter (Foster, 1970; Kerin, 1976; Adams, 2009). The Mount Fairplay pluton is a Late Cretaceous to early Tertiary alkaline complex with well-developed ring structures. The pluton intrudes biotite schist and gneiss, probably of Mississippian and older age and bimodal felsic and mafic volcanic rocks, probably of Late Cretaceous age. The Mount Fairplay complex was emplaced in three phases between 59 and 67 Ma: 1) an early alkaline ring phase that consists of diorite and several syenite units on the north side of the complex; 2) a later alkaline ring phase that consists of several syenite units and perthosite on the south side of the complex; and 3) a calc-alkaline core phase that consists of hornblende-biotite quartz monzonite. The Two Mile prospect is in the hornblende-biotite quartz monzonite in the central part of the complex.

The mineralization and hostrock at the Two Mile prospect are similar to that at the Silver Lining prospect (TC026) about a mile to the south (Adams, 2009). The mineralization consists of narrow gold-sulfide-quartz veins; that strike about N22E and dip 90SE; alteration and oxidation is pervasive. Two rock samples of quartz monzonite contained anomalous gold and sporadic, weak amounts of silver, copper, lead, molybdenum, thorium, uranium, and tungsten. Singer and others (1976) classified the deposit as a porphyry. However, more recent work by Adams (2009) suggest vein-type mineralization.

Alteration:

Unstated.

Age of mineralization:

Late Cretaceous or early Tertiary based on the age of the host rocks.

Generic deposit model:

Deposit model:

Low-sulfide gold-quartz vein; porphyry deposit?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Several companies have explored in the Mount Fairplay area since 1970 (Adams, 2009; Kerin, 1976). The history of the Two Mile prospect is uncertain but there are fairly well known prospects along the Taylor Highway to the north, the Fairplay prospect (TC008), and to the south, the Silver Lining prospect (TC 026), which was active as of early 2010. It is likely that the Two Mile prospect has been staked at one time or another but it status in early 2010 was unknown. The exploration probably only consisted of some surface sampling and geologic mapping.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Adams, David, 2009, Geologic report on the Drakan project, Fortymile Mining District, Alaska: Technical Report DK08 43-101 for Fire River Gold Corporation, 49 p. (posted on www.sedar.com, February 23, 2009).

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Kerin, L.J., 1976, The reconnaissance petrology of the Mount Fairplay igneous complex: Fairbanks, University of Alaska, M.Sc. thesis, 95 p

Wilson, F.H., Smith, J.G., and Shew, Nora, 1985, Review of radiometric data from the Yukon crystalline terrane, Alaska and Yukon Territory: Canadian Journal of Earth Sciences, v. 22, p. 525-537.

Primary Reference: Adams, 2009

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Discovery Zone

Site type: Prospect

ARDF no.: TC034

Latitude: 63.2846 **Quadrangle:** TC B-6

Longitude: 143.8329

Location description and accuracy:

The Discovery Zone prospect is about 3.6 miles north of the junction of the Tok River and Stibnite Creek. It is at an elevation of about 4350 feet and about 0.3 mile northwest of the center of section 2, T. 17 N., R. 8 E., of the Copper River Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au, Cu, Pb, Sb, Zn

Other:

Ore minerals: Arsenopyrite, chalcopyrite, galena, gold, pyrite, sphalerite, stibnite

Gangue minerals: Carbonates, quartz

Geologic description:

The Discovery Zone prospect is one of several similar deposits in a mineral belt about 4 miles long that is called the Tushtena project by the current (2010) operator, Triton Gold Ltd. (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). Work along the belt began in 1976 when Resource Associates of Alaska began geochemical sampling in the area. They soon staked claims over the Discovery Zone prospect on what was then considered massive-sulfide mineralization. Their work continued through 1987 in conjunction with several partners and consisted of geologic mapping, rock and soil sampling, and geophysical surveys along what became a belt of deposits. They drilled 17 holes along the belt in 1986 and 8 holes in 1987, totaling 3,390 meters. From 1998 to 2001, Inmet Mining Corporation and Pacific Northwest Resources Company did additional mapping and rock and soil surveys. They diamond drilled 8 more holes totaling 1,489 meters. The property was idle until 2007 when James DeMarchi staked 40 claims over the belt and transferred them to Tushtena Resources Ltd. In 2008, they entered into a joint agreement with Triton Gold.

The rocks along the belt consist of two main units: the Devonian to Precambrian, Macomb Belt unit to the east and the Devonian Tushtena Pass unit to the west. They are separated by the Itra Fault, a regional scale, shallowly to moderately dipping thrust fault (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). The Macomb Belt rocks consist mainly of felsic metatuff and volcaniclastic rocks, and sericite-carbonate-quartz phyllonite. The Tushtena Pass unit consists of schist and phyllite, metadiorite, and lithic tuff.

There are two main styles of mineralization along the belt: 1) hanging-wall, bonanza-style vein systems; and 2) footwall, sulfide stockwork and breccia vein systems. The hanging-wall, vein-type mineralization has an arsenic-lead-zinc association with narrow or no alteration envelopes and is characterized by quartz-carbonate-sulfide-gold-mica veins. The footwall, stockwork-breccia zones have a gold-rich core and peripheral antimony-rich mineralization. The deposits are correlative with others along the Tintina gold belt; the key characteristics are the low angle faults that trap the mineralization and the carbonaceous rocks that provide the right chemistry for deposition.

The Discovery Zone was initially classified as a volcanogenic, exhalative and carbonate, massive-sulfide deposit. But magnetite skarns and gold veins were also identified (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009;). High grade mineralization is found only in Tushtena Unit rocks above the

Itra fault. Four types of veins are reported: 1) metamorphic, gold-deficient, quartz veins with disseminated base-metal minerals parallel to foliation; 2) post-metamorphic quartz-gold veins with base-metal sulfides; 3) quartz +/- carbonate veins with chalcedony, clay, and hematite; and 4) alunite-clay-iron oxide-quartz veins. The veins and vein breccias vary from 0.3 to 9 meters thick and are usually in short segments truncated by northeast-trending fractures. The veins have weak, thin alteration haloes with an inner zone of silicification and an outer zone of weak to moderate, iron-magnesium carbonate alteration. High gold values are typically related to abundant arsenopyrite. Numerous intervals in the 13 drill holes in the Discovery Zone prospect contained more than 400 parts per billion (ppb) gold, and many intervals had more than 1,000 ppb gold. The most notable were 116 feet with 1,064 ppb gold, 4,283 parts per million (ppm) arsenic, and 2.80 ppm silver; this included an 2.7-foot interval with 37,028 ppb gold, 33,018 ppm arsenic, and 48.40 ppm silver. An 8.0-foot zone contained 5,037 ppb gold, 11,736 ppm arsenic, and 1.55 ppm silver; this included 0.5 feet with 18,200 ppb gold, 27,500 ppm arsenic, and 5,80 ppm silver.

Alteration:

The veins have weak, thin alteration haloes with an inner zone of silicification and and an outer zone of weak to moderate, iron-magnesium carbonate alteration.

Age of mineralization:

About 70 to 105 Ma by analogy, if Tintina-style mineralization.

Generic deposit model:

Deposit model:

Tintina-style, gold-arsenopyrite-quartz veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The Discovery Zone prospect is one of several similar deposits in a mineral belt about 4 miles long that is called the Tushtena project by the current (2010) operator, Triton Gold Ltd. (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). Work along the belt began in 1976 when Resource Associates of Alaska began geochemical sampling in the area. They soon staked claims over the Discovery Zone prospect on what was then considered massive-sulfide mineralization. Their work continued through 1987 in conjunction with several partners and consisted of geologic mapping, rock and soil sampling, and geophysical surveys along what became a belt of deposits. They drilled 17 holes along the belt in 1986 and 8 holes in 1987, totaling 3,390 meters. From 1998 to 2001, Inmet Mining Corporation and Pacific Northwest Resources Company did additional mapping, and rock and soil surveys; they diamond drilled 8 more holes totaling 1,489 meters. The property was idle until 2007 when James DeMarchi staked 40 claims over the belt and transferred them to Tushtena Resources Ltd. In 2008, they entered into a joint agreement with Triton Gold.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

DiMarchi, J.J., Oreskes, N., Newkirk, S.R. and Hanneman, N.L., 1987. AR/TRIO 1987 Annual Report. Resource Associates of Alaska Inc.. Internal Report, 111 p.

Fonseca, Anna, 2009, Technical report on the Tushtena gold property, Delta Mineral District, Alaska: Technical Report for Triton Gold Limited, 67 p. (as of February 1, 2010, posted on the Internet at: http://www.tritongold.com.au/docs/Alaskan_Project_Independent_Geologists_Report.pdf).

Newkirk, S. R., Muntzert, J. K., Puchner, C. C., Hanneman, N. L., and Flanders, R. W., 1986, AR JV 1986 Annual Report - Volume 1. Resource Associates of Alaska Inc.. Internal Report, 141 p.

Primary Reference: Fonseca, 2009

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): RS

Site type: Prospect

ARDF no.: TC035

Latitude: 63.2902 **Quadrangle:** TC B-6

Longitude: 143.8509

Location description and accuracy:

The RS prospect is about 3.9 miles north of the junction of the Tok River and Stibnite Creek. It is at an elevation of about 4900 feet, about 0.5 mile north-northeast of the center of section 3, T. 17 N., R. 8 E., of the Copper River Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au, Cu, Pb, Sb, Zn

Other:

Ore minerals:

Gangue minerals: Carbonates, quartz

Geologic description:

The RS prospect prospect is one of several similar deposits in a mineral belt about 4 miles long that is called the Tushtena project by the current (2010) operator, Triton Gold Ltd. (DiMarchi and others, 1987; Fonseca, 2009; Newkirk and others, 1986). Work along the belt began in 1976 when Resource Associates of Alaska began geochemical sampling in the area. They soon staked claims over the Discovery Zone prospect (TC034) on what was then was considered massive-sulfide mineralization. Their work continued through 1987 in conjunction with several partners and consisted of geologic mapping, rock and soil sampling, and geophysical surveys along what became a belt of deposits. They drilled 17 holes along the belt in 1986 and 8 holes in 1987, totaling 3,390 meters. From 1998 to 2001, Inmet Mining Corporation and Pacific Northwest Resources Company did addition mapping, rock and soil surveys, and they drilled 8 more diamond drill holes totaling 1,489 meters. The property was idle until 2007 when James DeMarchi staked 40 claims over the belt and transferred them to Tushtena Resources Ltd. In 2008, they entered into a joint agreement with Triton Gold.

The rocks along the belt consist of two main units: the Devonian to Precambrian, Macomb Belt unit to the east and the Devonian Tushtena Pass unit to the west. They are separated by the Itra Fault, a regional scale, shallowly to moderately dipping thrust fault (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). The Macomb Belt rocks consist mainly of felsic metatuff and volcaniclastic rocks, and sericite-carbonate-quartz phyllonite. The Tushtena Pass unit consists of schist and phyllite, metadiorite, and lithic tuff.

There are two main styles of mineralization along the belt: 1) hanging-wall, bonanza-style vein systems; and 2) footwall, sulfide stockwork and breccia vein systems. The hanging-wall, vein-type mineralization has an arsenic-lead-zinc association with narrow or no alteration envelopes and is characterized by quartz-carbonate-sulfide-gold-mica veins. The footwall, stockwork-breccia zones have a gold-rich core and peripheral antimony-rich mineralization. The deposits are correlative with others along the Tintina gold belt; the key characteristics are the low angle faults that trap the mineralization and the carbonaceous rocks that provide the right chemistry for deposition.

The RS prospect is in the Tushtena Unit rocks above the Itra fault (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009. The mineralization consists of quartz-ankerite-arsenopyrite-pyrite-galena-gold veins in quartz-sericite calc-schist interbedded with minor quartzite and chlorite schist. The veins are

controlled by northeast-trending fractures. The veins are usually zoned with sulfides on the walls and a center of comb quartz and ankerite. Several intercepts in the 3 holes drilled on the RS prospect had gold values about 400 parts per billion (ppb) gold. The best intercept was 24.2 feet with 1,320 ppb gold, 6,282 parts per million (ppm) arsenic, and 0.40 ppm silver; this included 6.0 feet with 3,833 ppb gold, 6,360 ppm arsenic, and 1.30 ppm silver. A 1.0-foot intercept contained 22,100 ppb gold, 36,200 ppm arsenic, and 6.40 ppm silver.

Alteration:

Age of mineralization:

About 70 to 105 Ma by analogy if Tintina Belt-style mineralization.

Generic deposit model:

Deposit model:

Tintina Belt-style, gold-arsenopyrite-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The RS Zone prospect is one of several similar deposits in a mineral belt about 4 miles long that is called the Tushtena project by the current (2010) operator Triton Gold Ltd. (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009. Work along the belt began in 1976 when Resource Associates of Alaska began geochemical sampling in the area. They soon staked claims over the Discovery Zone what then was considered massive-sulfide mineralization. Their work continued through 1986 in conjunction with several partners and consisted of geologic mapping, rock and soil sampling, and geophysical surveys along what became a belt of deposits. They drilled 17 holes long the belt in 1986 and 8 holes in 1987, totaling 3,390 meters. From 1998 to 2001, Inmet Mining Corporation and Pacific Northwest Resources Company did addition mapping, rock and soil surveys, and they drilled 8 more diamond drill holes totaling 1489 meters. Three of these holes are on the RS zone. The property was idle until 2007 when James DeMarchi staked 40 claims over the belt and transferred them to Tushtena Resources. In 2008, they entered into a joint agreement with Triton Gold.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

DiMarchi, J.J., Oreskes, N., Newkirk, S.R. and Hanneman, N.L., 1987. AR/TRIO 1987 Annual Report. Resource Associates of Alaska Inc. Internal Report, 111 p.

Fonseca, Anna, 2009, Technical report on the Tushtena gold property, Delta Mineral District, Alaska:

Technical Report for Triton Gold Limited, 67 p. (as of Feb 1, 2010, posted on the Internet at: http://www.tritongold.com.au/docs/Alaskan_Project_Independent_Geologists_Report.pdf).

Newkirk, S. R., Muntzert, J. K., Puchner, C. C., Hanneman, N. L., and Flanders, R. W., 1986, AR JV 1986 Annual Report - Volume 1. Resource Associates of Alaska Inc. Internal Report, 141 p.

Primary Reference: Fonseca, 2009

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Dave's Zone

Site type: Prospect

ARDF no.: TC036

Latitude: 63.2592 **Quadrangle:** TC B-6

Longitude: 143.8031

Location description and accuracy:

The Dave's Zone prospect is about 2.0 miles northeast of the junction of the Tok River and Stibnite Creek. The prospect is at an elevation of about 4,000 feet, about 0.5 mile northwest of the center of section 13, T. 17 N., R. 8 E., of the Copper River Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au, Cu, Pb, Sb, Zn

Other:

Ore minerals:

Gangue minerals: Carbonates, quartz

Geologic description:

The Dave's Zone prospect prospect is one of several similar deposits in a mineral belt about 4 miles long that is called the Tushtena project by the current (2010) operator, Triton Gold Ltd. (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). Work along the belt began in 1976 when Resource Associates of Alaska began geochemical sampling in the area. They soon staked claims over the Discovery Zone prospect (TC034) on what was then was classified as massive-sulfide mineralization. Their work continued through 1987 in conjunction with several partners and consisted of geologic mapping, rock and soil sampling, and geophysical surveys along what became a belt of deposits. They drilled 17 holes along the belt in 1986 along the belt and 8 holes in 1987, totaling 3,390 meters. From 1998 to 2001, Inmet Mining Corporation and Pacific Northwest Resources Company did addition mapping, rock and soil surveys, and they drilled 8 more diamond drill holes totaling 1,489 meters. Two holes were drilled at the Dave's Zone prospect. The property was idle until 2007 when James DeMarchi staked 40 claims over the belt and transferred them to Tushtena Resources Ltd. In 2008, they entered into a joint agreement with Triton Gold.

The rocks along the belt consist of two main units: the Devonian to Precambrian, Macomb Belt unit to the east and the Devonian Tushtena Pass unit to the west. They are separated by the Itra Fault, a regional scale, shallowly to moderately dipping thrust fault (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). The Macomb Belt rocks consist mainly of felsic metatuff and volcaniclastic rocks, and sericite-carbonate-quartz phyllonite. The Tushtena Pass unit consists of schist and phyllite, metadiorite, and lithic tuff.

There are two main styles of mineralization along the belt: 1) hanging-wall, bonanza-style vein systems; and 2) footwall, sulfide stockwork and breccia vein systems. The hanging-wall, vein-type mineralization has an arsenic-lead-zinc association with narrow or no alteration envelopes and is characterized by quartz-carbonate-sulfide-gold-mica veins. The footwall, stockwork-breccia zones have a gold-rich core and peripheral antimony-rich mineralization. The deposits are correlative with others along the Tintina gold belt; the key characteristics are the low angle faults that trap the mineralization and the carbonaceous rocks that provide the right chemistry for deposition.

The mineralization at the Dave's Zone prospect consists of arsenic-gold-antimony-silver veins and silicified stockworks in Macomb Belt gneiss in the footwall of the Itra Fault (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). Many of the veins are parallel to foliation and increase in

abundance toward the fault. There are three varieties of the stockwork: 1) stockworks with massive stibnite in zones of silicification, 2) arsenopyrite-rich stockworks, and 3) low-gold stockworks with quartz and chalcedony. Four types of veins are present: 1) vuggy, quartz-pyrite-arsenopyrite-carbonate-mica+/-stibnite+/- gold; 2) vuggy quartz veins with lenses and pods of stibnite; 3) blue quartz veins with accessory carbonates, chlorite, and rare sulfides; and 4) thick, coarse-grained white quartz-carbonate+/-chalcopyrite-pyrite-sphalerite-gold veins. The main stage of quartz veining and stockworking postdate pervasive carbonate alteration which is controlled by faulting and fracturing. Extensive zones of silicification increase with depth.

Two holes were drilled at the Dave's Zone prospect. Several intercepts contained more than 400 parts per billion (ppb) gold. The most notable is 0.6 feet that contained 1,020 ppm gold, 6,450 parts per million (ppm) arsenic, and 2.50 ppm silver.

Alteration:

Silicification and carbonate alteration.

Age of mineralization:

About 70 to 105 Ma by analogy if Tintina Belt-style mineralization.

Generic deposit model:

Deposit model:

Tintina Belt-style, gold-arsenopyrite-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The Dave's Zone prospect prospect is one of several similar deposits in a mineral belt about 4 miles long that is called the Tushtena project by the current (2010) operator, Triton Gold Ltd. (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). Work along the belt began in 1976 when Resource Associates of Alaska began geochemical sampling in the area. They soon staked claims over the Discovery Zone prospect (TC034) on what was then was classified as massive-sulfide mineralization. Their work continued through 1987 in conjunction with several partners and consisted of geologic mapping, rock and soil sampling, and geophysical surveys along what became a belt of deposits. They drilled 17 holes along the belt in 1986 along the belt and 8 holes in 1987, totaling 3,390 meters. From 1998 to 2001, Inmet Mining Corporation and Pacific Northwest Resources Company did addition mapping, rock and soil surveys, and they drilled 8 more diamond drill holes totaling 1,489 meters. Two holes were drilled at the Dave's Zone prospect. The property was idle until 2007 when James DeMarchi staked 40 claims over the belt and transferred them to Tushtena Resources Ltd. In 2008, they entered into a joint agreement with Triton Gold.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

DiMarchi, J.J., Oreskes, N., Newkirk, S.R. and Hanneman, N.L., 1987. AR/TRIO 1987 Annual Report. Resource Associates of Alaska Inc. Internal Report, 111 p.

Fonseca, Anna, 2009, Technical report on the Tushtena gold property, Delta Mineral District, Alaska: Technical Report for Triton Gold Limited, 67 p. (as of Feb 1, 2010, posted on the Internet at: http://www.tritongold.com.au/docs/Alaskan_Project_Independent_Geologists_Report.pdf).

Newkirk, S. R., Muntzert, J. K., Puchner, C. C., Hanneman, N. L., and Flanders, R. W., 1986, AR JV 1986 Annual Report - Volume 1. Resource Associates of Alaska Inc. Internal Report, 141 p

Primary Reference: Fonseca, 2009

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Upper Com

Site type: Prospect

ARDF no.: TC037

Latitude: 63.2551 **Quadrangle:** TC B-6

Longitude: 143.8026

Location description and accuracy:

The Upper Com prospect is about 1.7 miles northeast of the junction of the Tok River and Stibnite Creek. The prospect is at an elevation of 3700 feet, about 0.3 mile west of the center of section 13, T. 17 N., R. 8 E., of the Copper River Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au, Cu, Pb, Sb, Zn

Other:

Ore minerals:

Gangue minerals:

Geologic description:

The Upper Com prospect prospect is one of several similar deposits in a mineral belt about 4 miles long that is called the Tushtena project by the current (2010) operator, Triton Gold Ltd. (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). Work along the belt began in 1976 when Resource Associates of Alaska began geochemical sampling in the area. They soon staked claims over the Discovery Zone prospect (TC034) on what was then was classified as massive-sulfide mineralization. Their work continued through 1987 in conjunction with several partners and consisted of geologic mapping, rock and soil sampling, and geophysical surveys along what became a belt of deposits. They drilled 17 holes along the belt in 1986 along the belt and 8 holes in 1987, totaling 3,390 meters. From 1998 to 2001, Inmet Mining Corporation and Pacific Northwest Resources Company did addition mapping, and rock and soil surveys; they drilled 8 more diamond drill holes totaling 1,489 meters. None of the holes were at the Upper Com prospect. The property was idle until 2007 when James DeMarchi staked 40 claims over the belt and transferred them to Tushtena Resources Ltd. In 2008, they entered into a joint agreement with Triton Gold.

The rocks along the belt consist of two main units: the Devonian to Precambrian, Macomb Belt unit to the east and the Devonian Tushtena Pass unit to the west. They are separated by the Itra Fault, a regional scale, shallowly to moderately dipping thrust fault (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). The Macomb Belt rocks consist mainly of felsic metatuff and volcaniclastic rocks, and sericite-carbonate-quartz phyllonite. The Tushtena Pass unit consists of schist and phyllite, metadiorite, and lithic tuff.

There are two main styles of mineralization along the belt: 1) hanging-wall, bonanza-style vein systems; and 2) footwall, sulfide stockwork and breccia vein systems. The hanging-wall, vein-type mineralization has an arsenic-lead-zinc association with narrow or no alteration envelopes and is characterized by quartz-carbonate-sulfide-gold-mica veins. The footwall, stockwork-breccia zones have a gold-rich core and peripheral antimony-rich mineralization. The deposits are correlative with others along the Tintina gold belt; the key characteristics are the low angle faults that trap the mineralization and the carbonaceous rocks that provide the right chemistry for deposition.

Mineralization at the Upper Com prospect is in schist, quartz, and exhalite of the Tushtena Pass unit in the hanging wall of the Itra fault (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). The mineralization is similar to that at the Discovery Zone prospect (TC034). There are four types of veins: 1)

metamorphic gold-deficient, quartz veins with disseminated base metal minerals parallel to foliation; 2) post-metamorphic quartz-gold veins with base-metal sulfides; 3) quartz +/- carbonate veins with chalcedony, clay, hematite, and alunite; and 4) clay-iron oxide-quartz veins. The veins have weak, thin, alteration haloes with an inner zone of silicification and and an outer zone of weak to moderate, iron-magnesium carbonate alteration. High gold values are typically related to abundant arsenopyrite.

Alteration:

The veins have weak, thin alteration haloes with an inner zone of silicification and and an outer zone of weak to moderate, iron-magnesium carbonate alteration.

Age of mineralization:

About 70 to 105 Ma by analogy if Tintina Belt-style mineralization.

Generic deposit model:

Deposit model:

Tintina Belt-style, gold-arsenopyrite-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The Upper Com prospect prospect is one of several similar deposits in a mineral belt about 4 miles long that is called the Tushtena project by the current (2010) operator, Triton Gold Ltd. (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). Work along the belt began in 1976 when Resource Associates of Alaska began geochemical sampling in the area. They soon staked claims over the Discovery Zone prospect (TC034) on what was then was classified as massive-sulfide mineralization. Their work continued through 1987 in conjunction with several partners and consisted of geologic mapping, rock and soil sampling, and geophysical surveys along what became a belt of deposits. They drilled 17 holes along the belt in 1986 along the belt and 8 holes in 1987, totaling 3,390 meters. From 1998 to 2001, Inmet Mining Corporation and Pacific Northwest Resources Company did addition mapping, and rock and soil surveys; they drilled 8 more diamond drill holes totaling 1,489 meters. None of the holes were at the Upper Com prospect. The property was idle until 2007 when James DeMarchi staked 40 claims over the belt and transferred them to Tushtena Resources Ltd. In 2008, they entered into a joint agreement with Triton Gold.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

DiMarchi, J.J., Oreskes, N., Newkirk, S.R. and Hanneman, N.L., 1987. AR/TRIO 1987 Annual Report. Resource Associates of Alaska Inc. Internal Report, 111 p.

Fonseca, Anna, 2009, Technical report on the Tushtena gold property, Delta Mineral District, Alaska: Technical Report for Triton Gold Limited, 67 p. (as of Feb 1, 2010, posted on the Internet at: http://www.

tritongold.com.au/docs/Alaskan_Project_Independent_Geologists_Report.pdf).

Newkirk, S. R., Muntzert, J. K., Puchner, C. C., Hanneman, N. L., and Flanders, R. W., 1986, AR JV 1986 Annual Report - Volume 1. Resource Associates of Alaska Inc. Internal Report, 141 p

Primary Reference: Fonseca, 2009

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Lower Com

Site type: Prospect

ARDF no.: TC038

Latitude: 63.25 **Quadrangle:** TC B-6

Longitude: 143.804

Location description and accuracy:

The Lower Com prospect is about 1.5 miles northeast of the junction of the Tok River and Stibnite Creek. It is at an elevation of about 3,500 feet about 0.5 mile southwest of the center of section 13, T. 17 N., R. 8 E., of the Copper River Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au, Cu, Pb, Sb, Zn

Other:

Ore minerals:

Gangue minerals: Carbonates, quartz

Geologic description:

The Lower Com prospect prospect is one of several similar deposits in a mineral belt about 4 miles long that is called the Tushtena project by the current (2010) operator, Triton Gold Ltd. (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). Work along the belt began in 1976 when Resource Associates of Alaska began geochemical sampling in the area. They soon staked claims over the Discovery Zone prospect (TC034) what then was classified as massive-sulfide mineralization. Their work continued through 1987 in conjunction with several partners and consisted of geologic mapping, rock and soil sampling, and geophysical surveys along what became a belt of deposits. They drilled 17 holes along the belt in 1986 and 8 holes in 1987, totaling 3,390 meters. From 1998 to 2001, Inmet Mining Corporation and Pacific Northwest Resources Company did addition mapping, rock and soil surveys, and they drilled 8 more diamond drill holes totaling 1,489 meters. Eight holes were drilled at the Lower Com prospect. The property was idle until 2007 when James DeMarchi staked 40 claims over the belt and transferred them to Tushtena Resources Ltd. In 2008, they entered into a joint agreement with Triton Gold.

The rocks along the belt consist of two main units: the Devonian to Precambrian, Macomb Belt unit to the east and the Devonian Tushtena Pass unit to the west. They are separated by the Itra Fault, a regional scale, shallowly to moderately dipping thrust fault (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). The Macomb Belt rocks consist mainly of felsic metatuff and volcaniclastic rocks, and sericite-carbonate-quartz phyllonite. The Tushtena Pass unit consists of schist and phyllite, metadiorite, and lithic tuff.

There are two main styles of mineralization along the belt: 1) hanging-wall, bonanza-style vein systems; and 2) footwall, sulfide stockwork and breccia vein systems. The hanging-wall, vein-type mineralization has an arsenic-lead-zinc association with narrow or no alteration envelopes and is characterized by quartz-carbonate-sulfide-gold-mica veins. The footwall, stockwork-breccia zones have a gold-rich core and peripheral antimony-rich mineralization. The deposits are correlative with others along the Tintina gold belt; the key characteristics are the low angle faults that trap the mineralization and the carbonaceous rocks that provide the right chemistry for deposition.

The Lower Com prospect is in the immediate footwall of the Itra Fault (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). The host rock is quartz-mica schist, gneiss, and mylonite of the Macomb Belt rocks that outcrop along the creek at the prospect. The hanging wall above the fault is altered

meta-diorite. Mineralized, altered mylonite crops out for more than 240 meters along the creek. The mineralization and alteration consist of: 1) pre-mineral quartz stockworks; 2) synmineralization argillic alteration; 3) synmineralization quartz-dominated stockworks and breccias with up to 50 percent arsenopyrite, pyrite, stibnite; 4) post-mineral quartz stockworks; and 5) post-mineral iron-magnesium-carbonate veinlets. The mineralization is associated with brittle fracturing and faulting along the Itra fault. Drilling indicates that the gold, arsenic, and silver content increases down the dip of the mineralization.

Alteration:

Argillic alteration, silicification, carbonate alteration.

Age of mineralization:

About 70 to 105 Ma by analogy if Tintina Belt-style mineralization.

Generic deposit model:

Deposit model:

Tintina Belt-style, gold-arsenopyrite-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The Lower Com prospect prospect is one of several similar deposits in a mineral belt about 4 miles long that is called the Tushtena project by the current (2010) operator, Triton Gold Ltd. (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). Work along the belt began in 1976 when Resource Associates of Alaska began geochemical sampling in the area. They soon staked claims over the Discovery Zone prospect (TC034) what then was classified as massive-sulfide mineralization. Their work continued through 1987 in conjunction with several partners and consisted of geologic mapping, rock and soil sampling, and geophysical surveys along what became a belt of deposits. They drilled 17 holes along the belt in 1986 and 8 holes in 1987, totaling 3,390 meters. From 1998 to 2001, Inmet Mining Corporation and Pacific Northwest Resources Company did addition mapping, rock and soil surveys, and they drilled 8 more diamond drill holes totaling 1,489 meters. Eight holes were drilled at the Lower Com prospect. The property was idle until 2007 when James DeMarchi staked 40 claims over the belt and transferred them to Tushtena Resources Ltd. In 2008, they entered into a joint agreement with Triton Gold.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

DiMarchi, J.J., Oreskes, N., Newkirk, S.R. and Hanneman, N.L., 1987. AR/TRIO 1987 Annual Report. Resource Associates of Alaska Inc. Internal Report, 111 p.

Fonseca, Anna, 2009, Technical report on the Tushtena gold property, Delta Mineral District, Alaska:

Technical Report for Triton Gold Limited, 67 p. (as of Feb 1, 2010, posted on the Internet at: http://www.tritongold.com.au/docs/Alaskan_Project_Independent_Geologists_Report.pdf).

Newkirk, S. R., Muntzert, J. K., Puchner, C. C., Hanneman, N. L., and Flanders, R. W., 1986, AR JV 1986 Annual Report - Volume 1. Resource Associates of Alaska Inc. Internal Report, 141 p

Primary Reference: Fonseca, 2009

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Mobily

Site type: Prospect

ARDF no.: TC039

Latitude: 63.2693 **Quadrangle:** TC B-6

Longitude: 143.8125

Location description and accuracy:

The Mobily prospect is about 2.5 miles north-northeast of the junction of the Tok River and Stibnite Creek. It is at an elevation of about 4,300 feet, about 0.5 mile east-northeast of the center of section 11, T. 17 N., R. 8 E., of the Copper River Meridian. The location is accurate.

Commodities:

Main: Ag, As, Au, Cu, Pb, Sb, Zn

Other:

Ore minerals:

Gangue minerals: Carbonates, quartz

Geologic description:

The Mobily prospect prospect is one of several similar deposits in a mineral belt about 4 miles long that is called the Tushtena project by the current (2010) operator, Triton Gold Ltd. (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009. Work along the belt began in 1976 when Resource Associates of Alaska began geochemical sampling in the area. They soon staked claims over the Discovery Zone prospect (TC034) what then was considered massive-sulfide mineralization. Their work continued through 1987 in conjunction with several partners and consisted of geologic mapping, rock and soil sampling, and geophysical surveys along what became a belt of deposits. They drilled 17 holes along the belt in 1986 and 8 holes in 1987, totaling 3,390 meters. From 1998 to 2001, Inmet Mining Corporation and Pacific Northwest Resources Company did addition mapping, and rock and soil surveys; They drilled 8 more diamond drill holes totaling 1,489 meters. None of the holes were at the Mobily prospect. The property was idle until 2007 when James DeMarchi staked 40 claims over the belt and transferred them to Tushtena Resources Ltd. In 2008, they entered into a joint agreement with Triton Gold.

The rocks along the belt consist of two main units: the Devonian to Precambrian, Macomb Belt unit to the east and the Devonian Tushtena Pass unit to the west. They are separated by the Itra Fault, a regional scale, shallowly to moderately dipping thrust fault (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). The Macomb Belt rocks consist mainly of felsic metatuff and volcaniclastic rocks, and sericite-carbonate-quartz phyllonite. The Tushtena Pass unit consists of schist and phyllite, metadiorite, and lithic tuff.

There are two main styles of mineralization along the belt: 1) hanging-wall, bonanza-style vein systems; and 2) footwall, sulfide stockwork and breccia vein systems. The hanging-wall, vein-type mineralization has an arsenic-lead-zinc association with narrow or no alteration envelopes and is characterized by quartz-carbonate-sulfide-gold-mica veins. The footwall, stockwork-breccia zones have a gold-rich core and peripheral antimony-rich mineralization. The deposits are correlative with others along the Tintina gold belt; the key characteristics are the low angle faults that trap the mineralization and the carbonaceous rocks that provide the right chemistry for deposition.

The rocks at the Mobily prospect are gneiss of the Macomb Belt (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009). The mineralization consists of northeast-trending arsenopyrite-quartz stockworks, veins, and breccia that cut silicified gneiss. The rocks show a strong east to west alteration

zonation from Fe-carbonate alteration in the east, a central zone of sericite-ankerite+/-quartz+/-pyrite alteration, and a high silica outer zones with clay in the west. Grab and chip samples of stringer veins contained up to 920 parts per billion gold.

Alteration:

The rocks show a strong east to west alteration zonation from Fe-carbonate alteration in the east, to a central zone of sericite-ankerite+/-quartz+/-pyrite alteration, to high silica zones with clay in the west.

Age of mineralization:

About 70 to 105 Ma by analogy, if Tintina Belt-style mineralization.

Generic deposit model:

Deposit model:

Tintina Belt-style, gold-arsenopyrite-quartz vein.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The Mobily prospect prospect is one of several similar deposits in a mineral belt about 4 miles long that is called the Tushtena project by the current (2010) operator, Triton Gold Ltd. (Newkirk and others, 1986; DiMarchi and others, 1987; Fonseca, 2009. Work along the belt began in 1976 when Resource Associates of Alaska began geochemical sampling in the area. They soon staked claims over the Discovery Zone prospect (TC034) what then was considered massive-sulfide mineralization. Their work continued through 1987 in conjunction with several partners and consisted of geologic mapping, rock and soil sampling, and geophysical surveys along what became a belt of deposits. They drilled 17 holes along the belt in 1986 and 8 holes in 1987, totaling 3,390 meters. From 1998 to 2001, Inmet Mining Corporation and Pacific Northwest Resources Company did addition mapping, and rock and soil surveys; They drilled 8 more diamond drill holes totaling 1,489 meters. The property was idle until 2007 when James DeMarchi staked 40 claims over the belt and transferred them to Tushtena Resources Ltd. In 2008, they entered into a joint agreement with Triton Gold. There has been no drilling on the Mobily prospect and the work has only been geologic mapping, geophysical and geochemical surveys, and surface sampling.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

DiMarchi, J.J., Oreskes, N., Newkirk, S.R. and Hanneman, N.L., 1987. AR/TRIO 1987 Annual Report. Resource Associates of Alaska Inc. Internal Report, 111 p.

Fonseca, Anna, 2009, Technical report on the Tushtena gold property, Delta Mineral District, Alaska: Technical Report for Triton Gold Limited, 67 p. (as of Feb 1, 2010, posted on the Internet at: http://www.tritongold.com.au/docs/Alaskan_Project_Independent_Geologists_Report.pdf).

Newkirk, S. R., Muntzert, J. K., Puchner, C. C., Hanneman, N. L., and Flanders, R. W., 1986, AR JV 1986 Annual Report - Volume 1. Resource Associates of Alaska Inc. Internal Report, 141 p

Primary Reference: Fonseca, 2009

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Chief Danny; Peak Zone

Site type: Prospect

ARDF no.: TC040

Latitude: 63.1795 **Quadrangle:** TC A-4

Longitude: 142.9162

Location description and accuracy:

The Chief Danny prospect is centered about 0.9 mile west-southwest of VABM 3345 'Tetlin', on the crest of the Tetlin Hills about 8 miles northwest of the center of Tetlin Lake. It covers much of the southwest quarter of section 10, T. 16 N., R. 13 E., of the Copper River Meridian. The location is accurate to within 500 feet.

Commodities:

Main: Ag, Au, Cu

Other: As, Bi, Co, Mo, Sn, Te, W

Ore minerals: Arsenopyrite, chalcopyrite, gold, malachite, native copper, pyrite, pyrrhotite

Gangue minerals: Quartz

Geologic description:

The Chief Danny prospect was first identified in 2009 in the search for the source of anomalous panned-concentrate stream-sediment samples (Contango Ore Inc., 2012). The prospect is divided into several zones with the Peak Zone in the east-central area. Samples collected in trenches along a zone 0.5 mile long contained up to 9 grams of gold per tonne and 1 percent copper. The samples also contained anomalous silver, arsenic, bismuth, tellurium, and tungsten. Soil augering and geochemical surveys in 2010 and 2011 expanded the potential area of mineralization. Eleven holes were drilled in 2011 that totaled 8,057 feet; 5 holes were in gold-copper mineralization. The notable intercepts were: 1) 10 feet with 0.94 gram of gold per tonne, 1.1 gram of silver per tonne, and 0.03 percent copper; 2) 21.2 feet with 7.4 grams of gold per tonne, 4.9 grams of silver per tonne, and 0.15 percent copper; and 3) 12 feet with 3.1 grams of gold per tonne, 300.2 grams of silver per tonne, and 0.26 percent copper. A 70-foot sample in a trench contained 0.69 gram of gold per tonne, 8.60 grams of silver per tonne, and 0.38 percent copper.

There is little detailed mapping in the area. Foster (1970) indicates that the rocks in the area are mainly Paleozoic or Precambrian biotite gneiss and schist or Paleozoic phyllite and schist. A cross-section through the drill holes (Contango Ore Inc., 2012) indicates that the rocks are mainly greenstone and schist. The deposit is centered on a strong magnetic low.

District and regional scale northeast and northwest trending faults are present on the project and are often associated with gold and copper mineralization in this terrane. The Peak zone is a distal, reduced gold skarn deposit, possibly related to a larger porphyry copper-gold system outlined by a 6.5 kilometers by 5.5 kilometers zoned soil anomaly. Peak zone mineralization consists of free gold in disseminated to semi-massive pyrrhotite, chalcopyrite, and arsenopyrite with an amphibole and chlorite alteration envelope (Avalon Development Corporation, 2014). Anomalous silver, bismuth, cobalt and sporadic anomalous molybdenum and tin are also found within the Peak Zone (Freeman, 2014).

Alteration:

In some locations, free gold is associated, within and adjacent, with banded pyrrhotite in chlorite-amphibole alteration (Freeman, 2014).

Age of mineralization:

Illig (2014) has dated skarn mineralization at the Peak zone to 70 million years.

Generic deposit model:

Deposit model:

Gold-copper skarn (Cox and Singer, 1986; model 18b)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b

Production Status: None

Site Status: Active

Workings/exploration:

The Chief Danny prospect was first identified in 2009 in the search for the source of anomalous panned-concentrate stream-sediment samples (Contango Ore Inc., 2012). Subsequently, samples were collected in trenches along a zone 0.5 mile long. Soil augering and geochemical surveys in 2010 and 2011 expanded the potential area of mineralization. Eleven holes were drilled in 2011 that totaled 8,057 feet. Five of eleven holes reached gold-silver-copper mineralization. In 2012, Contango conducted 36,000 feet of drilling, discovering a new high grade 'Peak Zone' skarn. In 2013, Contango conducted 47,000 feet of drilling, expanding the Peak zone (Freeman, 2014).

Significant Peak zone intercepts include 99.9 meters grading 3.935 grams of gold per tonne, 8.4 grams of silver per tonne and 0.104 percent copper in hole 12016 (discovery hole), 58.53 meters grading 14.452 grams of gold per tonne, 9.1 grams of silver per tonne and 0.243 percent copper in hole 12018, 44.2 meters grading 15.962 grams of gold per tonne, 11.0 grams of silver per tonne and 0.267 percent copper in hole 12036, 64.8 meters grading 13.101 grams of gold per tonne, 21.0 grams of silver per tonne and 0.482 percent copper in hole 13062, 138.02 meters grading 3.626 grams of gold per tonne, 11.4 grams of silver per tonne and 0.113 percent copper in hole 13088, 159.25 meters grading 7.010 grams of gold per tonne, 6.6 grams of silver per tonne and 0.102 percent copper in hole 13107, 96 meters grading 9.060 grams of gold per tonne, 4.3 grams of silver per tonne and 0.093 percent copper in hole 13110, and 134.82 meters grading 4.848 grams of gold per tonne, 2.9 grams of silver per tonne and 0.084 percent copper in hole 13117 (western limit of current drilling). High grade mineralization remains open to the west and at depth (Avalon Development Corporation, 2014).

A resource estimate was completed in 2013 for the Peak zone. The resource came from 78 of 140 holes, totaling 16,010 meters of drill core. An indicated resource with a 0.5 gram of gold per tonne equivalent cut-off yielded 5,970,000 tonnes at 3.46 grams of gold per tonne, 11.8 grams of silver per tonne, 0.25 percent copper, and a gold equivalent at 4.08 grams per tonne. The inferred resource also used a 0.5 gram of gold per tonne equivalent cut-off and yielded 3,850,000 tonnes at 2.07 grams of gold per tonne, 14.28 grams of silver per tonne, 0.23 percent copper, and 2.69 grams of gold per tonne equivalent (Freeman, 2014).

Peak Gold, LLC is a joint venture formed in 2015 between Contango ORE Inc. and Royal Alaska, LLC, a wholly owned subsidiary of Royal Gold Inc., to explore the Tetlin project area south of Tok, which contains the Peak and North Peak polymetallic gold-silver-copper skarn deposits (TC040), and numerous other prospects and prospective targets (including TC041). Royal Alaska has the option to invest up to $30 million through October 2018 to earn up to a 40 percent interest in the joint venture; through December 31, 2016, Royal Alaska has earned a 20.6 percent interest (Athey and Werdon, 2017).

With a budget of $11 million aimed at expanding the gold- and copper-rich skarn deposits in the Tetlin project area, Peak Gold conducted Alaska’s largest exploration program for 2016. Peak Gold completed a three-phase drilling program: 19 core holes drilled in Phase I, 62 holes in Phase II, and 37 holes in Phase III, for a total of 20,522.8 m. The 2016 drilling traced a roughly 2,000-meter-long arc of contiguous, high-grade skarn mineralization, which is about three times the footprint of the Peak deposit described in Contango’s 2013 initial resource. One hole drilled in the 2016 expansion area cut three gold-rich intercepts, including 38.88 meters averaging 51.62 grams of gold per tonne from a depth of 14.5 m, which was the best intercept

at Tetlin in terms of high grades over broad widths. The North Peak area remains open to expansion on the northwest and southeast portions, as the last holes drilled were still in gold bearing skarn (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

A resource estimate was completed in 2013 for the Peak zone. The resource came from 78 of 140 holes, totaling 16,010 meters of drill core. An indicated resource with a 0.5 gram of gold per tonne equivalent cut-off yielded 5,970,000 tonnes at 3.46 grams of gold per tonne, 11.8 grams of silver per tonne, 0.25 percent copper, and a gold equivalent at 4.08 grams per tonne. The inferred resource also used a 0.5 gram of gold per tonne equivalent cut-off and yielded 3,850,000 tonnes at 2.07 grams of gold per tonne, 14.28 grams of silver per tonne, 0.23 percent copper, and 2.69 grams of gold per tonne equivalent (Freeman, 2014).

Contango’s December 2013 Tetlin project area report states an indicated resource of 5.97 million tonnes at a grade of 3.46 grams of gold per tonne (664,000 ounces of gold), 11.8 grams of silver per tonne, and 0.25 percent copper. In addition, there is an inferred resource of 3.85 million tonnes at a grade of 2.07 grams of gold per tonne (256,000 ounces of gold), 14.28 grams of silver per tonne, and 0.23 percent copper. These estimated resources are based on 16,010 meters of core in 78 of 130 holes, assuming prices of $1,318 per ounce of gold, $21.55 per ounce of silver, and $3.25 per pound of copper (Athey and Werdon, 2017). An updated resource is planned for release in 2017.

Additional comments:

This prospect is on Tetlin Native lands and Contango Ore Inc. is operating under a 10-year lease with the Tetlin Village Council that begin in July 2008.

Gold equivalent was calculated using gold at 1,318 US dollars per ounce, copper at 3.25 US dollars per pound, and silver at 21.55 US dollars per ounce (Freeman, 2014).

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Avalon Development Corporation, 2014, Tetlin Gold-Copper-Silver Project, January 2014 Summary: http://www.avalonalaska.com/Tetlin_Project_Summary-Jan2014.pdf (as of June 3, 2014).

Contango Ore Inc., 2012, Corporate overview: http://www.contangoore.com/presentations/20120206.pdf (February, 2012).

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Freeman, C., 2014, Geology and Mineralization of the Peak Zone Au-Cu-Ag Deposit, Tetlin Project, Alaska, for Avalon Development Corp and Contango ORE Inc.: http://www.avalonalaska.com/CordRoundup-Tetlin_Summary-26Jan14_noTTF-Final.pdf (as of June 3, 2014).

Illig, P., 2014, Alaska's Newest Gold Deposit: Mineralization and geochemistry of the Peak Zone Distal Gold Skarn,Ttetlin Project, Tok, Alaska, Avalon Development Corporation:

Primary Reference: Contango Ore Inc., 2012

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon

(DGGS)

Last report date: 2017-08-26

Site name(s): Chief Danny: Saddle Zone

Site type: Prospect

ARDF no.: TC041

Latitude: 63.2042 **Quadrangle:** TC A-4

Longitude: 142.8983

Location description and accuracy:

The Saddle Zone prospect is about 1.5 miles north of VABM 3345 'Tetlin' and about 9 miles northwest of the center of Tetlin Lake. The prospect is centered about 0.5 mile south of the center of section 34, T. 17 N., R. 13 E., of the Copper River Meridian. The location is accurate to within 500 feet.

Commodities:

Main: Au, Cu

Other: As

Ore minerals: Chalcopyrite?, gold

Gangue minerals: Quartz?

Geologic description:

There is little specific information about the Saddle Zone prospect other than it was discovered and drilled in conjunction with the Peak Zone prospect (TC040), about 2 miles to the south-southwest (Contango Ore Inc., 2012). Both of these zones are considered part of the Chief Danny prospect. It is assumed that they share the same geology and style of mineralization, although they are offset vertically by a fault.

The Saddle Zone prospect was first identified in 2009 in the search for the source of anomalous panned-concentrate, stream-sediment samples (Contango Ore Inc., 2012). Soil augering and geochemical surveys in 2010 and 2011 expanded the potential area of mineralization. Three holes were drilled on the Saddle Zone prospect in 2011; only 'weak mineralization' was found.

There is little detailed mapping in the area. Foster (1970) indicates that the rocks in the area are mainly Paleozoic or Precambrian biotite gneiss and schist or Paleozoic phyllite and schist. A cross-section through the drill holes at the nearby Chief Danny prospect indicates that the rocks are mainly greenstone and schist (Contango Ore Inc., 2012). The Saddle Zone prospect is associated with a strong magnetic low.

District and regional scale northeast and northwest trending faults are present on the project and are often associated with gold and copper mineralization in this terrane (Avalon Development Corporation, 2014).

As of 2014, the prospect is described as a diatreme polymictic breccia that is gold and arsenic rich, and copper poor. This diatreme is interpreted to be an ignimbrite filling a magmatic diatreme vent and is periphery to a prospective gold-silver target (Freeman, 2014).

Alteration:

Not described.

Age of mineralization:

Only that it is younger than the Paleozoic or Precambrian host rocks (Foster, 1970).

Generic deposit model:

Deposit model:

Insufficient data to assign.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The Saddle Zone prospect was first identified in 2009 in the search for the source of anomalous panned-concentrate stream-sediment samples (Contango Ore Inc., 2012). Soil augering and geochemical surveys in 2010 and 2011 expanded the potential area of mineralization. Three holes were drilled on the Saddle prospect in 2011.

Peak Gold, LLC is a joint venture formed in 2015 between Contango ORE Inc. and Royal Alaska, LLC, a wholly owned subsidiary of Royal Gold Inc., to explore the Tetlin project area south of Tok, which contains the Peak and North Peak polymetallic gold-silver-copper skarn deposits (TC040), and numerous other prospects and prospective targets (including TC041). Royal Alaska has the option to invest up to $30 million through October 2018 to earn up to a 40 percent interest in the joint venture; through December 31, 2016, Royal Alaska has earned a 20.6 percent interest (Athey and Werdon, 2017).

With a budget of $11 million aimed at expanding the gold- and copper-rich skarn deposits in the Tetlin project area, Peak Gold conducted Alaska’s largest exploration program for 2016. Peak Gold completed a three-phase drilling program: 19 core holes drilled in Phase I, 62 holes in Phase II, and 37 holes in Phase III, for a total of 20,522.8 m. The 2016 drilling traced a roughly 2,000-meter-long arc of contiguous, high-grade skarn mineralization, which is about three times the footprint of the Peak deposit described in Contango’s 2013 initial resource. One hole drilled in the 2016 expansion area cut three gold-rich intercepts, including 38.88 meters averaging 51.62 grams of gold per tonne from a depth of 14.5 m, which was the best intercept at Tetlin in terms of high grades over broad widths. The North Peak area remains open to expansion on the northwest and southeast portions, as the last holes drilled were still in gold bearing skarn (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

Contango’s December 2013 Tetlin project area report states an indicated resource of 5.97 million tonnes at a grade of 3.46 grams of gold per tonne (664,000 ounces of gold), 11.8 grams of silver per tonne, and 0.25 percent copper. In addition, there is an inferred resource of 3.85 million tonnes at a grade of 2.07 grams of gold per tonne (256,000 ounces of gold), 14.28 grams of silver per tonne, and 0.23 percent copper. These estimated resources are based on 16,010 meters of core in 78 of 130 holes, assuming prices of $1,318 per ounce of gold, $21.55 per ounce of silver, and $3.25 per pound of copper (Athey and Werdon, 2017). An updated resource is planned for release in 2017.

Additional comments:

This prospect is on Tetlin Native lands and Contango Ore Inc. is operating under a 10-year lease with the Tetlin Village Council that begin in July 2008.

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Avalon Development Corporation, 2014, Tetlin Gold-Copper-Silver Project, January 2014 Summary: http://www.avalonalaska.com/Tetlin_Project_Summary-Jan2014.pdf (as of June 3, 2014).

Contango Ore Inc., 2012, Corporate overview: http://www.contangoore.com/presentations/20120206.pdf

(February, 2012).

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Freeman, C., 2014, Geology and Mineralization of the Peak Zone Au-Cu-Ag Deposit, Tetlin Project, Alaska, for Avalon Development Corp and Contango ORE Inc., http://www.avalonalaska.com/CordRoundup-Tetlin_Summary-26Jan14_noTTF-Final.pdf (as of June 3,

Primary Reference: Contango Ore Inc., 2012

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Shalosky

Site type: Prospect

ARDF no.: TC042

Latitude: 63.1482 **Quadrangle:** TC A-6

Longitude: 143.9618

Location description and accuracy:

The Shalosky prospect is about 8.4 miles west of the junction of the Tok and Dry Tok Rivers. It is about 1.6 miles south-southwest of VABM 7302 'White'; about 0.5 mile southeast of the center of section 19, T. 16 N., R. 8 E., of the Copper River Meridian. The location is accurate within 1/4 mile.

Commodities:

Main: Au, Au, Sb

Other: As, Bi, Cu, Pb, Sb, Te, Zn

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

The rocks in the area are part of the Tok Schist and consists mainly of quartz-muscovite schist with a thick layer of quartz-chlorite schist (Rhyolite Resources Ltd., 2012a). The Tok Schist is cut by several steep to vertical faults, one of which control the trend of the mineralization at the Shalosky prospect. To the north across a north-dipping thrust fault, the rocks are a folded sequence of argillaceous sediments, felsic-sulphidic schist, chlorite schist, feldspar-quartz schist, banded sedimentary rocks, and gabbro. The age of the rocks is uncertain; Foster (1970) only indicates that they are Paleozoic or Mesozoic.

The mineralization in the area is sediment hosted and controlled by structure; it is associated with zones of silicification and quartz-vein stockwork (Rhyolite Resources Ltd., 2012b). Sulfides vary from 1 to more than 20 percent of the mineralization. There is a strong geochemical association of the gold with arsenic and antimony; copper, lead, zinc, bismuth, tellurium, and silver are low.

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Ltd., 2012a; 2012b). They collected many rock and geochemical samples, trenched, and drilled 12 holes totaling 1,174 meters, but the data are not publicly available. In 2009, Rhyolite Resources acquired the property and identified 3 high-priority areas that included the Shalosky prospect.

Placer Dome drilled at least two holes at the Shalosky prospect (Rhyolite Resources Ltd., 2012a; 2012b). Some notable intercepts were 38.2 meters with 0.8 gram of gold per tonne, including 1.3 meters with 17.8 grams of gold per tonne; and 17.5 meters with 1.2 grams of gold per tonne, including 7.0 meters with 2.2 grams of gold per tonne.

Rhyolite Resources Ltd. (2012a; 2012b) diamond drilled eight holes totaling 1,388 meters, along about 600 meters of the Shalosky zone. The zone is associated with a regional east-northeast striking, steeply dipping, mineralized structure up about 35 meters wide that appears to widen at depth. Seven of the eight holes cut significant gold mineralization. Some notable intercepts are 23.1 meters with 3.5 grams of gold per tonne, and 69.0 meters with 1.7 grams of gold per tonne. The mineralization occurs in two styles. The highest-grade mineralization with values of 5 to 23 grams of gold per tonne is associated with quartz veins and several periods of brecciation. Lower grade mineralization with values from 0.2 to 4 grams of gold per tonne is associated with pervasive hydrothermal alteration characterized by intense clay alteration and local silicification.

Alteration:

Lower grade mineralization is characterized by intense clay alteration and local silicification (Rhyolite Resources Ltd., 2012b).

Age of mineralization:

Unknown other than that it is younger than the Paleozoic or Mesozoic host rocks (Foster, 1970).

Generic deposit model:

Deposit model:

Gold-quartz in veins and brecciated zones; lower grade disseminated mineralization? (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active

Workings/exploration:

The earliest documented samples of gold mineralization from Shalosky Prospect were collected in 1995 by geologist Bill Shalosky exploring on behalf of American Copper & Nickel Company, Inc. (S. Dashevsky, written communication, 2014).

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Ltd., 2012a). They collected many rock and geochemical samples, trenched, and drilled 12 holes totaling 1,174 meters in the area but the data are not publicly available. Placer Dome drilled at least two holes at the Shalosky prospect (Rhyolite Resources Ltd., 2012b). In 2009, Rhyolite Resources acquired the property and identified 3 high-priority areas that included the Shalosky prospect. Rhyolite diamond drilled 8 holes totaling 1,388 meters, along about 600 meters of the Shalosky zone (Rhyolite Resources Ltd., 2012a; 2012b).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Rhyolite Resources Ltd. 2012a, (Corporate Presentation): http://www.rhyoliteresources.com/in/pdf/CorporatePresentation.pdf (as of February 18, 2012).

Rhyolite Resources Ltd., 2012b, Projects overview: http://www.rhyoliteresources.com/s/Projects.asp (as of February 23, 2012).

Primary Reference: Rhyolite Resources Ltd., 2012

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-03

Site name(s): Hunter

Site type: Prospect

ARDF no.: TC043

Latitude: 63.1393 **Quadrangle:** TC A-6

Longitude: 143.9457

Location description and accuracy:

The Hunter prospect is about 8.0 miles west-southwest of the junction of the Tok and Dry Tok Rivers. It is about 2.0 miles south of VABM 7302 'White'; about 0.2 mile west of the center of section 29, T. 16 N., R. 8 E., of the Copper River Meridian. The location is accurate to within 500 feet.

Commodities:

Main: Ag, Au, Sb, W

Other: As, Bi, Cu, Pb, Te, Zn

Ore minerals:

Gangue minerals: Quartz

Geologic description:

The rocks in the area are part of the Tok Schist and consists mainly of quartz-muscovite schist with a thick layer of quartz-chlorite schist (Rhyolite Resources Ltd., 2012a). The Tok Schist is cut by several steep to vertical faults, one of which control the trend of the mineralization at the nearby Shalosky prospect (TC042). To the north across a north-dipping thrust fault, the rocks are a folded sequence of argillaceous sediments, felsic-sulphidic schist, chlorite schist, feldspar-quartz schist, banded sedimentary rocks, and gabbro. The age of the rocks is uncertain; Foster (1970) only indicates that they are Paleozoic or Mesozoic.

The mineralization in the area is sediment hosted and controlled by structure; it is associated with zones of silicification and quartz-vein stockwork (Rhyolite Resources Ltd., 2012b). Sulfides vary from 1 to more than 20 percent of the mineralization. There is a strong geochemical association of the gold with arsenic and antimony; copper, lead, zinc, bismuth, tellurium, and silver are low.

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Ltd., 2012a); Rhyolite Resources Ltd., 2012b). They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters in the area, but the data are not publicly available. It is likely that they discovered the Hunter prospect and drilled at least one hole. In 2009, Rhyolite Resources acquired the property and identified 3 high-priority areas that included the Hunter prospect.

The one Placer Dome hole cut 4.4 meters with 0.8 gram of gold per tonne. Rhyolite Resources Ltd. (2011; 2012a; 2012b) drilled two holes totaling 323 meters at the Hunter prospect in 2011 and collected surface samples. A trench 6.3 meters long averaged 9.6 grams of gold per tonne and they drilled where surface samples contained up to 50.8 grams of gold per tonne. Neither of the Rhyolite holes cut significant gold values. One hole cut 3.9 meters with 256.1 grams of silver per tonne; this included 0.9 meter that contained 963 grams of silver per tonne and 6,230 parts per million tungsten. The mineralization is associated with highly fractured and altered metasedimentary rocks that hindered core recovery.

Alteration:

The mineralization is associated with highly fractured and altered metasedimentary rocks (Rhyolite Resources Ltd., 2012b).

Age of mineralization:

Unknown other than that it is younger than the Paleozoic or Mesozoic host rocks (Foster, 1970).

Generic deposit model:

Deposit model:

Gold-quartz in veins and brecciated zones; lower grade disseminated mineralization? (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active

Workings/exploration:

Gold mineralized schist with quartz-sulfide veining and alteration was discovered in outcrop by geologist Ed Hunter in 1996 exploring on behalf of American Copper & Nickel Company, Inc. (S. Dashevsky, President, Northern Associates Inc., written communication, 2014).

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored in the area (Rhyolite Resources Ltd., 2012a; 2012b). They collected many rock and geochemical samples, trenched, and drilled 12 holes totaling 1,174 meters,but the data is not publicly available. It is likely that they discovered the Hunter prospect and drilled at least one hole.

In 2001, a 50 meter long trench was sampled for Grayd Resources Inc. with a reported 6.3 meter section returning 9.6 grams of gold per tonne. A 2001 diamond drill hole collared approximately 50 meters east of the Hunter trench reportedly returned a best interval of 0.8 gram of gold per tonne over 4.4 meters. Field indications suggest that the mineralized target was not adequately tested by the orientation of that single drill hole (Rhyolite Resources Ltd., 2014).

In 2009, Rhyolite Resources acquired the property and identified 3 high-priority areas that included the Hunter prospect. Rhyolite Resources Inc. (2012a; 2012b) drilled two holes totaling 323 meters at the Hunter prospect in 2011 and collected surface samples (S. Dashevsky, President, Northern Associates Inc., written communication, 2014).

During the 2010 field season, Northern Associates, Inc. geologists working on behalf of Rhyolite Resources Ltd. collected confirmation grab samples from the collapsed trench that returned 5.37 grams of gold per tonne and 50.80 grams of gold per tonne, while a 2.5 meter channel sample returned 1.0 gram of gold per tonne (S. Dashevsky, President, Northern Associates Inc., written communication, 2014).

In 2011, Rhyolite Resources again attempted to test the Hunter prospect with two core holes, comprising 323 meters collared at the Hunter showing, by drilling at an opposing azimuth to the 2001 hole drilled by Grayd & Placer-Dome (S. Dashevsky, President, Northern Associates Inc., written communication, 2014). Neither hole encountered significant gold mineralization, but highly anomalous silver/tungsten values were found in highly broken and altered metasediments at the interface of overburden and bedrock. The mineralized interval had very poor core recovery - less than 50 percent. The very high silver value was 963 grams of silver per tonne (Rhyolite Resources Ltd., 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Rhyolite Resources, Ltd., 2011, Rhyolite drilling extends gold discoveries at Paxson: Highlight include 1.6 gr/t Au over 70.1 meters. 1.0 g/t Au over 100.1 m and 8.6 g/t over 2.2 m: http://www.rhyoliteresources.com/s/NewsReleases.asp?ReportID=490614&_Type=News-Releases&_Title=Rhyolite-Drilling-Extends-Gold-Discoveries-at-Paxson-Highlights-Include-1.6... (News release, November 8, 2011).

Rhyolite Resources Ltd. 2012a, (Corporate Presentation): http://www.rhyoliteresources.com/i/pdf/CorporatePresentation.pdf (as of February 18, 2012).

Rhyolite Resources Ltd., 2012b, Projects overview: http://www.rhyoliteresources.com/s/Projects.asp (as of February 23, 2012).

Rhyolite Resources Ltd., 2014, Paxson Project:

Primary Reference: Rhyolite Resources Ltd., 2014

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-12

Site name(s): Low

Site type: Prospect

ARDF no.: TC044

Latitude: 63.1478 **Quadrangle:** TC A-6

Longitude: 143.9024

Location description and accuracy:

The Low prospect is about 6.7 miles west of the junction of the Tok and Dry Tok Rivers. It is about 2.0 miles south-southeast of VABM 7302 'White' and about 0.4 mile south-southeast of the center of section 16, T. 16 N., R. 8 E., of the Copper River Meridian. The location is accurate within 1/4 mile.

Commodities:

Main: Au

Other: Ag, As, Bi, Cu, Pb, Te, Sb, Zn

Ore minerals: Arsenopyrite, gold

Gangue minerals: Muscovite, quartz

Geologic description:

The rocks in the area are part of the Tok Schist and consists mainly of quartz-muscovite schist with a thick layer of quartz-chlorite schist (Rhyolite Resources Ltd., 2012a). The Tok Schist is cut by several steep to vertical faults, one of which controls the trend of the mineralization at the nearby Shalosky prospect (TC042). To the north across a north-dipping thrust fault, the rocks are a folded sequence of argillaceous sediments, felsic-sulphidic schist, chlorite schist, feldspar-quartz schist, banded sedimentary rocks, and gabbro. The age of the rocks is uncertain; Foster (1970) only indicates that they are Paleozoic or Mesozoic.

The mineralization in the area is sediment hosted and controlled by structure; it is associated with zones of silicification and quartz-vein stockwork (Rhyolite Resources Ltd., 2012b). (Unstated) sulfides vary from 1 to more than 20 percent of the mineralization. There is a strong geochemical association of the gold with arsenic and antimony; copper, lead, zinc, bismuth, tellurium, and silver are low.

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Ltd., 2012a; 2012b). They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters, but the data are not publicly available. It is likely that they discovered the Low prospect. In 2009, Rhyolite Resources acquired the property and identified 3 high-priority areas that included the Low prospect.

Rhyolite Resources Ltd. (2011a; 2011b; 2012a; 2012b) drilled four holes totaling 537 meters at the Low prospect in 2011 and collected surface samples. The Tok Schist in the vicinity consists of highly altered, oxidized, calcareous metasedimentary rocks intruded by mafic/intermediate dikes. Samples of a trench 26.2 meters long contained up to 15.74 grams of gold per tonne. Two of the holes cut mineralization; notable intercepts were 13.6 meters with 3.4 grams of gold per tonne and 5.5 meters with 4.2 grams of gold per tonne. The Low prospect is associated with a steeply dipping shear zone with quartz veining, brecciation, and fault gouge. The mineralized structure has been traced for 150 meters on the surface.

Alteration:

Hydrothermal-silica and muscovite (Rhyolite Resources Ltd., 2014). Mineralization is associated with highly altered, oxidized calcareous metasedimentary rocks intruded by mafic/intermediate dikes (Rhyolite Resources Ltd., 2011b).

Age of mineralization:

Unknown other than that it is younger than the Paleozoic or Mesozoic host rocks (Foster, 1970).

Generic deposit model:

Deposit model:

Gold-quartz in veins and brecciated zones; lower grade disseminated mineralization? (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active

Workings/exploration:

The earliest documented samples of gold mineralization from Low Prospect were collected in 1996 by prospector Adam Low who found quartz-stibnite boulders and arsenopyrite bearing float while exploring on behalf of American Copper & Nickel Company, Inc (ACNC). Subsequent work by ACNC and Grayd Resources located and trenched a source area shedding the gold-arsenopyrite mineralization in talus, but not the stibnite style of mineralization. (S. Dashevsky, President, Northern Associates Inc., oral communication, 2014).

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored in the area (Rhyolite Resources Ltd., 2012a; 2012b). They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters, but the data are not publicly available. It is likely that they discovered the Low prospect and may have drilled it. In 2009, Rhyolite Resources acquired the property and identified 3 high-priority areas that included the Low prospect.

In 2010 geologists from Northern Associates, Inc. collected a series of three contiguous one meter long samples from sub-talus bedrock on behalf of Rhyolite Resources Ltd., which returned gold assays of 8.75 grams per tonne, 18.95 grams per tonne, and 12.4 grams per tonne . Five meters to the west, two contiguous one meter samples returned 3.51 grams of gold per tonne and 3.03 grams of gold per tonne. A further 150 meters to the west, channel sampling returned a weighted average of 3.76 grams of gold per tonne over 4 meters with a perpendicular channel sample yielding 6.23 grams of gold per tonne over 0.5 meter. Individual rock samples collected along the Low zone returned from 0.01 gram of gold per tonne to 18.95 grams of gold per tonne (Rhyolite Resources Inc., 2014).

Rhyolite Resources Ltd. completed a four hole diamond drill program, totaling 537 meters, in 2011 and collected surface samples. Two holes targeting the Hi-Low Showing encountered significant gold values within oxidized, carbonaceous fragmented schists and, silica and muscovite alteration that is associated with intermediate and mafic dikes (WG11-05: 27.4 meters at 1.9 grams of gold per tonne including 2.8 meters of 14.2 grams of gold per tonne). The dikes appear to have utilized the same structures as the mineralizing fluids, and they are themselves altered and locally auriferous (WG11-06: 2.2 meters at 8.6 grams of gold per tonne). In other cases, dikes are barren. Thus the relationship between dikes and the auriferous hydrothermal system remains poorly constrained (Rhyolite Resources Inc., 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Rhyolite Resources Ltd., 2011a, Rhyolite drills 14.2 g/t gold over 2.8 meters at Low – Significantly increases land package at Paxton: http://www.rhyoliteresources.com/s/NewsReleases.asp?ReportID=484634&_Type=News-Releases&_Title=Rhyolite-Drills-14.2-gt-Gold-Over-2.8-Meters-at-Low-Significantly-Increases... (News release, September 7, 2011).

Rhyolite Resources Ltd., 2011b, Rhyolite drilling extends gold discoveries at Paxson: Highlight include 1.6 gr/t Au over 70.1 meters. 1.0 g/t Au over 100.1 m and 8.6 g/t over 2.2 m: http://www.rhyoliteresources.com/s/NewsReleases.asp?ReportID=490614&_Type=News-Releases&_Title=Rhyolite-Drilling-Extends-Gold-Discoveries-at-Paxson-Highlights-Include-1.6... (News release, November 8, 2011).

Rhyolite Resources Ltd. 2012a, (Corporate Presentation): http://www.rhyoliteresources.com/i/pdf/CorporatePresentation.pdf (as of February 18, 2012).

Rhyolite Resources Ltd., 2012b, Projects overview: http://www.rhyoliteresources.com/s/Projects.asp (as of February 23, 2012).

Primary Reference: Rhyolite Resources Ltd., 2014

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-12

Site name(s): Low South

Site type: Prospect

ARDF no.: TC045

Latitude: 63.1392

Quadrangle: TC A-6

Longitude: 143.9022

Location description and accuracy:

The Low South prospect is about 6.6 miles west of the junction of the Tok and Dry Tok Rivers. It is about 2.3 miles south-southeast of VABM 7302 'White' near the center of section 28, T. 16 N., R. 8 E. The location is accurate.

Commodities:

Main: As, Au, Sb

Other: Bi, Cu, Pb, Te, Zn

Ore minerals: Gold

Gangue minerals: Quartz

Geologic description:

The rocks in the area are part of the Tok Schist and consists mainly of quartz-muscovite schist with a thick layer of quartz-chlorite schist (Rhyolite Resources Inc., 2012 [February 18]). The Tok Schist is cut by several steep to vertical faults, one of which control the trend of the mineralization at the nearby Shalosky prospect (TC042). To the north across a north-dipping thrust fault, the rocks are a folded sequence of argillaceous sediments, felsic-sulphidic schist, chlorite schist, feldspar-quartz schist, banded sedimentary rocks, and gabbro. The age of the rocks is uncertain; Foster (1970) only indicates that they are Paleozoic or Mesozoic.

The mineralization in the area is sediment hosted and controlled by structure; it is associated with zones of silicification and quartz-vein stockwork (Rhyolite Resources Inc., 2012 [February 23]). (Unstated) sulfides vary from 1 to more than 20 percent of the mineralization. There is a strong geochemical association of the gold with arsenic and antimony; copper, lead, zinc, bismuth, tellurium, and silver are low.

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Inc., 2012 [February 18]; 2012 [February 23]. They collected many rock and geochemical samples, trenched, and drilled 12 holes in the are totaling 1,174 meters but the data are not publicly available. It is likely that they discovered the Low South prospect. In 2009, Rhyolite Resources acquired the property and they show the Low South as a distinct prospect within the area they mapped and sampled.

Rhyolite Resources Inc. (2011 [September 7, 2011]; 2011 [November 8]; 2012 [February 18]; 2012 [February 23]) noted that a rock sample collected at the Low South prospect contained 19 grams of gold per tonne. The Tok Schist in the vicinity consists of highly altered, oxidized calcareous metasedimentary rocks intruded by mafic/intermediate dikes. The Low South prospect is probably similar to the Low prospect (TC044) about a half mile north.

Alteration:

Not specifically noted but see the nearby Low prospect (TC044).

Age of mineralization:

Unknown other than that it is younger than the Paleozoic or Mesozoic host rocks.

Generic deposit model:

Deposit model:

Gold-quartz in veins and brecciated zones; lower grade disseminated mineralization (Cox and Singer, 1986; model 22c?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active

Workings/exploration:

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Inc., 2012 [February 18]; 2012 [February 23]). They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters but the data are not publicly available. It is likely that they discovered the Low South prospect. In 2009, Rhyolite Resources acquired the property and they show the Low South as one of several distinct prospects within the area. Through 2011, Rhyolite had not drilled the prospect but they mapped and sampled it.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Rhyolite Resources Ltd., 2012, Projects overview: http://www.rhyoliteresources.com/s/Projects.asp (as of February 23, 2012).

Rhyolite Resources Ltd. 2012, (Corporate Presentation): http://www.rhyoliteresources.com/in/pdf/CorporatePresentation.pdf (as of February 18, 2012).

Primary Reference: Rhyolite Resources Ltd., 2012 [February 18, 2012]

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): HDS

Site type: Prospect

ARDF no.: TC046

Latitude: 63.1748 **Quadrangle:** TC A-6

Longitude: 143.8881

Location description and accuracy:

The HDS prospect is about 6.5 miles west-northwest of the junction of the Tok and Dry Tok Rivers. It is about 1.6 miles east-northwest of VABM 7302 'White' near the southwest corner of section 10, T. 16 N., R. 8 E. The location is accurate.

Commodities:

Main: Cu, Pb, Zn

Other:

Ore minerals:

Gangue minerals:

Geologic description:

The rocks in the area are part of the Tok Schist and consists mainly of quartz-muscovite schist with a thick layer of quartz-chlorite schist (Rhyolite Resources Inc., 2012 [February 18]). The Tok Schist is cut by several steep to vertical faults, one of which control the trend of the mineralization at the nearby Shalosky prospect (TC042). To the north across a north-dipping thrust fault, the rocks are a folded sequence of argillaceous sediments, felsic-sulphidic schist, chlorite schist, feldspar-quartz schist, banded sedimentary rocks, and gabbro. The age of the rocks is uncertain; Foster (1970) only indicates that they are Paleozoic or Mesozoic.

The mineralization in the area is sediment hosted and controlled by structure; it is associated with zones of silicification and quartz-vein stockwork (Rhyolite Resources Inc., 2012 [February 23]). (Unstated) sulfides vary from 1 to more than 20 percent of the mineralization. There is a strong geochemical association of the gold with arsenic and antimony; copper, lead, zinc, bismuth, tellurium, and silver are low.

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Inc., 2012 [February 18]; 2012 [February 23]. They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters but the data are not publicly available. It is likely they examined and sampled the HDS prospect. There is mention of a 1997 drill hole of unknown provenance.

In 2009, Rhyolite Resources acquired a large block of claims that covered the prospect and they show the HDS as a distinct prospect within the area they have mapped and sampled. Through 2011, Rhyolite had not drilled the HDS prospect but they mapped and sampled it. The mineralization at the HDS is unlike most of the other prospects in the area. A sample of massive-sulfide float contained 1.4 percent copper, 13.5 percent lead, and 13.8 percent zinc. They also note an intercept 0.2 foot long in a 1997 drill hole with 4.4 percent lead and 3.2 percent zinc.

Alteration:

Not noted.

Age of mineralization:

Unknown other than that it is younger than the Paleozoic or Mesozoic host rocks.

Generic deposit model:

Deposit model:
Volcanogenic copper-lead-zinc massive sulfide?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:
From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored in the area (Rhyolite Resources Inc., 2012 [February 18]; 2012 [February 23]). They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters but the data are not publicly available. It is likely that they discovered the HDS prospect and sampled it. In 2009, Rhyolite Resources acquired a large block of claims that covered the prospect and they show the HDS as a distinct prospect within the area they have mapped and sampled. There is mention of a 1997 hole drilled by an unknown party.

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Rhyolite Resources Ltd., 2012, Projects overview: http://www.rhyoliteresources.com/s/Projects.asp (as of February 23, 2012).

Rhyolite Resources Ltd. 2012, (Corporate Presentation): http://www.rhyoliteresources.com/in/pdf/CorporatePresentation.pdf (as of February 18, 2012).

Primary Reference: Rhyolite Resources, 2012 [February 18, 2012].

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Flicka

Site type: Prospect

ARDF no.: TC047

Latitude: 63.1677 **Quadrangle:** TC A-6

Longitude: 143.879

Location description and accuracy:

The Flicka prospect is on a ridge top about 6.0 miles west-northwest of the junction of the Tok and Dry Tok Rivers. It is about 1.9 miles east of VABM 7302 'White', near the center of section 15, T. 16 N., R. 8 E. The location is accurate.

Commodities:

Main: As, Au, Sb

Other: Bi, Cu, Pb, Te, Zn

Ore minerals: Gold

Gangue minerals: Quartz?

Geologic description:

The rocks in the area are part of the Tok Schist and consists mainly of quartz-muscovite schist with a thick layer of quartz-chlorite schist (Rhyolite Resources Inc., 2012 [February 18]). The Tok Schist is cut by several steep to vertical faults, one of which control the trend of the mineralization at the nearby Shalosky prospect (TC042). To the north across a north-dipping thrust fault, the rocks are a folded sequence of argillaceous sediments, felsic-sulphidic schist, chlorite schist, feldspar-quartz schist, banded sedimentary rocks, and gabbro. The age of the rocks is uncertain; Foster (1970) only indicates that they are Paleozoic or Mesozoic.

The mineralization in the area is sediment hosted and controlled by structure; it is associated with zones of silicification and quartz-vein stockwork (Rhyolite Resources Inc., 2012 [February 23]). (Unstated) sulfides vary from 1 to more than 20 percent of the mineralization. There is a strong geochemical association of the gold with arsenic and antimony; copper, lead, zinc, bismuth, tellurium, and silver are low.

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Inc., 2012 [February 18]; 2012 [February 23]). They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters but the data are not publicly available. It is likely they examined and sampled the Flicka prospect and they may have discovered it.

In 2009, Rhyolite Resources acquired a large block of claims that covered the prospect and they show the Flicka as a distinct prospect. Through 2011, Rhyolite had not drilled the deposit but it is likely that they examined if not sampled the prospect. They note that a (rock?) sample contained 2.2 grams of gold per tonne but give no other information on the prospect. The Flicka prospect is probably similar to several other gold projects in the area, the best known of which the Shalosky prospect (TC042).

Alteration:

Age of mineralization:

Unknown other than that it is younger than the Paleozoic or Mesozoic host rocks.

Generic deposit model:

Deposit model:

Insufficient data to assign and several different types of deposits occur nearby.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Inc., 2012 [February 18]; 2012 [February 23]). They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters but the data are not publicly available. It is likely they examined and sampled the Flicka prospect and they may have discovered it. In 2009, Rhyolite Resources acquired a large block of claims that covered the prospect and they show the Flicka as a distinct prospect. Through 2011, Rhyolite had not drilled the prospect but they mapped and sampled it.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Rhyolite Resources Ltd., 2012, Projects overview: http://www.rhyoliteresources.com/s/Projects.asp (as of February 23, 2012).

Rhyolite Resources Ltd. 2012, (Corporate Presentation): http://www.rhyoliteresources.com/in/pdf/CorporatePresentation.pdf (as of February 18, 2012).

Primary Reference: Rhyolite Resources Inc., 2012 [February 18]

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): HD Saddle

Site type: Prospect

ARDF no.: TC048

Latitude: 63.1675

Quadrangle: TC A-6

Longitude: 143.904

Location description and accuracy:

The HD Saddle prospect is about 7.0 miles west-northwest of the junction of the Tok and Dry Tok Rivers. It is about 1.1 miles east of VABM 7302 'White', near the center of section 16, T. 16 N., R. 8 E. The location is accurate.

Commodities:

Main: As, Au, Sb

Other: Bi, Cu, Pb, Te, Zn

Ore minerals:

Gangue minerals: Quartz?

Geologic description:

The rocks in the area are part of the Tok Schist and consists mainly of quartz-muscovite schist with a thick layer of quartz-chlorite schist (Rhyolite Resources Inc., 2012 [February 18]). The Tok Schist is cut by several steep to vertical faults, one of which control the trend of the mineralization at the nearby Shalosky prospect (TC042). To the north across a north-dipping thrust fault, the rocks are a folded sequence of argillaceous sediments, felsic-sulphidic schist, chlorite schist, feldspar-quartz schist, banded sedimentary rocks, and gabbro. The age of the rocks is uncertain; Foster (1970) only indicates that they are Paleozoic or Mesozoic.

The mineralization in the area is sediment hosted and controlled by structure; it is associated with zones of silicification and quartz-vein stockwork (Rhyolite Resources Inc., 2012 [February 23]). (Unstated) sulfides vary from 1 to more than 20 percent of the mineralization. There is a strong geochemical association of the gold with arsenic and antimony; copper, lead, zinc, bismuth, tellurium, and silver are low.

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Inc., 2012 [February 18]; 2012 [February 23]). They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters but the data are not publicly available. It is likely they examined and sampled the HD Saddle prospect and they may have discovered it.

In 2009, Rhyolite Resources Inc. (2012 [February 23])acquired a large block of claims that covered the HD Saddle prospect. They drilled two holes; the best intercept was 10.9 meters that contained 0.05 gram of gold per ton. They also note that a (rock?) sample contained 6.2 grams of gold per tonne. The HD Saddle prospect is probably similar to several other gold projects in the area, the best known of which the Shalosky prospect (TC042).

Alteration:

Age of mineralization:

Unknown other than that it is younger than the Paleozoic or Mesozoic host rocks.

Generic deposit model:

Deposit model:

Gold-quartz in veins and brecciated zones; lower grade disseminated mineralization (Cox and Singer, 1986; model 22c?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active

Workings/exploration:

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Inc., 2012 [February 18]; 2012 [February 23]). They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters but the data are not publicly available. It is likely they examined and sampled the HD Saddle prospect and they may have discovered it.

In 2009, Rhyolite Resources Inc. (2012 [February 23]) acquired a large block of claims that covered the HD Saddle prospect. They drilled two holes; the best intercept was 10.9 meters that contained 0.05 gram of gold per ton.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Rhyolite Resources Ltd., 2012, Projects overview: http://www.rhyoliteresources.com/s/Projects.asp (as of February 23, 2012).

Rhyolite Resources Ltd. 2012, (Corporate Presentation): http://www.rhyoliteresources.com/in/pdf/CorporatePresentation.pdf (as of February 18, 2012).

Primary Reference: Rhyolite Resources Inc., 2012 [February 18]

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): EWE

Site type: Prospect

ARDF no.: TC049

Latitude: 63.1513 **Quadrangle:** TC A-6

Longitude: 143.9386

Location description and accuracy:

The Ewe prospect is about 7.7 miles west-northwest of the junction of the Tok and Dry Tok Rivers. It is about 1.3 miles south of VABM 7302 'White', near the center of section 20, T. 16 N., R. 8 E. The location is accurate.

Commodities:

Main: As, Au, Sb

Other: Bi, Cu, Pb, Te, Zn

Ore minerals:

Gangue minerals: Quartz?

Geologic description:

The rocks in the area are part of the Tok Schist and consists mainly of quartz-muscovite schist with a thick layer of quartz-chlorite schist (Rhyolite Resources Inc., 2012 [February 18]). The Tok Schist is cut by several steep to vertical faults, one of which control the trend of the mineralization at the nearby Shalosky prospect (TC042). To the north across a north-dipping thrust fault, the rocks are a folded sequence of argillaceous sediments, felsic-sulphidic schist, chlorite schist, feldspar-quartz schist, banded sedimentary rocks, and gabbro. The age of the rocks is uncertain; Foster (1970) only indicates that they are Paleozoic or Mesozoic.

The mineralization in the area is sediment hosted and controlled by structure; it is associated with zones of silicification and quartz-vein stockwork (Rhyolite Resources Inc., 2012 [February 23]). (Unstated) sulfides vary from 1 to more than 20 percent of the mineralization. There is a strong geochemical association of the gold with arsenic and antimony; copper, lead, zinc, bismuth, tellurium, and silver are low.

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Inc., 2012 [February 18]; 2012 [February 23]). They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters but the data are not publicly available. It is likely they examined and sampled the Ewe prospect and they may have discovered it.

In 2009, Rhyolite Resources acquired a large block of claims that covered the prospect and they show the Ewe as a distinct prospect. Through 2011, Rhyolite had not drilled the deposit but it is likely that they examined if not sampled the prospect. They note that a (rock?) sample contained 12.3 grams of gold per tonne but give no other information on the prospect. The Ewe prospect is probably similar to several other gold projects in the area, the best known of which the nearby Shalosky prospect (TC042).

Alteration:

Age of mineralization:

Unknown other than that it is younger than the Paleozoic or Mesozoic host rocks.

Generic deposit model:

Deposit model:

Gold-quartz in veins and brecciated zones; lower grade disseminated mineralization. (Cox and Singer, 1986; model 22c?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active

Workings/exploration:

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Inc., 2012 [February 18]; 2012 [February 23]). They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters but the data are not publicly available. It is likely they examined and sampled the Ewe prospect and they may have discovered it. The prospect has not been drilled.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Rhyolite Resources Ltd., 2012, Projects overview: http://www.rhyoliteresources.com/s/Projects.asp (as of February 23, 2012).

Rhyolite Resources Ltd. 2012, (Corporate Presentation): http://www.rhyoliteresources.com/in/pdf/CorporatePresentation.pdf (as of February 18, 2012).

Primary Reference: Rhyolite Resources Inc., 2012 [February 18]

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): OTG

Site type: Prospect

ARDF no.: TC050

Latitude: 63.145

Quadrangle: TC A-6

Longitude: 143.9314

Location description and accuracy:

The OTG prospect is about 7.7 miles west-northwest of the junction of the Tok and Dry Tok Rivers. It is about 1.6 miles south of VABM 7302 'White' and about 0.5 mile north-northeast of the center of section 29, T. 16 N., R. 8 E. The location is accurate.

Commodities:

Main: As, Au, Sb

Other: Bi, Cu, Pb, Te, Zn

Ore minerals:

Gangue minerals: Quartz?

Geologic description:

The rocks in the area are part of the Tok Schist and consists mainly of quartz-muscovite schist with a thick layer of quartz-chlorite schist (Rhyolite Resources Inc., 2012 [February 18]). The Tok Schist is cut by several steep to vertical faults, one of which control the trend of the mineralization at the nearby Shalosky prospect (TC042). To the north across a north-dipping thrust fault, the rocks are a folded sequence of argillaceous sediments, felsic-sulphidic schist, chlorite schist, feldspar-quartz schist, banded sedimentary rocks, and gabbro. The age of the rocks is uncertain; Foster (1970) only indicates that they are Paleozoic or Mesozoic.

The mineralization in the area is sediment hosted and controlled by structure; it is associated with zones of silicification and quartz-vein stockwork (Rhyolite Resources Inc., 2012 [February 23]). (Unstated) sulfides vary from 1 to more than 20 percent of the mineralization. There is a strong geochemical association of the gold with arsenic and antimony; copper, lead, zinc, bismuth, tellurium, and silver are low.

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Inc., 2012 [February 18]; 2012 [February 23]). They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters but the data are not publicly available. It is likely they examined and sampled the OTG prospect and they may have discovered it. In 2009, Rhyolite Resources acquired a large block of claims that covered the prospect. Through 2011, Rhyolite had not drilled it. The OTG prospect is probably similar to several other gold projects in the area, the best known of which the nearby Shalosky prospect (TC042).

Alteration:

Age of mineralization:

Unknown other than that it is younger than the Paleozoic or Mesozoic host rocks.

Generic deposit model:

Deposit model:

Gold-quartz in veins and brecciated zones; lower grade disseminated mineralization. (Cox and Singer, 1986; model 22c?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active

Workings/exploration:

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Inc., 2012 [February 18]; 2012 [February 23]). They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters but the data are not publicly available. It is likely they examined and sampled the OTG prospect and they may have discovered it. In 2009, Rhyolite Resources acquired a large block of claims that covered the prospect. Through 2011, Rhyolite had not drilled it.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Rhyolite Resources Ltd., 2012, Projects overview: http://www.rhyoliteresources.com/s/Projects.asp (as of February 23, 2012).

Rhyolite Resources Ltd. 2012, (Corporate Presentation): http://www.rhyoliteresources.com/in/pdf/CorporatePresentation.pdf (as of February 18, 2012).

Primary Reference: Rhyolite Resources Inc., 2012 [February 18]

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Shalosky West

Site type: Prospect

ARDF no.: TC051

Latitude: 63.1403 **Quadrangle:** TC A-6

Longitude: 143.9786

Location description and accuracy:

The Shalosky West prospect is on a ridge top about 9.0 miles west-northwest of the junction of the Tok and Dry Tok Rivers. It is about 2.4 miles south of VABM 7302 'White' and about 0.3 mile northwest of the center of section 29, T. 16 N., R. 8 E. The location is accurate.

Commodities:

Main: As, Au, Sb

Other: Bi, Cu, Pb, Te, Zn

Ore minerals:

Gangue minerals: Quartz?

Geologic description:

The rocks in the area are part of the Tok Schist and consists mainly of quartz-muscovite schist with a thick layer of quartz-chlorite schist (Rhyolite Resources Inc., 2012 [February 18]). The Tok Schist is cut by several steep to vertical faults, one of which control the trend of the mineralization at the nearby Shalosky prospect (TC042). To the north across a north-dipping thrust fault, the rocks are a folded sequence of argillaceous sediments, felsic-sulphidic schist, chlorite schist, feldspar-quartz schist, banded sedimentary rocks, and gabbro. The age of the rocks is uncertain; Foster (1970) only indicates that they are Paleozoic or Mesozoic.

The mineralization in the area is sediment hosted and controlled by structure; it is associated with zones of silicification and quartz-vein stockwork (Rhyolite Resources Inc., 2012 [February 23]). (Unstated) sulfides vary from 1 to more than 20 percent of the mineralization. There is a strong geochemical association of the gold with arsenic and antimony; copper, lead, zinc, bismuth, tellurium, and silver are low.

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Inc., 2012 [February 18]; 2012 [February 23]). They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters but the data are not publicly available. It is likely they examined and sampled the Shalosky West prospect and they may have discovered it.

In 2009, Rhyolite Resources acquired a large block of claims that covered the prospect and they show the Shalosky West as a distinct prospect. Through 2011, Rhyolite had not drilled the deposit but it is likely that they examined if not sampled the prospect. They note that a (rock?) sample contained 2.9 grams of gold per tonne but give no other information on the prospect. The Shalosky West prospect is probably similar to several other gold prospects in the area, the best known of which the nearby Shalosky prospect (TC042).

Alteration:

Age of mineralization:

Unknown other than that it is younger than the Paleozoic or Mesozoic host rocks.

Generic deposit model:

Deposit model:

Gold-quartz in veins and brecciated zones; lower grade disseminated mineralization. (Cox and Singer, 1986; model 22c?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active

Workings/exploration:

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Inc., 2012 [February 18]; 2012 [February 23]). They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters but the data are not publicly available. It is likely they examined and sampled the Shalosky West prospect and they may have discovered it.

In 2009, Rhyolite Resources acquired a large block of claims that covered the prospect and they show the Shalosky West as a distinct prospect. Through 2011, Rhyolite had not drilled the deposit but it is likely that they examined if not sampled the prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Rhyolite Resources Ltd., 2012, Projects overview: http://www.rhyoliteresources.com/s/Projects.asp (as of February 23, 2012).

Rhyolite Resources Ltd. 2012, (Corporate Presentation): http://www.rhyoliteresources.com/in/pdf/CorporatePresentation.pdf (as of February 18, 2012).

Primary Reference: Rhyolite Resources Inc., 2012 [February 18]

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Goldberg

Site type: Prospect

ARDF no.: TC052

Latitude: 63.1755 **Quadrangle:** TC A-6

Longitude: 143.8203

Location description and accuracy:

The Goldberg prospect is about 4.2 miles northwest of the junction of the Tok River and Dry Tok Creek. It is about 3.7 miles east of VABM 7302 'White' and about 0.6 mile south-southwest of the center of section 12, T. 16 N., R. 8 E. The location is accurate.

Commodities:

Main: As, Au, Sb

Other: Bi, Cu, Pb, Te, Zn

Ore minerals:

Gangue minerals: Quartz?

Geologic description:

The rocks in the area are part of the Tok Schist and consists mainly of quartz-muscovite schist with a thick layer of quartz-chlorite schist (Rhyolite Resources Inc., 2012 [February 18]). The Tok Schist is cut by several steep to vertical faults, one of which control the trend of the mineralization at the nearby Shalosky prospect (TC New042). To the north across a north-dipping thrust fault, the rocks are a folded sequence of argillaceous sediments, felsic-sulphidic schist, chlorite schist, feldspar-quartz schist, banded sedimentary rocks, and gabbro. The age of the rocks is uncertain; Foster (1970) only indicates that they are Paleozoic or Mesozoic.

The mineralization in the area is sediment hosted and controlled by structure; it is associated with zones of silicification and quartz-vein stockwork (Rhyolite Resources Inc., 2012 [February 23]). (Unstated) sulfides vary from 1 to more than 20 percent of the mineralization. There is a strong geochemical association of the gold with arsenic and antimony; copper, lead, zinc, bismuth, tellurium, and silver are low.

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Inc., 2012 [February 18]; 2012 [February 23]). They collected many rock and geochemical samples, trenched, and drilled 12 holes in the area totaling 1,174 meters but the data are not publicly available. They examined and sampled the Goldberg prospect and they may have discovered it; they also drilled at least two holes on it.

In 2009, Rhyolite Resources acquired a large block of claims that covered the prospect and they identified the Goldberg as a distinct prospect. Through 2011, Rhyolite had not drilled the deposit but it is likely that they examined if not sampled the prospect. They note that one 'PD' (Placer Dome?) drill hole had a 1.2-meter intercept that contained 3.8 grams of gold per tonne and another drill hole had a 13-meter intercept that contained 1.2 grams of gold per tonne. The Goldberg prospect is probably similar to several other gold prospects in the area, the best known of which the Shalosky prospect (TC042).

Alteration:

Age of mineralization:

Unknown other than that it is younger than the Paleozoic or Mesozoic host rocks.

Generic deposit model:

Deposit model:

Gold-quartz in veins and brecciated zones; lower grade disseminated mineralization. (Cox and Singer, 1986; model 22c?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active

Workings/exploration:

From 1998 through 2001, Grayd Resources and Placer Dome Inc. explored the area (Rhyolite Resources Inc., 2012 [February 18]; 2012 [February 23]. They collected many rock and geochemical samples, trenched, and and drilled 12 holes in the area 1,174 meters but the data are not publicly available. They examined and sampled the Goldberg prospect and they may have discovered it; they also apparently drilled at least two holes on it. In 2009, Rhyolite Resources acquired a large block of claims that covered the prospect and they identified the Goldberg as a distinct prospect. Through 2011, Rhyolite had not drilled the deposit but it is likely that they examined if not sampled the prospect.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Rhyolite Resources Ltd., 2012, Projects overview: http://www.rhyoliteresources.com/s/Projects.asp (as of February 23, 2012).

Rhyolite Resources Ltd. 2012, (Corporate Presentation): http://www.rhyoliteresources.com/in/pdf/CorporatePresentation.pdf (as of February 18, 2012).

Primary Reference: Rhyolite Resources Inc., 2012 [February 18]

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): MM

Site type: Occurrence

ARDF no.: TC053

Latitude: 63.13 **Quadrangle:** TC A-4

Longitude: 143.0027

Location description and accuracy:

The MM prospect is about 5.0 miles southeast of VABM 3345 'Tetlin' and about 9.4 miles west-northwest of the center of Tetlin Lake. The prospect is centered about 0.5 mile northwest of the center of section 32, T. 16 N., R. 13 E., of the Copper River Meridian. The location is accurate to within one mile or less from the center of the deposit.

Commodities:

Main: Au, Cu

Other:

Ore minerals: Chalcopyrite?, gold

Gangue minerals: Quartz?

Geologic description:

There is little published specific information about the MM prospect other than it is a prospect composed of phyllite and schist, located at the Tetlin Project, currently operated by Contango ORE Inc. The prospect contains multiple magnetic and conductivity highs corresponding to anomalous surface geochemistry (Freeman, 2014).

The Tetlin project is located in Precambrian to Paleozoic greenschist to amphibolite-grade metamorphic rocks of the Yukon Tanana Terrane intruded by Cretaceous to Tertiary felsic and intermediate plutonic bodies. District and regional scale northeast and northwest trending faults are present on the project and are often associated with gold and copper mineralization in this terrane (Illig, 2014).

The Tetlin project is located within the prolific Tintina Gold Belt (+200 million ounces of resource) and is prospective for mid-Cretaceous intrusive-related gold deposits. The project also is cut by a younger, northeast striking belt of porphyry copper–gold deposits which have remained virtually unexplored since their discovery in the early 1970s (Illig, 2014).

Alteration:

Not described.

Age of mineralization:

Undetermined, but proximal to the Peak deposit, a massive sulfide distal skarn mineralization, which has been dated to 70 million years old (Illig, 2014).

Generic deposit model:

Deposit model:

Insufficient data to assign.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

In 2008, Contango ORE Inc. signed the lease with Tetlin Village, also acquiring and analyzing remote sensing data. In 2009, the first reconnaissance program was conducted, followed by soil sampling and trenching. In 2010, the field program entailed prospecting, stream sediment, and a pan concentrate program, and a focused basal soil sampling and IP surveys. In 2011, the basal soil sampling was continued, in addition to airborne magnetic and resistivity surveying (Freeman, 2014).

MM was identified through pan-stream sampling, soil sampling, and airborne geophysics. The prospect contains multiple magnetic and conductivity highs that correspond to anomalous surface geochemistry (Freeman, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Freeman, C., 2014, Geology and Mineralization of the Peak Zone Au-Cu-Ag Deposit, Tetlin Project, Alaska, for Avalon Development Corp and Contango ORE Inc., http://www.avalonalaska.com/CordRoundup-Tetlin_Summary-26Jan14_noTTF-Final.pdf (as of June 3, 2014).

Illig, P., 2014, Alaska's Newest Gold Deposit: Mineralization and geochemistry of the Peak Zone Distal Gold Skarn,Ttetlin Project, Tok, Alaska, Avalon Development Corporation:

Primary Reference: Freeman, 2014

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-15

Site name(s): McElfish

Site type: Prospect

ARDF no.: TC054

Latitude: 63.7368 **Quadrangle:** TC C-1

Longitude: 141.0321

Location description and accuracy:

The McElfish prospect is located next to the Alaska-Canada border on a north-south trending ridge at the headwaters of a northeast branch of McElfish Creek that drains into the Ladue River. The site location is based on where strongly altered augen gneiss was mapped near the center of a 1.1 by 1.5 kilometer soil grid located in the northwest corner of section 31, T. 23 N., R. 23 E. of the Copper River Meridian.

Commodities:

Main: Au

Other: Ag, Cu, Mo, Pb, Zn

Ore minerals: Chalcopyrite, galena, gold, molybdenite, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

McElfish is located within the Yukon-Tanana Terrane between the Denali and Tintina faults. The basement rock is comprised of amphibolite- to greenschist-facies metamorphic rocks intruded by Jurassic, Cretaceous, and Tertiary mostly felsic units. The amphibolite-facies rocks consist of schist, gneiss including augen gneiss, amphibolite, quartzite, and minor marble. The greenschist-facies rocks consist of schist and minor phyllite and metavolcanic rocks. These two packages represent an autochthonous continental-margin of Late Devonian to Early Mississippian age (Dusel-Bacon and others, 2006).

The bedrock geology at McElfish, from north to south, consists of weakly foliated metamorphosed gabbro that is in an east-west trending thrust contact with a metamorphic assemblage of megacrystic augen gneiss and quartz-feldspar-sericite gneiss to schist. The augen gneiss contains very large potassium feldspar porphyroblasts that range up to 3 inches in diameter. A feldspar-quartz porphyry is found intruding the augen gneiss along a northwest trending fault on the south side of the main ridge. The porphyry and the augen gneiss along the northwest trending fault have strong quartz-sericite-pyrite alteration. To the south of the prospect area, biotite-garnet amphibolite and biotite schist overlie the augen gneiss and define a general east-west thrust fault contact (King and Tedeschi, 2012).

Mineralization at McElfish is mostly stockwork quartz veinlets up to 2 mm wide cross cutting foliation at high angles and the veinlets commonly exhibit strong jarosite staining and minor disseminated gossanous blebs after weathering of sulfide minerals along vein selvages (Siron and Grady, 2011).

Alteration:

The augen gneiss and feldspar-quartz porphyry have strong quartz-sericite-pyrite alteration along a northwest trending fault (King and Tedeschi, 2012).

Age of mineralization:

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz veins? (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a?

Production Status: None

Site Status: Inactive

Workings/exploration:

In the mid-1970s Cities Service Minerals Corporation (CSMC) conducted regional reconnaissance exploration in the Tanacross quadrangle area. Several ridge and spur soil samples and rock samples were collected over the McElfish prospect area at this time (Hedderly-Smith, 2009).

Full Metal Minerals (FMM), in a joint venture with BHP Billington, conducted a 31,000 line-kilometer high-resolution airborne magnetic survey covering 1.05 million hectares of the Tanacross quadrangle encompassing the McElfish prospect and collected rock and soil samples within the headwaters of McElfish Creek during 2008 (Hedderly-Smith, 2009). This work identified weakly anomalous gold-in-soils (up to 10 parts per billion (ppb) gold) and highly altered rocks consisting of an assemblage of clay and silica within quartz-sericite schist and augen gneiss. Samples of the stockwork quartz veining that contain disseminated trace pyrite returned values up to 185 ppb gold (Siron and Grady, 2011).

In 2010 FMM completed a 50 by 100 meter soil grid within a larger 1 by 1.3 kilometer area of intense and pervasive silicification and clay alteration of augen gneiss and quartz-sericite schist. The sampling showed a soil geochemical anomaly with strong gold, silver, molybdenum, lead, and zinc. Baseline gold-in-soil observations display weakly anomalous gold, around 13 ppb gold, but have shown values as high as 7,160 ppb gold. Silver distribution is much broader and ranges from 300 ppb and up to 1,900 ppb silver over the same area as anomalous gold mineralization. A strong molybdenum anomaly occurs to the east and downslope of anomalous gold-in-soils and ranges from 5 to 30 parts per million (ppm) molybdenum. Lead (50 to 180 ppm) and zinc (80 to 170 ppm) also occur with gold and silver (Siron and Grady, 2011).

The soil grid was expanded to the south by FMM in 2011 collecting 207 more soil samples. Results from the grid showed a silver and gold anomaly with gold showing potentially two northeast-trending zones of mineralization. There were no significant silver and gold values in the rock samples collected as most of the samples were gathered on the ridge top where the silver and gold anomaly was weakest. A copper and molybdenum soil anomaly trends northwest-southeast with up to 48 ppm molybdenum and up to 463 ppm copper. A rock sample of strongly oxidized augen gneiss with magnetite veins was collected in this same area and contained 551 ppm copper and 113 ppm molybdenum. This mineralized trend is parallel to foliaion of the strongly quartz-sericite-pyrite-altered augen gneiss observed on the ridge (King and Tedeschi, 2012).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dusel-Bacon, C.J., Mortensen, J.K., and Nelson, J., 2006, Two-Fold Division of Yukon-Tanana Terrane in East-Central Alaska into Parautochthonous and Allochthonous Elements and the Need for Clarification of Terminology, in Geological Society of America, Abstracts with Programs, vol. 38, no. 5, 6 p.

Hedderly-Smith, D.A., 2009, Report on 2008 Work in the Tanacross Quadrangle, East-Central Alaska by the BHP-Full Metal Minerals Joint-Venture, prepared for Full Metal Minerals, 214 p. (Report held by Full Metal Minerals, Vancouver, British Columbia).

King, Natalie and Tedeschi, Mike, 2012, 2011 Technical Report for Rolling Thunder Project, East-Central, Alaska, prepared for Full Metal Mineras, 73 p. (Report held by Full Metal Minerals, Vancouver, British Columbia).

Siron, Chris and Grady, Jesse, 2011, 2010 Rolling Thunder Exploration Report, Eastern Fortymile District, Alaska, prepared for Full Metal Minerals, 78 p. (Report held by Full Metal Minerals, Vancouver, British Columbia).

Primary Reference: King and Tedeschi, 2012

Reporter(s): N.V. King (Alaska Earth Sciences)

Last report date: 2016-03-15

Site name(s): Road Metal

Site type: Prospect

ARDF no.: TC055

Latitude: 63.0152 **Quadrangle:** TC A-2

Longitude: 141.7895

Location description and accuracy:

The Road Metal prospect is a 1.5 mile-long northeast trend of silver-gold-base metal mineralization on Doyon, Limited conveyed land near the Northway Junction along the Alaska Highway near the Canadian border. The prospect site is centered on a 500 square meter area of drilling in the gold geochemical anomaly near an intrusion breccia along the northern edge of section 10, T. 14 N., R. 19 E. of the Copper River Meridian.

Commodities:

Main: Ag, Au, Cu, Pb

Other: Bi, Sb

Ore minerals: Bismuthinite, chalcopyrite, galena, gold, pyrite, silver sulfosalts, stibnite

Gangue minerals: Quartz

Geologic description:

The Road Metal prospect lies within the Yukon-Tanana terrane between the Tintina fault to the north and the Denali fault to the south. The region is comprised mostly of greenschist to amphibolite grade Paleozoic metasedimentary rocks and some mafic to felsic meta-igneous rocks. These Paleozoic rocks were extensively intruded by Mesozoic and Cenozoic granitic rocks and minor intermediate and mafic rocks. The area north of the Road Metal prospect contains abundant Cretaceous and Tertiary volcanic rocks. The Road Metal prospect lies within what has been mapped as a poorly exposed, coarse- to fine-grained Cretaceous batholith that ranges in composition from felsic to mafic (Foster, 1970, 1992).

Drilling completed on the gold geochemical anomaly at Road Metal has shown mineralization to be intrusion-hosted. An intrusion breccia, which contains granite and aplite clasts in a porphyritic granite matrix, has been mapped in the vicinity of drilling (North Star Exploration, 2001).

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Polymetallic veins? (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active?

Workings/exploration:

At the Road Metal prospect grid soil sampling completed by North Star Exploration, Inc. between 1997 to 2002 identified an open-ended, 1.5 mile-long trend of silver-gold-base metal mineralization. Twelve line kilometers of ground geophysics (magnetics and induced polarization) completed shows an anomaly which is adjacent to the mineralized trend (North Star Exploration, 2001; North Star Exploration, 2002; North Star Exploration, 2003).

Core drilling between 2000 to 2002 totaling 17,984 feet in 22 holes at the Road Metal prospect intersected intrusion-hosted, base metal mineralization that has silver grades of up to 135 ounces per ton (oz/ton) and gold grades of up to 2.51 oz/ton (North Star Exploration, 2002; North Star Exploration, 2003). Five of the drill holes completed by North Star Exploration, Inc. in 2000 intersected high-grade intercepts including three very significant intervals of silver-gold bearing sulfide and sulfosalt mineralization: 17.8 feet assaying 0.263 oz/ton gold and 14.7 oz/ton silver, 15.7 feet grading 0.03 oz/ton gold and 48.5 oz/ton silver, and 73.8 feet grading 0.045 oz/ton gold and 0.35 oz/ton silver. Corresponding base-metal assays for the intersections range up to 0.86 percent copper, 3.22 percent lead, 0.92 percent bismuth, and 2.80 percent antimony (Doyon Limited, 2015; North Star Exploration, 2001).

Production notes:

None.

Reserves:

None.

Additional comments:

The Road Metal prospect is located within Doyon, Limited conveyed land. For more information contact Doyon, Limited, Fairbanks, Alaska.

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Doyon, Limited, 2015, Northway Area Propsects: https://www.doyon.com/lands/minerals/resources_prospect_northway.aspx (as of July 7, 2015).

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations Map I-593, 1 sheet, 1:250,000 scale.

Foster, H.L., 1992, Geologic map of the eastern Yukon-Tanana region, Alaska: U.S. Geological Survey Open-File Report 92-313.

North Star Exploration, 2001, 2000 Annual Report, Northway Village Block, prepared for Doyon, Limited, Report 2001-09, 59 p. (Report held by Doyon, Limited, Fairbanks, Alaska).

North Star Exploration, 2002, 2001 Annual Report, Northway Village Block, prepared for Doyon, Limiated, Report 2002-09, 44 p. (Report held by Doyon, Limited, Fairbanks, Alaska).

North Star Exploration, 2003, 2002 Annual Report, Northway Village Block, prepared for Doyon, Limited, Report 2003-03, 53 p. (Report held by Doyon, Limited, Fairbanks, Alaska).

Primary Reference: North Star Exploration, 2001

Reporter(s): N.V. King (Alaska Earth Sciences)

Last report date: 2016-03-15

Site name(s): Peak Zone

Site type: Prospect

ARDF no.: TC056

Latitude: 63.1776 **Quadrangle:** TC A-4

Longitude: 142.8984

Location description and accuracy:

The Saddle Zone prospect is about 0.3 mile northeast of VABM 3345 'Tetlin' and about 7.9 miles northwest of the center of Tetlin Lake. The prospect is centered about 0.2 mile east-northeast of the center of section 11, T. 16 N., R. 13 E., of the Copper River Meridian. The location is accurate to within 500 feet.

Commodities:

Main: Ag, Au, Cu

Other: As, Bi, Co, Cd, Mo, Ni, Sb, Sn, Te, W, Zn

Ore minerals: Arsenopyrite, chalcopyrite, bismuth, galena, gold, magnetite, malachite, native copper, pyrargyrite, pyrite, pyrrhotite, sphalerite

Gangue minerals: Amphiboles, calcite, chlorite, garnet?

Geologic description:

The Peak Zone is a ‘gold skarn’ prospect at the Tetlin Project that lies within the Yukon-Tanana Terrane. The host rock is a deformed marble lens (Illig, 2014). An inferred related intrusive is quartz monzonite. The main prograde metamorphism mineral is pyroxene while the main retrograde metamorphism minerals are amphibole and chlorite (Freeman, 2014a). The mineralization is characterized by gold hosted in skarn-altered carbonates, pyrrhotite dominant, with chalcopyrite, arsenopyrite, and lesser pyrite with anomalous silver, bismuth, cobalt, and sporadic anomalous molybdenum and tin. The mineralization is within an amphibole and chlorite alteration envelope (Freeman, 2014a). There is also green to black hornblende-chlorite and calcite alteration. Malachite and native copper are present in fractures below weathered sulfide mineralization. Quartz monzonite porphyry contains barren quartz magnetite veins (Van Treeck, 2013). Metal is zoned around the prospect as copper + gold proximal to mineralized center, and arsenic + lead + zinc distal to mineralized center. The indicated tonnage is 6 million tonnes with a gold grade of 3.46 grams per tonne, 11.87 grams of silver per tonne, and 25 percent copper (Freeman, 2014a).

The geophysical signature of the Peak zone is high relative magnetic susceptibility and a high relative conductivity/low relative resistivity associated with mineralization. Airborne magnetic and resistivity surveys have outlined the Peak Zone mineralization in the upper 150 meters of crust. Areas with a similar geophysical signature located near the Peak Zone are along inferred stratigraphic horizons and share geochemical signatures (Van Treeck, 2013).

This prospect is part of the Tetlin Project; it is hosted in Precambrian to Paleozoic greenschist to amphibolite-grade metamorphic rocks of the Yukon-Tanana Terrane intruded by Cretaceous to Tertiary felsic and intermediate plutonic bodies (Foster, 1970). District and regional scale northeast and northwest trending faults are present on the project and are often associated with gold and copper mineralization in this terrane (Freeman, 2014b). The project area is interpreted to be located in overlapping mineral belts of the Tintina gold belt with the Carmacks Porphyry Belt (Freeman, 2014a).

Metallurgical test results were reported in 2014 by Contango ORE, Inc.. These results from three samples indicate that all samples achieved consistently high metallurgical recovery across the primary grind sizes that ranged from 49 to 115 microns. The proportion of contained gold recovered by gravity methods ranged from 8 percent to 30 percent with the lowest gravity recovery in a high copper bearing sample with

progressively higher percentages of gold in the gravity concentrate as gold grade increased in the other samples. Primary sulfides identified in the analysis were pyrrhotite and chalcopyrite with lesser amounts of arsenopyrite, silver-bearing minerals, sphalerite and native gold. Primary silicate minerals include quartz, calcite, chlorite, potassium feldspar, amphibole and pyroxene. Abundant visible gold was observed in two of the three samples (Contango ORE, Inc., 2014b).

Alteration:

Chlorite and amphibole alteration is associated with gold and silver mineralization (Illig, 2014).

Age of mineralization:

70 million years old, Cretaceous, according to U/Pb radioisotope dating techniques (Illig, 2014).

Generic deposit model:

Deposit model:

Skarn? (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b?

Production Status: None

Site Status: Active

Workings/exploration:

There has been no recorded past placer or lode mining or exploration drilling conducted on any prospect on the Tetlin Project until Contango Ore, Inc. completed its first reconnaissance exploration program in 2009 (Contango Ore Inc., 2012).

In 2008, Contango ORE, Inc. began acquiring and analyzing remote sensing data in the area of Peak Zone to begin exploration work targeting in the area. In 2009, the first reconnaissance program was conducted, followed by soil sampling and trenching (Freeman, 2014a). The first indication of mineralization was a linear gold-copper soil anomaly with a small induced polarization (IP) resistivity low (Illig, 2014). In 2010, the field program entailed prospecting, stream sediment sampling, and pan concentrate sampling, and focused basal soil sampling and IP surveys. In 2011, the basal soil sampling was continued, in addition to an airborne magnetic and resistivity survey and 11 holes (2,456 meters) of core drilling. The 2012 field program continued the basal soil sampling, along with a 50 hole (10,974 meters) core drilling program. The 2012 exploration work is what led to the discovery of Peak (Freeman, 2014b). Multiple drill intercepts with gold in excess of 10 parts per million (ppm) over 10 feet were reported. Gold is accompanied by variable silver of up to 500 ppm and copper of up to 1 percent over 100 feet The highest gold grade is associated with highly magnetic sulfide-bearing host rocks and also conductive sulfide-bearing host rocks. In 2013, Contango conducted an airborne magnetic and resistivity survey, and continued a basal soil sampling, stream sediment and pan concentrate sampling program, in addition to a 69 hole (14,625 meters) oriented core drilling program (Van Treeck, 2013).

In 2014, Contango reported the following resource estimate with a cut-off grade of 0.5 gram per tonne: 1) indicated resources of 5,970,000 tonnes grading 3.46 grams of gold per tonne, 11.00 grams of silver per tonne and 0.25 percent copper, and 2) inferred resources 3,850,000 tonnes grading 2.07 grams of gold per tonne, 14.28 grams of silver per tonne and 0.23 percent copper (Contango ORE, Inc., 2014a). They also reported results from metallurgical testing that indicated that all samples achieved consistently high metallurgical recovery across the primary grind sizes that ranged from 49 to 115 microns (Contango ORE Inc., 2014b).

Production notes:

None.

Reserves:

Indicated resources for the Peak Zone are reported, with a cutoff of 0.5 gram of gold per tonne equivalent and cut-off of 5,970,000 tonnes, to be 3.46 grams of gold per tonne, 11.00 grams of silver per tonne, 0.25 percent copper, 4.08 grams of gold per tonne equivalent, with total grams being 24,357,600 and total ounces of 783,115 (Contango Ore, Inc., 2014a).

Inferred resources for the Peak Zone are reported, with a cutoff of 0.5 gram of gold per tonne equivalent and cut-off of 3,850,000 tonnes, to be 2.07 grams of gold per tonne, 14.28 grams of silver per tonne, 0.23 percent copper, 2.69 grams of gold per tonne equivalent, with total grams being 10,356,500 and total ounces of 332,969 (Contango ORE, Inc., 2014a).

Resource from 78 of 130 holes, 16,010 meters of core. Seven gold values were capped at 75.0 grams per tonne, 13 silver values at 252.0 grams per tonne and 7 copper values at 5.40 percent. Resource blocks are 10 by 10 by 5 meters, ore specific gravity is 3.15, waste specific gravity is 2.81. Grades for gold, silver, copper were interpolated using ordinary kriging. For gold equivalent calculation: gold = US$1318 per ounce, copper = $3.25 per pound, silver = $21.55 per ounce (Freeman, 2014a).

Additional comments:

In 2008, Contango ORE, Inc. signed a lease with Tetlin Village to control mineral rights on about 675,000 acres of fee simple land leased from the Tetlin Village(Freeman, 2014b).

References:

Contango ORE, Inc., 2012, 2012 Project Summary, Tetlin Project, Alaska: http://www.contangoore.com/pdf/TETLIN-2012_PROJECT_SUMMARYb.pdf (as of December 29, 2014).

Contango ORE, Inc., 2014a, Contango ORE Announces Engagement of Strategic Advisor and Initial Resource Estimate, Press Release January 23, 2014: http://www.contangoore.com/pr/pr18_140123.pdf (as of June 4, 2014).

Contango ORE, Inc., 2014b, Contango ORE Announces Preliminary Metallurgical Results From the Peak Zone, Tetlin Project, Alaska and Earnings For the Quarter Ended March 31, 2014, Press Release May 16, 2014: http://www.contangoore.com/pr/pr20_140516.pdf (as of December 29, 2014).

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Freeman, Curt, 2014a, Geology and Mineralization of the Peak Zone Au-Cu-Ag Deposit, Tetlin Project, Alaska, for Avalon Development Corp and Contango ORE Inc.: http://www.avalonalaska.com/CordRoundup-Tetlin_Summary-26Jan14_noTTF-Final.pdf (as of June 3, 2014).

Freeman, Curt, 2014b, Tetlin Gold-Copper-Silver Project, January 2014 Summary: http://www.avalonalaska.com/Tetlin_Project_Summary-Jan2014.pdf (as of December 29, 2014).

Illig, Peter, 2014, Alaska's Newest Gold Deposit: Mineralization and Geochemistry of the Peak Zone Distal Gold Skarn, Tetline Project, Tok, Alaska, Avalon Development Corp: http://www.contangoore.com/presentations/Illig-spring_2014-AMA-final-lowres.pdf (as of June 4, 2014).

Van Treeck, C.J., 2013, Geology and Mineralization of the Chief Danny Prospect, Contango Ore Inc., Tetlin Project, Tok, AK, Avalon Development Corp.: Alaska Miners Association, 2013 Annual Convention,

Primary Reference: Freeman, 2014a

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Chisana

Site type: Prospect

ARDF no.: TC057

Latitude: 63.194 **Quadrangle:** TC A-4

Longitude: 142.5245

Location description and accuracy:

Chisana is a prospect about 11.0 miles east of VABM 3345 'Tetlin' and about 10.4 miles northeast of the center of Tetlin Lake. The prospect is centered about 0.4 mile southwest of the center of section 2, T. 16 N., R. 15 E., of the Copper River Meridian. The location is accurate to within 500 feet.

Commodities:

Main: Ag, Au, Cu

Other: As, Bi, Co, Cd, Mo, Ni, Sb, Sn, Te, W, Zn

Ore minerals: Arsenopyrite, chalcopyrite, bismuth, galena, gold, pyrargyrite, pyrite, pyrrhotite

Gangue minerals: Amphiboles, calcite, chlorite

Geologic description:

The Chisana prospect is part of the Tetlin Project (Freeman, 2014a), which is located in Precambrian to Paleozoic greenschist to amphibolite-grade metamorphic rocks of the Yukon-Tanana Terrane intruded by Cretaceous to Tertiary felsic and intermediate plutonic bodies (Foster, 1970). District and regional scale northeast and northwest trending faults are present in the project area and are often associated with gold and copper mineralization in this terrane (Freeman, 2014b). Chisana is within a biotite gneiss and schist unit. The project area is interpreted to be located in overlapping mineral belts of the Tintina gold belt with the Carmacks Porphyry Belt (Freeman, 2014a).

Chisana is characterized by a strong correlation between arsenic and gold in stream sediments and soil samples, multiple magnetic-conductivity highs, and visible gold in pans (Freeman, 2014a); this understanding was the result of surface work completed between 2010 and 2013. Results from this surface geochemistry have not been released (Van Treeck, C.J., Senior Geologist, Avalon Development Corp., written communication, 2014).

Alteration:

Age of mineralization:

70 million years old, Cretaceous, according to U/Pb radioisotope dating techniques, if similar age to Peak Zone prospect (Illig, 2014).

Generic deposit model:

Deposit model:

Skarn? (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b?

Production Status: None

Site Status: Active

Workings/exploration:

There has been no recorded past placer or lode mining or exploration drilling conducted on any prospect of the Tetlin Project until Contango Ore, Inc. completed its first reconnaissance exploration program in 2009 (Contango Ore, Inc., 2012). In 2010, the field program entailed prospecting, stream sediment sampling, and pan concentrate sampling, and focused basal soil sampling. In 2011, the basal soil sampling was continued (Van Treeck, 2013). Chisana is characterized by a strong correlation between arsenic and gold in stream sediments and soil samples, multiple magnetic-conductivity highs, and visible gold in pans (Freeman, 2014a); this understanding was the result of surface work completed between 2010 and 2013. Results from this surface geochemistry have not been released (Van Treeck, C.J., Senior Geologist, Avalon Development Corp., written communication, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

In 2008, Contango ORE, Inc. signed a lease with Tetlin Village to control mineral rights on about 675,000 acres of fee simple land leased from the Tetlin Village(Freeman, 2014b).

References:

Contango ORE, Inc., 2012, 2012 Project Summary, Tetlin Project, Alaska: http://www.contangoore.com/pdf/TETLIN-2012_PROJECT_SUMMARYb.pdf (as of December 29, 2014).

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Freeman, Curt, 2014a,Geology and Mineralization of the Peak Zone Au-Cu-Ag Deposit, Tetlin Project, Alaska, for Avalon Development Corp and Contango ORE Inc.: http://www.avalonalaska.com/CordRoundup-Tetlin_Summary-26Jan14_noTTF-Final.pdf (as of June 3, 2014).

Freeman, Curt, 2014b, Tetlin Gold-Copper-Silver Project, January 2014 Summary: http://www.avalonalaska.com/Tetlin_Project_Summary-Jan2014.pdf (as of December 29, 2014).

Illig, Peter, 2014, Alaska's Newest Gold Deposit: Mineralization and Geochemistry of the Peak Zone Distal Gold Skarn, Tetline Project, Tok, Alaska, Avalon Development Corp: http://www.contangoore.com/presentations/Illig-spring_2014-AMA-final-lowres.pdf (as of June 4, 2014).

Van Treeck, C.J., 2013, Geology and Mineralization of the Chief Danny Prospect, Contango Ore Inc., Tetlin Project, Tok, AK, Avalon Development Corp.: Alaska Miners Association, 2013 Annual Convention,

Primary Reference: Freeman, 2014a

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Tors

Site type: Prospect

ARDF no.: TC058

Latitude: 63.186 **Quadrangle:** TC A-4

Longitude: 142.7819

Location description and accuracy:

Tors is a prospect is about 3.5 miles east of VABM 3345 'Tetlin' and about 6.6 miles north of the center of Tetlin Lake. The prospect is centered about 0.4 mile north-northwest of the center of section 9, T. 16 N., R. 14 E., of the Copper River Meridian. The location is accurate to within about 2.5 miles.

Commodities:

Main: Ag, Au, Cu

Other: Bi, Co, Cd, Mo, Ni, Sb, Sn, Te, W, Zn

Ore minerals:

Gangue minerals: Amphiboles, calcite, chlorite

Geologic description:

The Tors prospect is part of the Tetlin Project (Freeman, 2014a), which is located in Precambrian to Paleozoic greenschist to amphibolite-grade metamorphic rocks of the Yukon-Tanana Terrane intruded by Cretaceous to Tertiary felsic and intermediate plutonic bodies (Foster, 1970). District and regional scale northeast and northwest trending faults are present on the project and are often associated with gold and copper mineralization in this terrane (Freeman, 2014b).

The Tors prospect is located within the Tintina Gold Belt and also is cut by a younger, northeast striking mineralization belt called the Carmacks Porphyry Belt (Freeman, 2014a).

The Tors prospect is characterized by multiple magnetic and conductivity highs and anomalous surface geochemistry (Freeman, 2014a). This understanding was the result of a soil geochemistry survey and aeromagnetic survey from field work in 2013 (Illig, 2014; Freeman, 2014a).

Alteration:

Age of mineralization:

70 million years old, Cretaceous, according to U/Pb radioisotope dating techniques, if similar age to Peak Zone prospect (Illig, 2014).

Generic deposit model:

Deposit model:

Skarn? (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b?

Production Status: None

Site Status: Active

Workings/exploration:

In 2008, Contango ORE, Inc. signed the lease with Tetlin Village and began acquiring and analyzing remote sensing data in the area. Surface work began in the summer of 2009. In 2011, an airborne magnetic and resistivity survey was completed over Tors. In 2013, Contango conducted another airborne magnetic and resistivity survey and the first soil sampling over Tors was then completed (Van Treeck, 2013). The geophysical anomaly at Tors is similar to the response found at the Peak Zone (Van Treeck, C.J., Senior Geologist, Avalon Development Corp., written communication, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

In 2008, Contango ORE, Inc. signed a lease with Tetlin Village to control mineral rights on about 675,000 acres of fee simple land leased from the Tetlin Village(Freeman, 2014b).

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Freeman, Curt, 2014a,Geology and Mineralization of the Peak Zone Au-Cu-Ag Deposit, Tetlin Project, Alaska, for Avalon Development Corp and Contango ORE Inc.: http://www.avalonalaska.com/CordRoundup-Tetlin_Summary-26Jan14_noTTF-Final.pdf (as of June 3, 2014).

Freeman, Curt, 2014b, Tetlin Gold-Copper-Silver Project, January 2014 Summary: http://www.avalonalaska.com/Tetlin_Project_Summary-Jan2014.pdf (as of December 29, 2014).

Illig, Peter, 2014, Alaska's Newest Gold Deposit: Mineralization and Geochemistry of the Peak Zone Distal Gold Skarn, Tetline Project, Tok, Alaska, Avalon Development Corp: http://www.contangoore.com/presentations/Illig-spring_2014-AMA-final-lowres.pdf (as of June 4, 2014).

Van Treeck, C.J., 2013, Geology and Mineralization of the Chief Danny Prospect, Contango Ore Inc., Tetlin Project, Tok, AK, Avalon Development Corp.: Alaska Miners Association, 2013 Annual Convention,

Primary Reference: Freeman, 2014a

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Eagle

Site type: Occurrence

ARDF no.: TC059

Latitude: 63.2651 **Quadrangle:** TC B-5

Longitude: 143.2192

Location description and accuracy:

Eagle is a prospect about 3.5 miles north-northwest of the peak named 'Eagle' and about 19.7 miles northwest of the center of Tetlin Lake. The prospect is centered about 0.4 mile north-northwest of the center of section 12, T. 17 N., R. 11 E., of the Copper River Meridian. The location is accurate to within a mile.

Commodities:

Main: Ag, Au, Cu

Other: Bi, Co, Cd, Mo, Ni, Sb, Sn, Te, W, Zn

Ore minerals:

Gangue minerals: Amphiboles, calcite, chlorite

Geologic description:

The Eagle prospect is part of the Tetlin Project, which is located in Precambrian to Paleozoic greenschist to amphibolite-grade metamorphic rocks of the Yukon-Tanana Terrane intruded by Cretaceous to Tertiary felsic and intermediate plutonic bodies (Foster, 1970). District and regional scale northeast and northwest trending faults are present on the project and are often associated with gold and copper mineralization in this terrane. Eagle is within a granitic rock unit (Freeman, 2014a).

The Eagle prospect is located within the Tintina Gold Belt (+200 million ounces of resource) and is prospective for mid-Cretaceous intrusive-related gold deposits. The area is also cut by a younger, northeast striking belt of porphyry copper–gold deposits, which have remained virtually unexplored since their discovery in the early 1970s (Freeman, 2014a).

Eagle exploration potential is characterized by multiple streams with visible gold or gold +/- copper anomalies (Freeman, 2014a).

Alteration:

Age of mineralization:

70 million years old, Cretaceous, according to U/Pb radioisotope dating techniques, if similar age to Peak Zone prospect (Illig, 2014).

Generic deposit model:

Deposit model:

Skarn? (Cox and Singer, 1986; model 18b).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

18b?

Production Status: None

Site Status: Active

Workings/exploration:

In 2008, Contango ORE Inc. signed the lease with Tetlin Village, and began acquiring and analyzing remote sensing data in the area. Contango ORE, Inc. worked in the area of the Eagle prospect starting with surface geochemistry work and geophysics. In 2013, based on similar geology to the Peak Zone, pan concentrate stream sediment sampling and prospecting work were conducted (Van Treeck, C.J., Senior Geologist, Avalon Development Corp., written communication, 2014). The Eagle prospect contains multiple streams with visible gold or gold +/- copper anomalies (Freeman, 2014a).

Production notes:

None.

Reserves:

None.

Additional comments:

In 2008, Contango ORE, Inc. signed a lease with Tetlin Village to control mineral rights on about 675,000 acres of fee simple land leased from the Tetlin Village(Freeman, 2014b).

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-593, 1 sheet, scale 1:250,000.

Freeman, Curt, 2014a,Geology and Mineralization of the Peak Zone Au-Cu-Ag Deposit, Tetlin Project, Alaska, for Avalon Development Corp and Contango ORE Inc.: http://www.avalonalaska.com/CordRoundup-Tetlin_Summary-26Jan14_noTTF-Final.pdf (as of June 3, 2014).

Freeman, Curt, 2014b, Tetlin Gold-Copper-Silver Project, January 2014 Summary: http://www.avalonalaska.com/Tetlin_Project_Summary-Jan2014.pdf (as of December 29, 2014).

Illig, P., 2014, Alaska's Newest Gold Deposit: Mineralization and Geochemistry of the Peak Zone Distal Gold Skarn, Tetline Project, Tok, Alaska, Avalon Development Corp:

Primary Reference: Freeman, 2014a

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Goodrich Porphyry

Site type: Prospect

ARDF no.: TC060

Latitude: 63.0569

Quadrangle: TC A-1

Longitude: 141.091

Location description and accuracy:

Goodrich Porphyry is a prospect located 3.7 miles east of VABM 3385 'Flat', 0.4 mile north from the center of section 29, T. 15 N., R. 23 E., of the Copper River Meridian This location is accurate to within 500 feet of the center of the prospect.

Commodities:

Main: Au, Cu, Mo

Other: Ag, As, Ba, Bi, Mn, Pb, Sb, W, Zn

Ore minerals: Arsenopyrite, bismuthite, boulangerite, chalcopyrite, galena, gold, pyrite, sphalerite

Gangue minerals: Barium, quartz

Geologic description:

Goodrich Porphyry is part of the Blue Moose Exploration, Inc. (BME) project located in the Moosehorn Range on the Alaska-Yukon border. The Moosehorn Range is located in the Tintina Gold Belt, in the Dawson Range Batholith of the Yukon-Tanana Terrane (Joyce, 2002). The BME project geology consists of regional gneiss and schist intruded by a Mid-Cretaceous granodiorite and a quartz-rich mineralized porphyry. The area is unglaciated, and Moosehorn Range outcrop exposures are limited (Handverger, 2015).

The principal Moosehorn host rock is hornblende-biotite granodiorite. The mineralogy is 20 to 30 percent quartz, 25 to 45 percent plagioclase, 10 to 20 percent potassium-feldspar, 10 to 15 percent biotite, 10 percent hornblende, and titanite, pyrite, magnetite, allanite, epidote, and chlorite. The hornblende may be altered to biotite +/- sericite and chlorite. Feldspars may be sericitized (Joyce, 2002).

Using geochemical sampling, BME discovered and staked the Goodrich Porphyry, a quartz-rich mineralized intrusive underlying almost two square miles. Soil and rock geochemistry, trench sampling and mapping and 31 short (under 22 feet) churn drill holes have established anomalous values of gold, silver, arsenic, copper, molybdenum, antimony, strongly anomalous barium, zinc and manganese (Handverger, 2015).

The geology from a 4,600 foot-long trench excavated by BME in 2001 consists predominantly of altered quartz-rich rocks including quartz (+/-feldspar) porphyries and totally silicified units. Unaltered Moosehorn granodiorite and small intermediate dikes make up less than ten percent of the rocks exposed in the trench. Some of the silicic units indicate total quartz flooding showing ghosts of former feldspar crystals . Intense fracturing followed by silica invasion was observed. Limonitic veinlets with gossan boxworks after sulfides were identified and one tiny specimen of chalcopyrite was identified. A quartz-eye unit hosted limonitic veinlets and locally intense fracturing approaching a breccia (Handverger, 2015).

The 2014 pit sampling program of bedrock of the Goodrich Porphyry established evidence of a highly fractured, altered, supergene, leached capping of a mineralized copper porphyry system (Handverger, 2015).

Alteration:

Quartz-flooding of quartz-feldspar porphyries (Handverger, 2015).

Age of mineralization:

Generic deposit model:

Deposit model:
Porphyry Cu-Mo (Cox and Singer, 1986; model 21a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
21a

Production Status: None

Site Status: Active

Workings/exploration:

The initial discovery of gold in the Moosehorn Range occurred in 1970 during a Quintana Minerals Corp. porphyry copper exploration program. The first placer gold claims were staked shortly after, and the Moosehorn Range has been the site of placer operations since then. The placer and limited hard rock mining production in the Moosehorn Range exceeds 100,000 ounces of gold (Handverger, 2015), largely in Canada.

In 1975, Great Bear Mining Ltd. conducted the first significant gold exploration project in the Canadian portion of the Moosehorn Range. In 1990, Canada Tungsten conducted a placer gold exploration program on the Alaskan side of the border (Handverger, 2015).

Blue Moose Exploration, Inc. (BME) first staked claims on the Alaska side of the Moosehorn Range in 1993. In 1999, BME conducted a widespread soil geochemical survey program of 111 samples in Alaska along the west side of the Moosehorn Range. This was followed up in 2000 by a 420-sample program over fifteen square miles in the same area. In 2010, Millrock Resources staked claims around the BME property and conducted an additional 252 soil sampling geochemical program on and around BME claims (Handverger, 2015).

In 2001, following up on anomalous soil geochemical results, BME personnel excavated a 4,600 foot-long trench cross-cutting the Goodrich Porphyry. Forty-five rock samples were collected and assayed from this trench. The highest trench rock sample contained 0.021ppm gold, 6.4 ppm silver, 540 ppm copper, 616 ppm molybdenum, 3677 ppm lead, 693 ppm zinc, 213 ppm antimony, 54 ppm bismuth, and 2.59 ppm mercury (Handverger, 2015).

During the summer field season of 2011, Blue Moose completed 33 shallow drill holes on the Goodrich Porphyry target to sample the bedrock below the frozen soil horizons. A total of 416 holes were drilled using a down-hole hammer with a 4.5-inch bit. The depth of the holes ranged from 4.0 to 22.5 feet with a median depth of 12.5 feet; 128 samples were assayed. The dimensions of the area drilled are 8,000 feet by 2,000 feet (Handverger, 2015).

The 2014 pit sampling program of bedrock on the Goodrich Porphyry established evidence of a highly fractured, altered, supergene, leached capping of a mineralized copper porphyry system (Handverger, 2015).

Production notes:
None.

Reserves:
None.

Additional comments:

References:
Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

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Joyce, N.L., 2002, Geologic Setting, Nature, and Structural Evolution of Intrusion-Hosted Au-bearing Quartz Veins at the Longline Occurrence, Moosehorn Range Area, West-Central Yukon Territory, M.Sc. Thesis for University of British Columbia, 199 p.: https://circle.ubc.ca/bitstream/id/29362/ubc_2002-0137.pdf (as of September 30, 2014).

Primary Reference: Handverger, 2015

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.); N.V. King (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Honks

Site type: Prospect

ARDF no.: TC061

Latitude: 63.0731 **Quadrangle:** TC A-1

Longitude: 141.008

Location description and accuracy:

Honks is a prospect located a quarter mile southwest of Monument 150 in the northwest corner of section 23, T. 15 N., R. 23 E., of the Copper River Meridian. This location is accurate to within 500 feet.

Commodities:

Main: Au

Other: As, Sb, U

Ore minerals: Arsenopyrite, gold

Gangue minerals: Quartz

Geologic description:

The Honks prospect is part of Blue Moose Exploration, Inc. (BME) project located in the Moosehorn Range on the Alaska-Yukon border. The Moosehorn Range is located in the Tintina Gold Belt, in the Dawson Range Batholith of the Yukon-Tanana Terrane (Joyce, 2002). The BME project geology consists of regional gneiss and schist intruded by a Mid-Cretaceous granodiorite and a quartz-rich mineralized porphyry. The area is unglaciated, and Moosehorn Range outcrop exposures are limited (Handverger, 2015).

This prospect is characterized by gold-arsenopyrite-quartz veins with anomalous elevated values of gold, arsenic, anitmony, and uranium. Secondary indicator elements are copper, lead, and bismuth (Handverger, 2015).

In 2010, Millrock Resources Inc. collected rock samples from 1,060 feet of trenches in this area with these gold values: 45 feet of 0.221 part per million (ppm), 15 feet of 0.378 ppm, and 70 feet of 0.230 ppm and within the latter, 10 feet of 0.481 ppm. Anomalous arsenic values are associated with the higher levels of gold (Handverger and Gibler, 2014).

Alteration:

Age of mineralization:

Mineralization at Honks is likely a similar age as gold vein mineralization on the Yukon side of the Moosehorn Range which has been dated between 93 and 88 million years old, and the age of the Moosehorn intrusive is 96 to 99 million years, dated using K/Ar, Ar/Ar, and U/Pb methods (Joyce, 2002).

Generic deposit model:

Deposit model:

Polymetallic veins? (Cox and Singer, 1986; model 22c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active

Workings/exploration:

The initial discovery of gold in the Moosehorn Range occurred in 1970 during a Quintana Minerals Corp. porphyry copper exploration program. The first placer gold claims were staked shortly after, and the Moosehorn Range has been the site of placer operations since then. The placer and limited hard rock mining production in the Moosehorn Range exceeds 100,000 ounces of gold (Handverger, 2015).

In 1975, Great Bear Mining Ltd. conducted the first significant gold exploration project in the Canadian portion of the Moosehorn Range. In 1990, Canada Tungsten conducted a placer gold exploration program on the Alaskan side of the border. Blue Moose Exploration, Inc. (BME) first staked claims on the Alaska side of the mountain range in 1993 (Handverger, 2015).

In 2010, Millrock Resources Inc. collected rock samples from 1,060 feet of trenches in this area with these gold values: 45 feet of 0.221 part per million (ppm), 15 feet of 0.378 ppm, and 70 feet of 0.230 ppm and within the latter, 10 feet of 0.481 ppm. Anomalous arsenic values are associated with the higher levels of gold (Handverger and Gibler, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

Exploration for placer gold has occured downstream of the Honks prospect on Honks Creek. In 1990, Canada Tungsten conducted a placer gold exploration drill hole program consisting of twenty-nine 3.5 inch air-trac holes in six lines on Honks Creek near Blue Moose Exploration, Inc. (BME) claims. Five of the lines intersected pay gravels. The program defined resources of 325,784 cubic yards containing 5,880 ounces gold; this was too small to be of further consideration by Canada Tungsten. In 2010, a small placer operation commenced stripping and sluicing the Honks Creek gravels (Handverger, 2015).

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Handverger, Paul, 2015, Executive Summary - Blue Moose Exploration Gold Prospect, Moosehorn Range, Tanacross (A1) Quadrangle, Alaska, 8 p.: http://www.bluemooseexploration.com/ (as of April 14, 2015).

Handverger, Paul, and Gibler, Kati, 2014, The Goodrich Porphyry Mineral Prospect, Blue Moose Exploration, Moosehorn Range, Tanacross (A1) Quadrangle, Alaska: Alaska Miners Association, 2013 Annual Convention, Abstracts, p. 29-30.

Joyce, N.L., 2002, Geologic Setting, Nature, and Structural Evolution of Intrusion-Hosted Au-bearing Quartz Veins at the Longline Occurrence, Moosehorn Range Area, West-Central Yukon Territory, M.Sc. Thesis for University of British Columbia, 199 p.: https://circle.ubc.ca/bitstream/id/29362/ubc_2002-0137.pdf (as of September 30, 2014).

Primary Reference: Handverger, 2015

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.); N.V. King (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Kelly Creek

Site type: Prospect

ARDF no.: TE069

Latitude: 65.7706 **Quadrangle:** TE D-2

Longitude: 165.8962

Location description and accuracy:

Kelly Creek, unofficially named in 1982 after film actress Grace Kelly, is a north tributary to the American River. Kelly Creek is the largest tributary entering from the north in the area where the direction of American River changes from north to south. The prospect is about 14.3 miles southeast of Ear Mountain. The 2011 drilling by Cedar Mountain Exploration and the earlier drilling by Anaconda Minerals was 1) aligned northwest to both sides of the saddle centered about 0.5 mile southwest of section 2, T. 4 N., R. 35 W., and 2) in a area about 0.5 mile to the northwest. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Hg, Sb

Ore minerals: Arsenopyrite?, gold, pyrite

Gangue minerals: Calcite, quartz

Geologic description:

The Kelly Creek prospect is in mica-quartz schist and graphitic quartz schist intercalated in a metasedimentary sequence that includes schistose, micaceous, dolomitic marble; mica-calcite schist; and minor micaceous quartzite (Cedar Mountain, 2011 [project]). The sequence is interpreted as a limestone-shale assemblage with facies variations. It is highly deformed and perhaps isoclinally folded. Schistosity dips moderately in various directions. Steeply-dipping marble-schist contacts and other strong linear features may indicate normal faults. In the headwaters of Fox Creek, 3 miles north of the Kelly Creek prospect, the rocks consist of a mafic to intermediate(?) metavolcanic and metasedimentary assemblage which consist of various greenschist and amphibolite units regionally intercalated with some calcareous quartzite and marble. The relation of the metavolcanic assemblage to the pelitic schist/marble assemblage that hosts the Kelly Creek prospect is not known. All of the metavolcanic and metasedimentary rocks in area were probably Paleozoic originally and have been metamorphosed in the Cretaceous; Sainsbury (1972) however mapped them as Precambrian.

The Kelly Creek prospect is primarily tundra-mantled metapelitic rocks in saddles and slopes between rubble uplands of schistose marble; bedrock outcrops are only locally present on the marble uplands. The metapelitic rocks have lineated quartz segregations along their foliation; disseminated euhedral pyrite crystals are common.

The Kelly Creek prospect is one of several similar deposits that define a district-level, west-northwest trending belt of gold mineralization about 11 miles long and 2 miles wide. This is the best known and most extensively explored of the deposits in the belt; other are the Wolf (TE107), North Fox (TE109), South Fox (TE108), Wolverine (TE110), Moose (TE111), and Jaeger (TE112) prospects.

The Kelly Creek prospect was discovered by following up gold and arsenic anomalies in soils and stream sediments from the west headwaters of Kelly Creek (Hudson and Wyman, 1983; Hudson, 1984; Cedar Mountain, 2011 [assay]). The soil geochemical surveys defined an irregularly shaped area about 3,000 by 4,00 feet in size with gold values up to 1.4 parts per million (ppm), arsenic up to 1,000 ppm, antimony up to 62 ppm, mercury up to 5 ppm, and silver up to 0.9 ppm. The gold, arsenic, and antimony values define

strong, coherent, multi-element anomalies. Mercury is commonly elevated in the soils, but its distribution and concentration are more erratic and it is more widely dispersed at anomalous levels than the other three elements.

Rock samples from frost boils and surface pits 3 to 4 feet deep show that the stronger anomalies are associated with silicified breccia and quartz-stockwork veins in sooty, black carbonaceous quartz schist. The quartz stockwork veins are less than 0.5 inch wide, and locally are broken and recemented by fine-grained, dark siliceous matrix. Two small-diameter diamond drill holes drilled by Anaconda Minerals cut mineralization at shallow depths (Marrs and Ivey, 1984). The holes were oriented N 45 E, were inclined 45 and 60 degrees, and reached depths of 140 and 154 feet. One penetrated 77 feet with 0.032 ounce of gold per ton, and the other 44 feet with 0.035 ounce of gold per ton. The higher gold values seem to be in a zone that dips gently west. All the rocks in these holes had highly anomalous metal contents; gold values are commonly in the several-hundred parts-per-billion range.

In 2011, Cedar Mountain Exploration drilled 18 holes totaling 1820.5 meters (Cedar Mountain Exploration, 2011 [Sept. 26, news release]. Twelve holes were aligned northwest across the saddle centered about 0.5 mile southwest of the center of section 2, T. 4 N., R. 35 W. The best intercepts in the saddle zone were: 1) 16.5 meters that contained 0.85 gram of gold per tonne, this included 7.5 meters with 1.34 grams of gold per tonne; and 2) 26.8 meters with 1.04 grams of gold per tonne, this included 10.1 meters with 2.07 grams of gold per tonne. Another 6 holes were drilled on a strong geochemical anomaly at the head of Kelly Creek about a half mile to the northwest of the saddle. These holes only cut one strong, narrow intercept of 6.10 meters with 1.31 grams of gold per tonne. The drilling indicates that the best grades are associated with zones of quartz veining and stockworks within fractured and sheared carbonaceous schist.

Clay is locally present in fractures and as part of the matrix in breccia. Dolomite and calcite reportedly accompany quartz in the veins in some drill core (Marrs and Ivey, 1984). Pyrite is disseminated in pelitic schist and is present in all mineralized rocks; in part, it is probably of sedimentary origin. Quartz segregations along the foliation in pelitic schist are recrystallized, sugary textured, and vuggy in mineralized rocks. The controls on the mineralization have not been fully identified nor has the distribution of gold; large geochemical anomalies in gold have not been drilled.

Alteration:

Brecciation, silicification, and quartz stockwork veining is common in pelitic schist. Some quartz veins contain carbonate minerals. Clay and limonite are present in some mineralized rocks.

Age of mineralization:

Unknown but probably mid-to Late Cretaceous as the mineralization postdates regional metamorphism.

Generic deposit model:

Deposit model:

Disseminated and stockwork quartz and gold mineralization in metapelitic rocks. Possibly carbonate-hosted Au-Ag and/or low sulfide Au-quartz vein (Cox and Singer, 1986; models 26a or 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

26a or 36a?

Production Status: None

Site Status: Active

Workings/exploration:

Exploration includes regional stream sediment geochemistry; a soil geochemical survey on a grid covering a 3,000 by 6,000 foot area; several shallow surface pits; and four small-diameter diamond drill holes. In 2011, Cedar Mountain Exploration drilled 18 holes totaling 1820.5 meters (Cedar Mountain Exploration, 2011 [Sept. 26, news release]. Twelve holes were aligned northwest across the saddle centered about 0.5 mile southwest of the center of section 2, T. 4 N., R. 35 W. Another 6 holes were drilled on a strong

geochemical anomaly at the head of Kelly Creek about a half mile northwest of the saddle.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Cedar Mountain Exploration Inc., 2011, New assay date upgrades Cedar Mountain's Kelly Creek Project: http://www.cedarmountainexp.com/_resources/CED_2011_01_25.pdf (News release, January 25, 2011).

Cedar Mountain Exploration, 2011, Drilling confirms broad gold zones at Kelly Creek Prospect: http://www.cedarmountainexp.com/news/index.php?&content_id=79 (News Release, September 26, 2011).

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Sainsbury, C.L., 1972, Geologic map of the Teller quadrangle, Seward Peninsula, Alaska: U.S. Geological Survey Map I-685, 4 p., 1 sheet, scale 1:250,000.

Primary Reference: Cedar Mountain Exploration Inc., 2011 [January 25]

Reporter(s): Travis L. Hudson (Applied Geology); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Kougarok

Site type: Prospect

ARDF no.: TE072

Latitude: 65.7103 **Quadrangle:** TE C-1

Longitude: 165.2289

Location description and accuracy:

The Kougarok prospect is a 1.5 square mile area centered 2 miles north of the summit of Kougarok Mountain (2,870 feet elevation), the highest area in the Teller quadrangle outside the York Mountains. The prospect area is on the west flank of the north-south trending ridge crest from near the Kougarok Mountain summit downslope to elevations of about 1,000 feet in the southeast headwaters of Star Creek. Star Creek is a north-flowing headwater tributary to the south fork of the Serpentine River.

Commodities:

Main: Nb, Sn, Ta

Other:

Ore minerals: Arsenopyrite, cassiterite, columbite-tantalite, pyrrhotite

Gangue minerals: Fluorite, quartz, topaz, tourmaline, white mica

Geologic description:

A Late Cretaceous composite granite complex intrudes metapelitic schist in the Kougarok prospect area. The metapelitic schist is a highly deformed mica-quartz schist characterized by isoclinally folded quartz boudins and segregations that may be Precambrian in age (Gardner and Hudson, 1984). It is thermally metamorphosed to biotite-bearing hornfels within several hundred feet of the granite contact. Boron-rich metasomatism has altered metapelitic schist and hornfels to tourmaline-axinite-sulfide rocks throughout the main prospect area.

Most of the granite complex is only present in the subsurface but a few granite dikes and a highly altered plug are exposed at the surface. Diamond drilling shows the subsurface granite to have porphyritic and equigranular phases (Puchner, 1986). Equigranular leucocratic phases were intruded later than the porphyritic phases and are associated with extensive alteration of the country rocks, exogreisen development in peripheral dikes and plug, and roof greisen development in the subsurface pluton. Local and regional gravity surveys (Puchner, 1986; Barnes and Hudson, 1977) show that the Kougarok granites are part of a much larger batholithic complex at depth. Puchner (1986) reports Rb/Sr and K/Ar data that indicate that the granite and associated mineralized rocks are Late Cretaceous in age (72 +/- 2 and 70.2 +/- 2.2 Ma respectively). These ages are consistent with that of other tin granite complexes on the western Seward Peninsula (Hudson and Arth, 1983).

A greisen-altered granite dike, Chuck's dike, and the Main plug are the principal exogreisen deposits (Puchner, 1984; Apel, 1984). The equigranular zinnwaldite granite dike is offset locally by normal faults and is almost 3,000 feet long in the prospect area (Puchner, 1986, figure 3). This dike dips steeply east, and varies in thickness from one to 15 feet although it commonly is 6 to 8 feet thick. It is variably altered over most of its length but complete greisenization is present at five places at the surface (Puchner, 1986, p. 1787). The longest exposed greisen segment is 500 feet in strike length and greisen development in it continues down dip in the subsurface about 500 feet where it merges with a roof greisen in the subsurface pluton (Puchner, 1986, p. 1786). Tin grades in the Chuck's dike greisen are commonly 1 percent. Two surface trenches and 9 diamond drill holes in this part of the dike indicate a resource of 240,000 tons of 1.3 percent tin (with a 0.1 percent tin cutoff grade (Puchner, 1984). This resource includes a higher grade

portion of 110,000 tons averaging 2.3 percent tin. The Main plug area that is exposed up slope to the east of Chuck's dike at an elevation of about 2,100 feet is a nearly vertical composite intrusive center that is extensively altered and contains two greisen pipes. These pipes, each about 100 feet across at the surface, appear to merge at depth and extend to deep levels in the intrusive center (Puchner, 1986, p. 1786). The Main plug is a complex body but surface trenches and diamond drilling suggest a combined resource of 1.4 million tons averaging 0.45 percent (no cutoff); tantalum and niobium are each present in the 0.1 to 0.03 percent range (Puchner, 1984). A high grade resource within this plug (0.5 percent tin cutoff) is estimated to contain 100,000 tons averaging 2.1 percent tin.

The zinnwaldite granite that forms Chuck's dike at the surface becomes a subhorizontal granite intrusion at depth whose irregular upper part is a greisen (Puchner, 1986, p. 1786). Alteration throughout this intrusion increases upward to quartz-tourmaline-topaz greisen in which tin grades can exceed 1 percent. Limited diamond drilling suggests a resource of 1.3 million tons or more averaging 0.36 percent tin (0.1 percent cutoff) including a portion where 140,000 tons averages 1.0 percent tin (0.5 percent cutoff) (Puchner, 1984). One of the diamond drill intercepts in the roof greisen was 53 feet of 0.23 percent tin (0.1 percent cutoff) including 13 feet of 0.93 percent tin (0.5 percent cutoff). In general, tin grade increases to as much as 3.4 percent upwards through the altered zinnwaldite intrusion to the roof greisen. Upward from the base to the roof greisen, silver increases to 17 parts per million (ppm) and lead to 1,340 ppm; tantalum increases from 20 ppm to as high as 845 ppm from the base to the roof greisen. The zinnwaldite granite contains 1 to 2 percent fluorite and arsenic may be as high as 1,000 ppm locally in the upper part of the intrusion (Puchner, 1986, p. 1791).

Kougarok is a boron-rich tin system characterized by abundant tourmaline and axinite replacement in the host schist and by tourmaline disseminations in altered granite. Its elevated tantalum and niobium, present in discrete tantalite/columbite grains, is also notable.

Anaconda's 1980s exploration showed that parts of the roof greisen and main plug zones contained elevated tantalum contents in the few to several hundred ppm range. (The following information has not previously been made public; it comes from the personal involvement in the work by the compiler, Travis Hudson.) Navigator Exploration Corp. and Chapleau Resources, Ltd. optioned this prospect from Greatland Exploration Ltd. in 2001 and 2002 to evaluate its tantalum potential. This exploration included surface prospecting and sampling, examination and sampling of core from Anaconda's 1980s drilling, analysis of gravity and magnetic data, and drilling of 7 vertical diamond drill holes totaling 2,438.2 m (8,000 feet). Their descriptions follow:

1) Drill hole 2002-1 was located near the summit of Kougarok Mountain (489457 mE, 7284312 mN). This 237.6 m (813 foot) hole encountered a few felsic dikes intruding Kougarok Schist. The highest tantalum value was 32 ppm and the highest tin value was 310 ppm; 2) Drill hole 2002-2 was located near the north end of Chuck's dike and about 650 meters northwest of the main plug (489222 mE, 7287955 mN). This 237.6 meter (780 feet) hole encountered 70.8 meters (232 feet) of zinnwaldite granite with tantalum values to 87 ppm and tin values to 337 ppm; 3) Drill hole 2002-3 was located between 2002-2 and the main plug (489494 mE, 7287718 mN). Its total length was 368.4 meters (1,209 feet) and it encountered 114.4 meters (375 feet) of zinnwaldite granite and related intrusive breccias. The highest tantalum value was 57 ppm and the highest tin value was 408 ppm; 4) Drill hole 2002-4 was located about 40 meters east of the main plug (489683 mE, 7287497 mN). This 328.6 meter (1,078 feet) hole encountered 198 meters (649 feet) of variously altered zinnwaldite granite and related intrusive breccias. Tantalum values reached 353 ppm; one 31.5 meter (103 feet) interval averaged 233 ppm Ta. Tin values reached 3.6 percent.; 5) Drill hole 2002-5 was located about 250 meters east of 2002-4 (389916 mE, 7287460 mN). This 408.6 meter (1,340 foot) hole encountered 172 meters (564 feet) of Kougarok Schist above 237 meters (778 feet) of Paleozoic quartzite and marble. No samples were submitted for assay from this hole.; 6) Drill hole 2002-6 was located on Tourmaline Ridge about 1,200 meters southwest of the main plug and near the south end of Chuck's dike (489453 mE, 7826435 mN). This 473.1 meter (1,552 foot) hole encountered a zone of zinnwaldite granite intrusives between 393 and 470 meters (1,289 and 1,542 feet). The hole bottomed in porphyritic biotite granite. The highest Ta value in the hole was 13 ppm and the highest Sn value was 59 ppm; 7) Drill hole 2002-7 was located about 900 meters (2,950 feet) north of the main plug (489700 mE, 7288447 mN) This 264.6 meter (868 foot) hole encountered several felsic dikes and brecciated intrusives in Kougarok Schist. One dike contained 119 ppm tantalum.

Alteration:

Hydrothermal alteration is extensive in the Kougarok prospect area. The country rock metapelitic schist and hornfels is extensively veined and replaced by tourmaline, axinite, and sulfide minerals (dominantly pyrrhotite but including arsenopyrite and chalcopyrite) over a roughly circular area with a diameter of 3,700 feet at the surface and to a depth of almost 800 feet in the area above the zinnwaldite granite and between Chuck's dike and the Main plug (Puchner, 1986). Tin is commonly anomalous in these rocks and in places exceeds 0.1%. Sericite and tourmaline development is ubiquitous in granite intrusions of the prospect area. Puchner (1986) recognizes increasing degrees of alteration from weak sericite-tourmaline replacement to assemblages with increasing zinnwaldite contents to quartz-tourmaline-topaz greisen. Zinnwaldite-rich alteration zones peripheral to roof greisen are common.

Age of mineralization:

Late Cretaceous; the radiometric ages referenced by Puchner (1986) include an Rb/Sr age of 72 +/- 2 Ma for porphyritic biotite granite and a K/Ar age of 70.2 +/- 2.6 Ma for zinnwaldite granite from the Main plug.

Generic deposit model:

Deposit model:

Tin greisen including exogreisen and endogreisen (roof) deposits (Cox and Singer, 1986, model 15c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

15c

Production Status: None

Site Status: Active

Workings/exploration:

Surface dozer trenching has been completed on a part of Chuck's dike and in the Main plug area. Twenty nine larger diameter diamond drill holes and 32 smaller diamond drill (Winkie) holes were done in the early 1980s (Puchner, 1984). Most of these have been in the north Chuck's dike and Main plug area.

Anaconda's 1980s exploration showed that parts of the roof greisen and main plug zones contained elevated tantalum contents in the few to several hundred ppm range. Navigator Exploration Corp. and Chapleau Resources, Ltd. optioned this prospect from Greatland Exploration Ltd. in 2001 and 2002 to evaluate its tantalum potential. This exploration included surface prospecting and sampling, examination and sampling of core from Anaconda's 1980s drilling, analysis of gravity and magnetic data, and drilling of 7 vertical diamond drill holes totaling 2,438.2 meters (8,000 feet).

Production notes:

None.

Reserves:

Preliminary resource estimates have been made for a part of the exogreisen deposit in Chuck's dike, the exogreisen deposit in the Main plug, and the roof greisen in buried zinnwaldite granite (Puchner, 1984). The resource estimate for exogreisen in Chuck's dike is 240,000 tons averaging 1.3 percent tin (including a part that is 110,00 tons averaging 2.3 percent tin). The Main plug exogreisen resource estimate is 1.4 million tons averaging 0.45 percent tin and 0.1 to 0.3 percent of both tantalum and niobium; this includes a part that has 100,000 tons of 2.1 percent tin. The roof greisen estimate is 1.3 million tons of 0.36 percent tin including a part that is 140,000 tons of 1.0 percent tin. Puchner (1984) emphasized that these estimates are preliminary and that more exploration is needed to constrain them. (No reserves have been published from the drilling in 2001 and 2002).

Additional comments:

References:

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Primary Reference: Puchner,1984; Puchner, 1986; this record

Reporter(s): Travis L. Hudson (Applied Geology, Inc.)

Last report date: 2005-10-10

Site name(s): Christophosen Creek

Site type: Prospect

ARDF no.: TE103

Latitude: 65.026 **Quadrangle:** TE A-2

Longitude: 165.629

Location description and accuracy:

Christophosen Creek is a stream on the north flank of the Kigluaik Mountains whose mouth is on Windy Cove of Imuruk Basin. This creek is not identified by name on USGS topographic maps; its name comes from a location map made by Coats (1944). It is located 0.2 mile east from the center of section 30, T. 5 S., R. 35 W., of the Kateel River Meridian. The graphite deposit at this locality is 1.75 miles southeast of the mouth of the creek and 8.5 miles due east of the White River. It is at the abrupt break in slope on the north side of the mountain front, just upslope of the surface trace of the active Kigluaik normal fault. The graphite-bearing rocks are in the footwall of this fault. This location was not shown by Cobb and Sainsbury (1972), but Cobb (1975) summarized relevant references under the name 'Christophosen Cr.' Location is accurate within 500 feet.

Commodities:

Main: Graphite

Other:

Ore minerals: Graphite, pyrrhotite

Gangue minerals: Amphibole, biotite, garnet, muscovite, plagioclase, quartz, sillimanite, sphene, zircon

Geologic description:

Christophosen Creek is now encompassed as part of the Graphite Creek record (TE105).

Flake graphite occurs as disseminations and high-grade tabular lenses within amphibolite facies metasedimentary rocks (Coats, 1944). The metamorphic rocks are primarily biotite-quartz schist with some sillimanite and garnet (Sainsbury, 1972). Small granitic plugs, dikes, and sills locally intrude the metamorphic rocks. The graphite-bearing schists are sharply bound to the north by the recently active Kigluaik fault, the principal fault along which late Cenozoic uplift of the Kigluaik Mountains has taken place (Hudson and Plafker, 1978). The graphite-bearing schists strike approximately parallel to the mountain front and dip north between 25 and 65 degrees. They form a zone along the mountain front that is 200 to 400 feet thick and possibly 20,000 feet long (Hudson, 1981; also see Ruby Creek (TE104) and Graphite Creek (TE105) localities to the east). To the south, the graphite-bearing schists are in conformable contact with other amphibolite facies metasedimentary rocks. The latter appear to be feldspathic and contain much less graphite. The graphite-bearing schists make up two general sequences; (1) a heterogeneous sequence of garnet-sillimanite-biotite-quartz schist with disseminated graphite and graphite-rich lenses, and (2) a more evenly layered biotite-quartz schist with disseminated graphite. The latter contains disseminated pyrrhotite and commonly weathers orange.

Claims were first staked on this deposit in 1900 but most of the work appears to have taken place between 1912 and 1917 (Cobb, 1975). Coats (1944) describes 25-foot thick schist units containing 10 percent disseminated graphite. Lenses in these schists, a few inches to 18 inches thick, can contain 50 to 90 percent coarse graphite by volume. The length of the lenses appears to be 10 to 15 times their width. The graphite flakes are commonly 0.004 to 0.04 inches in diameter although some are greater than 0.1 inch across. Two samples (Coats, 1944) contained 24.9 percent and 56.6 percent graphite of which 76 percent and 82 percent was coarser than 30 mesh per inch. Samples of schist with disseminated graphite from this locality appeared

to have a few to 15 percent graphite in thin section but laboratory analyses indicated only 4 to 6 percent (Wolgemuth, 1982).

During 2011 and 2012, Graphite One conducted exploration work at the Graphite Creek Property. The majority of the exploration work was completed during the summer 2012 including: a time-domain helicopter-borne electromagnetic survey; geological mapping; surface grab, channel and bulk pit sampling; and an 18 drillhole program to test the graphitic units at depth (Duplessis and others, 2013). In 2013, a 10 drillhole program expanded the area of mineralization both easterly and westerly, more than doubling the length of the graphite zone, which was about 2.2 kilometers in 2012, and became 4.8 kilometers in 2013 (Eccles and Nicholls, 2014).

Alteration:

Some shearing and deformation of graphite-rich lenses has accompanied faulting and oxidation of disseminated pyrrhotite has led to orange-staining of graphite-bearing rocks but other types of alteration are not identified.

Age of mineralization:

The metamorphism that has developed coarse graphite in these rocks is Late Jurassic to Early Cretaceous in age.

Generic deposit model:

Deposit model:

Disseminated flake graphite (Orris and Bliss, 1992; model 37f).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

37f

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Small surface pits are the principal workings here. Exploration activity in the general area took place in 1994 (Swainbank and others, 1995) as well as in 2011 to 2013 (Duplessis and others, 2013; Graphite One Resources, 2014).

During 2011 and 2012, Graphite One conducted exploration work at the Graphite Creek Property. The majority of the exploration work was completed during the summer 2012 including: a time-domain helicopter-borne electromagnetic survey; geological mapping; surface grab, channel and bulk pit sampling; and an 18 drillhole program to test the graphitic units at depth (Duplessis and others, 2013). In 2013, a 10 drillhole program expanded the area of mineralization both easterly and westerly, more than doubling the length of the graphite zone, which was about 2.2 kilometers in 2012, and became 4.8 kilometers in 2013 (Eccles and Nicholls, 2014).

Production notes:

About 130 tons of hand-sorted high-grade material were shipped in 1916 (Mertie, 1918) and other small shipments of similar material may have occurred.

Reserves:

A stock pile of hand-sorted material is estimated to contain 50 tons and the few miles of strike between the area of the Christophosen Creek deposit and the Graphite Creek deposit to the east has been estimated to contain 65,000 tons averaging about 60 percent graphite (Coats, 1944). This zone has also been estimated to contain, overall, more than 10 million tons of 10 percent or more graphite (Weiss, 1973).

The first mineral resource estimate for Graphite Creek (TE105), which also includes Christophosen Creek and Ruby Creek (TE104), was prepared by Claude Duplessis, Eng., senior consultant for SGS Canada Inc.

(SGS), and an independent Qualified Person under National Instrument (NI) 43-101, using the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves, Definitions and Guidelines (Duplessis and others, 2013), which was updated the following year to include 2013 drill program results (Eccles and Nicholls, 2014).

They report an inferred resource of 186.86 million tonnes of schist containing 5.5 percent graphite with a recommended cut-off grade of 3 percent graphitic carbon (by LECO CR-412 Carbon Analyzer) and an inferred resource in-situ graphite of 10.34 million tonnes. For the list of other cut-off grades, refer to Eccles and Nicholls, 2014.

Additional comments:

In January 2012, Graphite One Resources entered an option agreement to earn 100 percent interest in claims encompassing known graphite showings over a three year period through exploration work totaling approximately $1.525 million, which Graphite One has completed with its 2012 summer exploration program. The total Graphite Creek Property land package comprises 129 claims totaling 16,801 acres (6,799 hectares), essentially controlling all prospective lands of known graphite mineralization in the region (Duplessis and others, 2013). The historically-named Christophosen Creek prospect is part of the overall Graphite Creek Project (Eccles and Nicholls, 2014).

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Primary Reference: Coats, 1944

Reporter(s): Travis L. Hudson (Applied Geology); V.C. Zinno (Alaska Earth Sciences, Inc.), F.H. Wilson (USGS)

Last report date: 2016-03-15

Site name(s): Ruby Creek

Site type: Prospect

ARDF no.: TE104

Latitude: 65.037

Quadrangle: TE A-2

Longitude: 165.552

Location description and accuracy:

Ruby Creek is a small east headwater tributary to Glacier Canyon Creek that flows northward across the Kigluaik Mountain front 0.4 mile northeast of Glacier Canyon Creek. It is located 0.5 mile east-southeast from the center of section 21, T. 5 S., R. 34. W., of the Kateel River Meridian. This creek is not identified by name on USGS topographic maps; its name comes from a location map made by Coats (1944). Ruby Creek is now encompassed as part of Graphite Creek Property (TE105, 2014). This location is 11.8 miles due east of White River and 2.4 miles northeast of the Christophosen mine (TE103) at elevations of 550 to 650 feet. It is at the abrupt break in slope on the north side of the mountain front, just upslope of the surface trace of the active Kigluaik normal fault. The graphite-bearing rocks are in the footwall of this fault. This location was not shown by Cobb and Sainsbury (1972), but Cobb (1975) summarized relevant references under the name 'Ruby Cr.' Location is accurate within 500 feet.

Commodities:

Main: Graphite

Other:

Ore minerals:

Gangue minerals: Amphibole, biotite, garnet, muscovite, plagioclase, quartz, sillimanite, sphene, zircon

Geologic description:

Ruby Creek is now encompassed as part of the Graphite Creek record (TE105, 2014).

Flake graphite occurs as disseminations and high-grade tabular lenses within amphibolite facies metasedimentary rocks (Coats, 1944). The metamorphic rocks are primarily biotite-quartz schist with some sillimanite and garnet (Sainsbury, 1972). Small granitic plugs, dikes, and sills locally intrude the metamorphic rocks. The graphite-bearing schists are sharply bound to the north by the recently active Kigluaik fault, the principal fault along which late Cenozoic uplift of the Kigluaik Mountains has taken place (Hudson and Plafker, 1978). The graphite-bearing schists strike approximately parallel to the mountain front and dip north between 25 and 65 degrees. They form a zone along the mountain front that is 200 to 400 feet thick and possibly 20,000 feet long (Hudson, 1981; also see Christophosen Creek (TE103) locality to the west and Graphite Creek (TE105) locality to the east). To the south, the graphite-bearing schists are in conformable contact with other amphibolite facies metasedimentary rocks. The latter appear to be feldspathic and contain much less graphite. The graphite-bearing schists make up two general sequences; (1) a heterogeneous sequence of garnet-sillimanite-biotite-quartz schist with disseminated graphite and graphite-rich lenses, and (2) a more evenly layered biotite-quartz schist with disseminated graphite. The latter contains disseminated pyrrhotite and commonly weathers orange.

To the west of Ruby Creek, a 50-foot trench along strike exposes lenses up to 1 foot wide that are estimated to contain 70 percent graphite by volume. This zone of high-grade lenses has been traced along strike for 500 feet and is exposed over a vertical extent of 175 feet. The width of the graphite-rich zone was not recorded. A sample from this exposure contained 60 percent graphite of which 65 percent was coarser than 30 mesh to the inch (Coats, 1944). Other graphite-rich zones are present along Ruby Creek including a faulted section 4 feet wide with 1 to 6 inch wide graphite stringers and a 12 foot wide section with several 4

to 12 inch thick graphite-rich lenses. Individual lenses are not more than 20 feet long and seem to be about 12 times their width in length. The lenses overlap one another and come and go through the graphite-rich section (Coats, 1944). A sample of schist (plagioclase-biotite-quartz schist) with disseminated graphite from this locality was thought to have 5 to 10 percent graphite in thin section but laboratory analysis indicated a graphite content of 3 percent (Wolgemuth, 1982).

During 2011 and 2012, Graphite One conducted exploration work at the Graphite Creek Property. The majority of the exploration work was completed during the summer 2012 including: a time-domain helicopter-borne electromagnetic survey; geological mapping; surface grab, channel and bulk pit sampling; and an 18 drillhole program to test the graphitic units at depth (Duplessis and others, 2013). In 2013, a 10 drillhole program expanded the area of mineralization both easterly and westerly, more than doubling the length of the graphite zone, which was about 2.2 kilometers in 2012, and became 4.8 kilometers in 2013 (Eccles and Nicholls, 2014).

Alteration:

Age of mineralization:

The metamorphism that has developed coarse graphite in these rocks is Late Jurassic to Early Cretaceous in age.

Generic deposit model:

Deposit model:

Disseminated flake graphite (Orris and Bliss, 1992; model 37f).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

37f

Production Status: Yes; small

Site Status: Active

Workings/exploration:

A 50 foot-long surface trench and a 20 foot-long drift were noted by Coats (1944) and other small surface workings (pits) are probably present. Exploration activity in the general area took place in 1994 (Swainbank and others, 1995) as well as in 2011 to 2013 (Duplessis and others, 2013; Graphite One Resources, 2014).

During 2011 and 2012, Graphite One conducted exploration work at the Graphite Creek Property. The majority of the exploration work was completed during the summer 2012 including: a time-domain helicopter-borne electromagnetic survey; geological mapping; surface grab, channel and bulk pit sampling; and an 18 drillhole program to test the graphitic units at depth (Duplessis and others, 2013). In 2013, a 10 drillhole program expanded the area of mineralization both easterly and westerly, more than doubling the length of the graphite zone, which was about 2.2 kilometers in 2012, and became 4.8 kilometers in 2013 (Eccles and Nicholls, 2014).

Production notes:

Some of the graphite shipments reported for the Alaska Graphite Company may have come from this locality. These shipments include 35 tons (1907) and 100 tons (1916 or 1917) of hand-sorted, high-grade material (Mertie, 1918; Harrington, 1919; Coats, 1944).

Reserves:

The few miles along strike between the area of the Christophosen Creek (TE103)deposit and the Graphite Creek (TE105) deposit to the east has been estimated to contain 65,000 tons averaging about 60 percent graphite (Coats, 1944). This zone has also been estimated to contain, overall, more than 10 million tons of 10 percent or more graphite (Weiss, 1973).

The first mineral resource estimate for Graphite Creek (TE105), which also includes Christophosen Creek (TE103) and Ruby Creek, was prepared by Claude Duplessis, Eng., senior consultant for SGS Canada Inc. (SGS), and an independent Qualified Person under National Instrument (NI) 43-101, using the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves, Definitions and Guidelines (Duplessis and others, 2013), which was updated the following year to include 2013 drill program results (Eccles and Nicholls, 2014).

They report an inferred resource of 186.86 million tonnes of schist containing 5.5 percent graphite with a recommended cut-off grade of 3 percent graphitic carbon (by LECO CR-412 Carbon Analyzer) and an inferred resource of in-situ graphite of 10.34 million tonnes. For the list of other cut-off grades, refer to Eccles and Nicholls, 2014.

Additional comments:

In January 2012, Graphite One Resources entered an option agreement to earn 100 percent interest in claims encompassing known graphite showings over a three year period through exploration work totaling approximately $1.525 million, which Graphite One has completed with its 2012 summer exploration program. The total Graphite Creek Property land package comprises 129 claims totaling 16,801 acres (6,799 hectares), essentially controlling all prospective lands of known graphite mineralization in the region (Duplessis and others, 2013). The historically-named Ruby Creek prospect is part of the overall Graphite Creek Project (Eccles and Nicholls, 2014).

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Wolgemuth, L.G., 1982, Graphite flake samples from Kigluaik graphite deposits: Denver, Colorado, Anaconda Minerals Company internal memorandum.

Primary Reference: Coats, 1944

Reporter(s): Travis L. Hudson (Applied Geology); V.C. Zinno (Alaska Earth Sciences, Inc.); F.H. Wilson (USGS)

Last report date: 2016-02-25

Site name(s): Graphite Creek

Site type: Prospect

ARDF no.: TE105

Latitude: 65.04 **Quadrangle:** TE A-2

Longitude: 165.535

Location description and accuracy:

The Graphite Creek Prospect is located near the center of section 22, T. 5 S., R. 34 W., of the Kateel River Meridian. Graphite Creek flows northward across the Kigluaik Mountain front 0.9 mile northeast of Glacier Canyon Creek and 0.5 mile northeast of Ruby Creek. This creek is not identified by name on USGS topographic maps; its name comes from a location map made by Coats (1944). Its mouth is on the east shore of Windy Cove on Imuruk Basin, 0.75 mile northeast of the mouth of Glacier Canyon Creek. The graphite deposits are at about 750 feet elevation at the abrupt break in slope on the north side of the mountain front, just upslope of the surface trace of the active Kigluaik normal fault. The graphite-bearing rocks are in the footwall of this fault. This location was not shown by Cobb and Sainsbury (1972), but Cobb (1975) summarized relevant references under the name 'Graphite Cr.' Location is accurate within 500 feet.

Commodities:

Main: Graphite

Other:

Ore minerals:

Gangue minerals: Amphibole, biotite, garnet, muscovite, plagioclase, quartz, sillimanite, sphene, zircon

Geologic description:

Flake graphite occurs as disseminations and high-grade tabular lenses within amphibolite facies metasedimentary rocks (Coats, 1944). The metamorphic rocks are primarily biotite-quartz schist with some sillimanite and garnet (Sainsbury, 1972). Small granitic plugs, dikes, and sills locally intrude the metamorphic rocks. The graphite-bearing schists are sharply bound to the north by the recently active Kigluaik fault, the principal fault along which late Cenozoic uplift of the Kigluaik Mountains has taken place (Hudson and Plafker, 1978). The graphite-bearing schists strike approximately parallel to the mountain front and dip north between 25 and 65 degrees. They form a zone along the mountain front that is 200 to 400 feet thick and possibly 20,000 feet long (Hudson, 1981; also see Christophosen Creek (TE103) to the west). To the south, the graphite-bearing schists are in conformable contact with other amphibolite facies metasedimentary rocks. The latter appear to be feldspathic and contain much less graphite. The graphite-bearing schists make up two general sequences; (1) a heterogeneous sequence of garnet-sillimanite-biotite-quartz schist with disseminated graphite and graphite-rich lenses, and (2) a more evenly layered biotite-quartz schist with disseminated graphite. The latter contains disseminated pyrrhotite and commonly weathers orange.

West of Graphite Creek a 30 foot-long pit exposes a garnet-bearing schist with disseminated graphite and graphite-rich lenses. A 13-foot section here contained 3 feet of garnet -bearing schist with graphite and a 3.5 foot thick high-grade graphite lense with quartz stringers. A sample of the garnet-bearing schist contained 12 percent graphite of which 80 percent was coarser than 30 mesh per inch and a sample of the graphite-rich material contained 59 percent graphite of which 83 percent was coarser than 30 mesh per inch (Coats, 1944). A 25-foot thick zone containing disseminated graphite and a 3-foot wide high-grade lens is exposed on the east side of Graphite Creek. Twenty feet of this section is estimated to contain 10 percent disseminated graphite. This zone has been traced eastward on the surface for a distance of 480 feet and

where it is well exposed, a 3- to 4-foot wide high-grade lens is present (Coats, 1944).

In 2016, Graphite One Resources conducted a comprehensive product-development program for graphite from their Graphite Creek deposit. Significant results include: test work exceeded graphite-purity threshold requirements; produced premiumgrade spherical graphite (SPG) from purified graphite; achieved almost 75 percent conversion of STAX graphite (Spheroidal, Thin, Aggregate, and eXpanded naturallyoccurring morphologies present in graphite sourced from the Graphite Creek deposit) to SPG in the size range suitable for electric-vehicle applications compared to typical industry yields of 30 to 40 percent; successful, near-theoretical-limit discharge-capacity tests on coated and uncoated spherical graphite; nearing completion of preliminary test work on mineral-processing circuit for producing high-grade graphite concentrate; and, demonstrated potential to produce products that will effectively compete in the high-end battery market (for both electric vehicles and power storage) as well as other markets for purified graphite and graphite byproducts (Athey and Werdon, 2017).

Alteration:

The graphite occurs as massive to semi-massive segregations and disseminations in amphibolite grade biotite-quartz schist with zones of sillimanite-garnet-biotite-quartz schist with high-grade graphite within 1 km of a fault zone (Eccles and Nicholls, 2014).

Age of mineralization:

The metamorphism that has developed coarse graphite in these rocks is Late Cretaceous, based on K/Ar and Ar/Ar dating which is immediately preceding or coincident with the intrusion of the Kigluaik Pluton (Eccles and Nicholls, 2014).

Generic deposit model:

Deposit model:

Disseminated flake graphite (Orris and Bliss, 1992; model 37f).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

37f

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Surface pits, including one 30 feet long from which 50 tons of high-grade material were recovered, are present. Exploration activity in the general area took place in 1994 (Swainbank and others, 1995).

In January 2012, Graphite One Resources (Graphite One) entered an option agreement to earn 100 percent interest in claims encompassing known graphite showings over a three year period. The total Graphite Creek Property land package comprises 129 claims totaling 16,801 acres (6,799 hectares) (Duplessis and others, 2013).

During 2011 and 2012, Graphite One conducted exploration work at the Graphite Creek Property. The majority of the exploration work was completed during the summer 2012 including: a time-domain helicopter-borne electromagnetic survey; geological mapping; surface grab, channel and bulk pit sampling; and an 18 drillhole program to test the graphitic units at depth (Duplessis and others, 2013). In 2013, a 10 drillhole program expanded the area of mineralization both easterly and westerly, more than doubling the length of the graphite zone, which was about 2.2 kilometers in 2012, and became 4.8 kilometers in 2013 (Eccles and Nicholls, 2014).

In 2014 infill drilling along a 730 meter strike length at Graphite Creek was completed by Graphite One. Twenty-two holes were drilled for a total of 2313 meters. Two of these drill holes were for metallurgical work. The other 20 drill holes, along with drill holes from previous years, provided enough drill coverage and confidence to estimate an indicated and inferred resource at Graphite Creek. Highlights from the 2014 drilling include 23.43 meters of 8.66 percent graphitic carbon (Cg), 38.87 meters of 10.50 percent Cg, 42.81

meters of 6.27 percent Cg, 38.80 meters of 7.80 percent Cg, and 24.56 meters of 6.76 Cg (Eccles and others, 2015).

Production notes:

Most of the graphite shipments reported for the Alaska Graphite Company may have come from this locality. These shipments include 35 tons (1907) and 100 tons (1916 or 1917) of hand-sorted, high-grade material (Mertie, 1918; Harrington, 1919; Coats, 1944). Coats (1944) reports that about 50 tons were recovered in 1916 from the 30-foot long pit on the west side of Graphite Creek.

Reserves:

The few miles along strike between the area of the Christophosen Creek (TE103) deposit and the Graphite Creek deposit to the east has been estimated to contain 65,000 tons averaging about 60 percent graphite (Coats, 1944). This zone has also been estimated to contain, overall, more than 10 million tons of 10 percent or more graphite (Weiss, 1973).

The first mineral resource estimate for Graphite Creek, which includes Christophosen Creek (TE103) and Ruby Creek (TE104), calculated according to modern standards was by Duplessis and others in 2013. Eccles and Nicholls (2014) updated this estimate with an inferred resource of 186.86 million tonnes of 5.5 percent graphitic carbon with a recommended cut-off grade of 3 percent graphitic carbon and in-situ graphite of 10,346,000 tonnes.

With more infill drilling completed, in 2015 an indicated resource at Graphite Creek was finally able to be estimated by Eccles and others (2015). The indicated resource at a 3 percent cut-off grade is 17.95 million tonnes at 6.3 percent graphitic carbon and 1,133,000 tonnes in-situ graphite. The inferred resource was updated at a 3 percent cut-off grade to 154.36 million tonnes at 5.7 percent graphitic carbon and 8,764,000 tonnes of in-situ graphite (Eccles and others, 2015).

Graphite One Resources plans to release Graphite Creek’s inaugural Preliminary Economic Assessment, including a refined resource estimate, in February 2017. As of April 2015, Graphite Creek’s indicated resources include 17.95 million tonnes grading 6.3 percent carbon-as-graphite (Cg) for an in situ 1.13 million tonnes of graphite, and inferred resources of 154.36 million tonnes grading 5.7 percent Cg for an in situ 8.76 million tonnes of graphite (Graphite One Resources, 2015). Resources are based on 48 drill holes, using a cut-off grade of 3 percent. The deposit remains open along strike in both the east and west directions, as well as down dip.

Additional comments:

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Reporter(s): Travis L. Hudson (Applied Geology); V.C. Zinno (Alaska Earth Sciences, Inc.); N.V. King (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Wolf

Site type: Prospect

ARDF no.: TE107

Latitude: 65.7624 **Quadrangle:** TE D-2

Longitude: 165.9036

Location description and accuracy:

The Wolf prospect is about 15.1 miles southeast of Ear Mountain, about 0.3 mile southeast of hill 1095, and about 0.4 mile south-southeast of the center of section 11, T. 4 N., R. 35 W. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Hg, Sb

Ore minerals: Arsenopyrite?, gold, pyrite

Gangue minerals: Calcite, quartz

Geologic description:

The Wolf prospect is in mica-quartz schist and graphitic quartz schist intercalated in a metasedimentary sequence that includes schistose, micaceous, dolomitic marble; mica-calcite schist; and minor micaceous quartzite (Cedar Mountain, 2011 [project]). The sequence is interpreted as a limestone-shale assemblage with facies variations. It is highly deformed and perhaps isoclinally folded. Schistosity dips moderately in various directions. Steeply-dipping marble-schist contacts and other strong linear features may indicate normal faults. The Wolf prospect is along a northwest-trending, regional fault that marks the contact between schist to the southwest and marble to the northeast. All of the metavolcanic and metasedimentary rocks in area were probably Paleozoic originally and have been metamorphosed in the Cretaceous; Sainsbury (1972) however mapped them as Precambrian.

The Wolf prospect is one of several similar deposits that define a district-level, west-northwest-trending belt of gold mineralization about 11 miles long and 2 miles wide. The best known and most extensively explored of these is the Kelly Creek prospect (TE069) about a half mile to the north; other are the North Fox (TE109), South Fox (TE108), Wolverine (TE110), Moose (TE111), and Jaeger (TE112) prospects.

The Wolf prospect was discovered by following up gold and arsenic anomalies in soils and stream sediments from the west headwaters of Kelly Creek (Hudson and Wyman, 1983; Hudson, 1984; Cedar Mountain, 2011 [assay]). The gold, arsenic, and antimony values define strong, coherent, multi-element anomalies. Mercury is commonly elevated in the soils, but its distribution and concentration are more erratic and it is more widely dispersed at anomalous levels than the other three elements. Rock samples from frost boils show that the stronger anomalies are associated with silicified breccia and quartz-stockworks in sooty, black carbonaceous quartz schist.

Clay is locally present in fractures and as part of the matrix in breccia. Dolomite and calcite reportedly accompany quartz in the veins in some drill core (Marrs and Ivey, 1984). Pyrite is disseminated in pelitic schist and is present in all mineralized rocks; in part, it is probably of sedimentary origin. Quartz segregations along the foliation in pelitic schist are recrystallized, sugary textured, and vuggy in mineralized rocks.

Cedar Mountain Exploration Inc. acquired the property in March 2010 and began aggressive exploration (Cedar Mountain Exploration Inc., 2011 [Kelly Creek]). In 2011, they drilled four holes totaling 473.8 meters along a high-angle fault; three holes were directed across the trace of the fault (Cedar Mountain, 2011 [November 2, news release]. One hole had to be abandoned before it reached the target zone but the

three holes that were completed all cut intervals with at least 0.1 gram of gold per tonne. The best intercepts were four, 1.5-meter-thick zones with 0.12 to 0.48 gram of gold per tonne, a 1.5 meter interval with 0.17 gram of gold per ton, and a 1.5-meter thick zone with 0.28 gram of gold per tonne. The gold-bearing intercepts are in sheared and quartz-veined, partly calcareous, mica-graphite-quartz schist.

Alteration:

Brecciation, silicification, and quartz stockwork veining is common in pelitic schist. Some quartz veins contain carbonate minerals. Clay and limonite are present in some mineralized rocks.

Age of mineralization:

Unknown but probably mid-to Late Cretaceous as the mineralization postdates regional metamorphism.

Generic deposit model:

Deposit model:

Disseminated and stockwork quartz and gold mineralization in metapelitic rocks. Possibly carbonate-hosted Au-Ag and/or low sulfide Au-quartz vein (Cox and Singer, 1986; models 26a or 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

26a or 36a

Production Status: None

Site Status: Active

Workings/exploration:

The prospect was discovered by following up gold and arsenic anomalies in soils and stream sediments from the west headwaters of Kelly Creek (Hudson and Wyman, 1983; Hudson, 1984; Cedar Mountain, 2011 [assay]). Cedar Mountain Exploration Inc. acquired the property in March 2010 and began aggressive exploration (Cedar Mountain Exploration Inc., 2011 [Kelly Creek]). In 2011, they drilled four holes totaling 473.8 meters, along a high-angle fault; three were directed across the trace of the fault (Cedar Mountain, 2011 [November 2, news release].. One hole had to be abandoned before it reached the target zone but the other three were completed.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cedar Mountain Exploration, 2011, Drilling confirms bedrock gold source at Kelly Creek project: http://cedarmountainexp.com/news/news_archive/index.php?&content_id=85 (News release, November 2, 2011).

Cedar Mountain Exploration Inc., 2011, Kelly Creek project: http://www.cedarmountainexp.com/projects/alaska/kelly_creek_project/ (as of Feb. 10, 2011).

Cedar Mountain Exploration Inc., 2011, New assay date upgrades Cedar Mountain's Kelly Creek Project: http://www.cedarmountainexp.com/_resources/CED_2011_01_25.pdf (News release, January 25, 2011).

Cedar Mountain Exploration, 2011, Drilling confirms bedrock gold source at Kelly Creek project: http://cedarmountainexp.com/news/news_archive/index.php?&content_id=85 (News release, November 2, 2011).

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Sainsbury, C.L., 1972, Geologic map of the Teller quadrangle, Seward Peninsula, Alaska: U.S. Geological Survey Map I-685, 4 p., 1 sheet, scale 1:250,000.

Primary Reference: Cedar Mountain Exploration, 2011 [November 2, news release]

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): South Fox

Site type: Prospect

ARDF no.: TE108

Latitude: 65.7864 **Quadrangle:** TE D-2

Longitude: 165.9999

Location description and accuracy:

The South Fox prospect is about 11.9 miles southeast of Ear Mountain. It is centered about 0.5 mile west of hill 1180 and about 0.6 mile southwest of the center of section 35, T. 5 N., R. 35 W. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Hg, Sb

Ore minerals:

Gangue minerals: Calcite, quartz

Geologic description:

The South Fox prospect is in mica-quartz schist and graphitic quartz schist intercalated in a metasedimentary sequence that includes schistose, micaceous, dolomitic marble; mica-calcite schist; and minor micaceous quartzite (Cedar Mountain, 2011 [project]). The sequence is interpreted as a limestone-shale assemblage with facies variations. It is highly deformed and perhaps isoclinally folded. Schistosity dips moderately in various directions. Steeply-dipping marble-schist contacts and other strong linear features may indicate normal faults. The South Fox prospect is along a northwest-trending, regional fault that marks the contact between schist to the southwest and marble to the northeast. All of the metavolcanic and metasedimentary rocks in area were probably Paleozoic originally and have probably been metamorphosed in the Cretaceous; Sainsbury (1972) however mapped them as Precambrian.

The South Fox prospect is one of several similar deposits that define a district-level, west-northwest trending belt of gold mineralization about 11 miles long and 2 miles wide. The best known and most extensively explored of these is the Kelly Creek prospect (TE069) about a half mile to the north; other are the North Fox (TE109), Wolf (TE107), Wolverine (TE110), Moose (TE111), and Jaeger (TE112) prospects.

The prospect was discovered by following up gold and arsenic anomalies in soils and stream sediments collected in the west headwaters of Kelly Creek (Hudson and Wyman, 1983; Hudson, 1984; Cedar Mountain, 2011 [assay]) The gold, arsenic, and antimony values define strong, coherent, multi-element anomalies. Mercury is commonly elevated in the soils, but its distribution and concentration are more erratic and it is more widely dispersed at anomalous levels than the other three elements. Rock samples from frost boils show that the stronger anomalies are associated with silicified breccia and quartz-stockworks in sooty, black carbonaceous quartz schist.

Clay is locally present in fractures and as part of the matrix in breccia. Dolomite and calcite reportedly accompany quartz in the veins in some drill core (Marrs and Ivey, 1984). Pyrite is disseminated in pelitic schist and is present in all mineralized rocks; in part, it is probably of sedimentary origin. Quartz segregations along the foliation in pelitic schist are recrystallized, sugary textured, and vuggy in mineralized rocks.

Cedar Mountain Exploration Inc. acquired the property in March 2010 and began aggressive exploration (Cedar Mountain Exploration Inc., 2011 [Kelly Creek]). In 2011, Cedar Mountain drilled 10 holes that totaled 1,102 meters (Cedar Mountain Exploration, 2011 [November 18]). Four holes in the northern part of

the prospect cut significant intervals with gold values along a strike length of about 250 meters. The best intercepts were 0.45 gram of gold per ton along 28.40 meters and 0.76 gram of gold per tonne along 24.00 meters. The mineralization is associated with faulted and sheared quartz-veinlets and stockworks in mica-quartz schist and calcareous, graphite-quartz schist. The other holes in the south portion of the prospect did not cut significant mineralization, possibly due to faulting that offset the mineralized zone.

Alteration:

Age of mineralization:

Unknown but probably mid-to Late Cretaceous as the mineralization postdates regional metamorphism.

Generic deposit model:

Deposit model:

Disseminated and stockwork quartz and gold mineralization in metapelitic rocks. Possibly carbonate-hosted Au-Ag and/or low sulfide Au-quartz vein (Cox and Singer, 1986; models 26a or 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

26a or 36a?

Production Status: None

Site Status: Active

Workings/exploration:

The prospect was discovered by following up gold and arsenic anomalies in soils and stream sediments collected in the west headwaters of Kelly Creek (Hudson and Wyman, 1983; Hudson, 1984; Cedar Mountain, 2011 [assay]). Cedar Mountain Exploration Inc. acquired the property in March 2010 and began aggressive exploration (Cedar Mountain Exploration Inc., 2011 [Kelly Creek]). In 2011, Cedar Mountain drilled 10 holes that totaled 1,102 meters

Four holes in the northern part of the prospect cut significant intervals with gold values along a strike length of about 250 meters. The other six holes in the south portion of the prospect did not cut significant mineralization.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cedar Mountain Exploration, 2011, Drilling confirms bedrock gold source at Kelly Creek project: http://cedarmountainexp.com/news/news_archive/index.php?&content_id=85 (News release, November 2, 2011).

Cedar Mountain Exploration Inc., 2011, Kelly Creek project: http://www.cedarmountainexp.com/projects/alaska/kelly_creek_project/ (as of Feb. 10, 2011).

Cedar Mountain Exploration Inc., 2011, New assay date upgrades Cedar Mountain's Kelly Creek Project: http://www.cedarmountainexp.com/_resources/CED_2011_01_25.pdf (News release, January 25, 2011).

Cedar Mountain Exploration, 2011, Cedar identified new gold targets at Kelly Creek project: http://www.cedarmountainexp.com/news/index.php?&content_id=86 (News Release, November 18, 2011).

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Hudson, T.L., and Wyman, W. F., 1983, Interim report on areas of Seward Peninsula warranting further prospecting and evaluation: Anchorage, Anaconda Minerals Company internal report, 84 p., 7 plates. (Report held by Cook Inlet Region Inc., Anchorage, Alaska.)

Marrs, C.D., and Ivey, J.A., 1984, 1984 Prospect evaluation project; Kelly Creek (Fox claims): Anchorage, Alaska, Anaconda Minerals Company internal report. (Report held by Cook Inlet Region, Inc., Anchorage, Alaska).

Sainsbury, C.L., 1972, Geologic map of the Teller quadrangle, Seward Peninsula, Alaska: U.S. Geological Survey Map I-685, 4 p., 1 sheet, scale 1:250,000.

Primary Reference: Cedar Mountain Exploration, 2011 [November 18 news release]

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): North Fox

Site type: Prospect

ARDF no.: TE109

Latitude: 65.7957 **Quadrangle:** TE D-2

Longitude: 165.9691

Location description and accuracy:

The North Fox prospect is about 12.1 miles southeast of Ear Mountain. It is about 0.7 mile north-northeast of hill 1180 and about 0.6 mile northeast of the center of section 35, T 5. N., R. 35 W. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Hg, Sb

Ore minerals:

Gangue minerals: Calcite, quartz

Geologic description:

The North Fox prospect is in mica-quartz schist and graphitic quartz schist intercalated in a metasedimentary sequence that includes schistose, micaceous, dolomitic marble; mica-calcite schist; and minor micaceous quartzite (Cedar Mountain, 2011 [project]). The sequence is interpreted as a limestone-shale assemblage with facies variations. It is highly deformed and perhaps isoclinally folded. Schistosity dips moderately in various directions. Steeply-dipping marble-schist contacts and other strong linear features may indicate normal faults. The North Fox prospect is along a northwest-trending, regional fault that marks the contact between schist to the southwest and marble to the northeast. All of the metavolcanic and metasedimentary rocks in area were probably Paleozoic originally and have been metamorphosed in the Cretaceous; Sainsbury (1972) however mapped them as Precambrian.

The North Fox prospect is one of several similar deposits that define a district-level, west-northwest trending belt of gold mineralization about 11 miles long and 2 miles wide. The best known and most extensively explored of these is the Kelly Creek prospect (TE069) about 2.6 miles to the southeast; other are the South Fox (TE108), Wolf (TE107), Wolverine (TE110), Moose (TE111), and Jaeger (TE112) prospects.

The prospect was discovered by following up gold and arsenic anomalies in soils and stream sediments from the west headwaters of Kelly Creek (Hudson and Wyman, 1983; Hudson, 1984; Cedar Mountain, 2011 [assay]; Cedar Mountain, 2011 [November 2, news release], Cedar Mountain, 2011 [November 2 map]) The gold, arsenic, and antimony values define strong, coherent, multi-element anomalies. Mercury is commonly elevated in the soils, but its distribution and concentration are more erratic and it is more widely dispersed at anomalous levels than the other three elements. Rock samples from frost boils show that the stronger anomalies are associated with silicified breccia and quartz-stocks in sooty, black carbonaceous quartz schist.

Clay is locally present in fractures and as part of the matrix in breccia. Dolomite and calcite reportedly accompany quartz in the veins in some drill core (Marrs and Ivey, 1984). Pyrite is disseminated in pelitic schist and is present in all mineralized rocks; in part, it is probably of sedimentary origin. Quartz segregations along the foliation in pelitic schist are recrystallized, sugary textured, and vuggy in the mineralized rocks.

Cedar Mountain Exploration Inc. acquired the property in March 2010 and began aggressive exploration

(Cedar Mountain Exploration Inc., 2011 [Kelly Creek]). In 2011, they drilled six holes at North Fox that totaled 668.5 meters on a geochemical anomaly in carbonaceous schist (Cedar Mountain, 2011 [November 2, news release], Cedar Mountain, 2011 [November 2 map]). All the holes cut intervals with more than 0.1 gram of gold per tonne. The gold intersects are relatively narrow and low grade. Some notable intercepts are 4.5 meters with 0.32 gram of gold per tonne, 4.5 meters with 0.42 gram of gold per tonne, 4.5 meters with 0.50 gram of gold per tonne, and 4.5 meters with 0.70 gram of gold per tonne. However the grade increase systematically toward the eastern end of the gold-in-soil geochemical anomaly that extends beyond the drilling. The gold-bearing zones are in sheared and quartz-veined, partly calcareous, mica-graphite-quartz schist.

Alteration:

Age of mineralization:

Unknown but probably mid-to Late Cretaceous as the mineralization postdates regional metamorphism.

Generic deposit model:

Deposit model:

Disseminated and stockwork quartz and gold mineralization in metapelitic rocks. Possibly carbonate-hosted Au-Ag and/or low sulfide Au-quartz vein (Cox and Singer, 1986; models 26a or 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

26a or 36a?

Production Status: None

Site Status: Active

Workings/exploration:

The North Fox prospect was discovered by following up gold and arsenic anomalies in soils and stream sediments from the west headwaters of Kelly Creek (Hudson and Wyman, 1983; Hudson, 1984; Cedar Mountain, 2011 [assay]; Cedar Mountain, 2011 [November 2, news release], Cedar Mountain, 2011 [November 2 map]) Cedar Mountain Exploration Inc. acquired the property in March 2010 and began aggressive exploration (Cedar Mountain Exploration Inc., 2011 [Kelly Creek]). In 2011, they drilled six holes at North Fox that totaled 668.5 meters on a geochemical anomaly in carbonaceous schist (Cedar Mountain, 2011 [November 2, news release], Cedar Mountain, 2011 [November 2 map]). All the holes cut intervals with more than 0.1 grams of gold per tonne. The gold intersects are relatively narrow and low grade. Some notable intercepts are 4.5 meters with 0.32 gram of gold per tonne, 4.5 meters with 0.42 gram of gold per tonne, 4.5 meters with 0.50 gram of gold per tonne, and 4.5 meters with 0.70 gram of gold per tonne. However the grade increases systematically toward the eastern end of the gold-in-soil geochemical anomaly that extends beyond the drilling. The gold-bearing zones are in sheared and quartz-veined, partly calcareous, mica-graphite-quartz schist.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cedar Mountain Exploration Inc., 2011, Kelly Creek project: http://www.cedarmountainexp.com/projects/alaska/kelly_creek_project/ (as of Feb. 10, 2011).

Cedar Mountain Exploration Inc., 2011, New assay date upgrades Cedar Mountain's Kelly Creek Project: http://www.cedarmountainexp.com/_resources/CED_2011_01_25.pdf (News release, January 25, 2011).

Cedar Mountain Exploration, 2011, Drilling confirms bedrock gold source at Kelly Creek project: http://www.cedarmountainexp.com/news/index.php?&content_id=85 (News release, November 2, 2011).

Cedar Mountain Exploration, 2011, North Fox prospect, gold in soils 2010 & 2011: http://cedarmountainexp.com/_resources/CED-NR-Nov-2-2011.pdf November 2, 2011 map)

Cedar Mountain Exploration, 2011, Cedar identified new gold targets at Kelly Creek project: http://www.cedarmountainexp.com/news/index.php?&content_id=86 (News Release, November 18, 2011).

Hudson, T.L., 1984, 1983 Seward Peninsula reconnaissance project: Anchorage, Alaska, Anaconda Minerals Company internal report (Report held by Cook Inlet Region, Inc., Anchorage, Alaska).

Hudson, T.L., and Wyman, W. F., 1983, Interim report on areas of Seward Peninsula warranting further prospecting and evaluation: Anchorage, Anaconda Minerals Company internal report, 84 p., 7 plates. (Report held by Cook Inlet Region Inc., Anchorage, Alaska.)

Marrs, C.D., and Ivey, J.A., 1984, 1984 Prospect evaluation project; Kelly Creek (Fox claims): Anchorage, Alaska, Anaconda Minerals Company internal report. (Report held by Cook Inlet Region, Inc., Anchorage, Alaska).

Sainsbury, C.L., 1972, Geologic map of the Teller quadrangle, Seward Peninsula, Alaska: U.S. Geological Survey Map I-685, 4 p., 1 sheet, scale 1:250,000.

Primary Reference: Cedar Mountain, 2011 [November 2, news release]; Cedar Mountain, 2011 [November 2, map]

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Wolverine

Site type: Prospect

ARDF no.: TE110

Latitude: 65.7822 **Quadrangle:** TE D-2

Longitude: 165.7776

Location description and accuracy:

The Wolverine prospect is about 16.3 miles southeast of Ear Mountain. It is centered along the ridge top about 1.2 mile south of peak 1610 and about 0.5 mile north-northeast of the center of section 5, T. 4 N., R. 34 W. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Hg, Sb

Ore minerals:

Gangue minerals: Calcite, quartz

Geologic description:

The Wolverine prospect is in mica-quartz schist and graphitic quartz schist intercalated in a metasedimentary sequence that includes schistose, micaceous, dolomitic marble; mica-calcite schist; and minor micaceous quartzite (Cedar Mountain, 2011 [project]). The sequence is interpreted as a limestone-shale assemblage with facies variations. It is highly deformed and perhaps isoclinally folded. Schistosity dips moderately in various directions. All of the metavolcanic and metasedimentary rocks in area were probably Paleozoic originally and have been metamorphosed in the Cretaceous; Sainsbury (1972) however mapped them as Precambrian.

The Wolverine prospect is in mica-quartz schist and graphitic quartz schist intercalated in a metasedimentary sequence that includes schistose, micaceous, partly dolomitic marble, mica-calcite schist, and minor micaceous quartzite (Cedar Mountain, 2011 [project]). The metasedimentary sequence is interpreted to represent a limestone-shale assemblage with facies variations. It is highly deformed and perhaps isoclinally folded. Schistosity dips moderately in various directions. All of the metavolcanic and metasedimentary rocks in the area are of unknown but probable Paleozoic age; however, Sainsbury (1972) mapped them as Precambrian.

The Wolverine prospect is one of several similar deposits that define a district-level, west-northwest-trending belt of gold mineralization about 11 miles long and 2 miles wide. The best known and most extensively explored of these is the Kelly Creek prospect (TE069) about 3.5 miles to the west-southwest; other are the South Fox (TE108), North Fox (TE109), Wolf (TE107), Moose (TE111), and Jaeger (TE112) prospects.

The Wolverine prospect was discovered by following up gold and arsenic anomalies in soils and stream sediments (Hudson and Wyman, 1983; Hudson, 1984; Cedar Mountain, 2011 [assay]; Cedar Mountain, 2011 [November 2, news release], Cedar Mountain, 2011 [November 2 map]). The gold, arsenic, and antimony values define strong, coherent, multi-element anomalies. Mercury is commonly elevated in the soils, but its distribution and concentration are more erratic and it is more widely dispersed at anomalous levels than the other three elements. Rock samples from frost boils show that the stronger anomalies are associated with silicified breccia and quartz-stockworks in sooty, black carbonaceous quartz schist.

Clay is locally present in fractures and as part of the matrix in breccia. Dolomite and calcite reportedly accompany quartz in the veins in some drill core (Marrs and Ivey, 1984). Pyrite is disseminated in pelitic

schist and is present in all mineralized rocks; in part, it is probably of sedimentary origin. Quartz segregations along the foliation in pelitic schist are recrystallized, sugary textured, and vuggy in mineralized rocks.

Cedar Mountain Exploration Inc. acquired the property in March 2010 and began aggressive exploration (Cedar Mountain Exploration Inc., 2011 [November 2]). In 2011, Cedar Mountain drilled seven hole totaling 755.5 meters on a large, linear gold-in-soil anomaly. All of the drill holes cut least one mineralized interval 1 to 5.5 meters wide with 0.1 grams or more of gold per tonne. Two of the holes cut five such intervals. The best was 4.5 meters with 0.44 gram of gold per tonne. The gold-bearing zones are predominantly associated with sheared and quartz veined, partly calcareous, mica quartz schist and graphite quartz schist.

Alteration:

Age of mineralization:

Unknown but probably mid-to Late Cretaceous as the mineralization postdates regional metamorphism.

Generic deposit model:

Deposit model:

Disseminated and stockwork quartz and gold mineralization in metapelitic rocks. Possibly carbonate-hosted Au-Ag and/or low sulfide Au-quartz vein (Cox and Singer, 1986; models 26a or 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

26a or 36a?

Production Status: None

Site Status: Active

Workings/exploration:

The Wolverine prospect was discovered by following up gold and arsenic anomalies in soils and stream sediments (Hudson and Wyman, 1983; Hudson, 1984; Cedar Mountain, 2011 [assay]; Cedar Mountain, 2011 [November 2, map]). Cedar Mountain Exploration Inc. acquired the property in March 2010 and began aggressive exploration (Cedar Mountain Exploration Inc., 2011 [Kelly Creek]). In 2011, Cedar Mountain drilled seven hole totaling 755.5 meters in 2011 on a large, linear gold-in-soil anomaly.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cedar Mountain Exploration Inc., 2011, New assay date upgrades Cedar Mountain's Kelly Creek Project: http://www.cedarmountainexp.com/_resources/CED_2011_01_25.pdf (News release, January 25, 2011).

Cedar Mountain Exploration Inc., 2011, Kelly Creek project: http://www.cedarmountainexp.com/projects/alaska/kelly_creek_project/ (as of Feb. 10, 2011).

Cedar Mountain Exploration, 2011, Drilling confirms bedrock gold source at Kelly Creek project: http:

//www.cedarmountainexp.com/news/index.php?&content_id=85 (News release, November 2, 2011).

Cedar Mountain Exploration, 2011, North Fox prospect, gold in soils 2010 & 2011: http://cedarmountainexp.com/_resources/CED-NR-Nov-2-2011.pdf November 2, 2011 map)

Cedar Mountain Exploration, 2011, Cedar identified new gold targets at Kelly Creek project: http://www.cedarmountainexp.com/news/index.php?&content_id=86 (News Release, November 18, 2011).

Hudson, T.L., 1984, 1983 Seward Peninsula reconnaissance project: Anchorage, Alaska, Anaconda Minerals Company internal report (Report held by Cook Inlet Region, Inc., Anchorage, Alaska).

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Marrs, C.D., and Ivey, J.A., 1984, 1984 Prospect evaluation project; Kelly Creek (Fox claims): Anchorage, Alaska, Anaconda Minerals Company internal report. (Report held by Cook Inlet Region, Inc., Anchorage, Alaska).

Sainsbury, C.L., 1972, Geologic map of the Teller quadrangle, Seward Peninsula, Alaska: U.S. Geological Survey Map I-685, 4 p., 1 sheet, scale 1:250,000.

Primary Reference: Cedar Mountain, 2011 [News release, November 2]

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Moose

Site type: Prospect

ARDF no.: TE111

Latitude: 65.7667 **Quadrangle:** TE D-2

Longitude: 165.7047

Location description and accuracy:

The Moose prospect is about 18.6 miles southeast of Ear Mountain. It is about 0.4 mile south of hill 1346 and about 0.5 mile northeast of the center of section 10, T. 4 N., R. 34 W. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Hg, Sb

Ore minerals:

Gangue minerals: Calcite, quartz

Geologic description:

The Moose prospect is in mica-quartz schist and graphitic quartz schist intercalated in a metasedimentary sequence that includes schistose, micaceous, partly dolomitic marble, mica-calcite schist, and minor micaceous quartzite (Cedar Mountain, 2011 [project]). The metasedimentary sequence is interpreted to represent a limestone-shale assemblage with facies variations. It is highly deformed and perhaps isoclinally folded. Schistosity dips moderately in various directions. All of the metavolcanic and metasedimentary rocks in the area are of unknown but probable Paleozoic age; however, Sainsbury (1972) mapped them as Precambrian.

The Moose prospect is one of several similar deposits that define a district-level, west-northwest trending belt of gold mineralization about 11 miles long and 2 miles wide. The best known and most extensively explored of these is the Kelly Creek prospect (TE069) about 5.5 miles to the west; other are the South Fox (TE108), North Fox (TE109), Wolf (TE107), Wolverine (TE110) and Jaeger (TE112) prospects.

The prospect was discovered by following up gold and arsenic anomalies in soils and stream sediments (Hudson and Wyman, 1983; Hudson, 1984; Cedar Mountain, 2011 [assay]; Cedar Mountain, 2011 [November 2]) The gold, arsenic, and antimony values define strong, coherent, multi-element anomalies. Mercury is commonly elevated in the soils, but its distribution and concentration are more erratic and it is more widely dispersed at anomalous levels than the other three elements. Rock samples from frost boils show that the stronger anomalies are associated with silicified breccia and quartz-stockworks in sooty, black carbonaceous quartz schist.

Clay is locally present in fractures and as part of the matrix in breccia. Dolomite and calcite reportedly accompany quartz in the veins in some drill core (Marrs and Ivey, 1984). Pyrite is disseminated in pelitic schist and is present in all mineralized rocks; in part, it is probably of sedimentary origin. Quartz segregations along the foliation in pelitic schist are recrystallized, sugary textured, and vuggy in mineralized rocks.

Cedar Mountain Exploration Inc. acquired the property in March 2010 and began aggressive exploration (Cedar Mountain Exploration Inc., 2011 [Kelly Creek]). Reconnaissance samples collected in 2007 contained some anomalous gold; soil sampling in 2010 and 2011 defined an area about 800 meters long with up to 1,105 parts per billion gold. The rocks in the anomalous area are black, fine-grained carbonaceous schist and mica-quartz schist; the rocks and structural setting are similar to and may be a continuation of those seen in drill holes at the Wolverine prospect (TE110) about 3.5 miles to the northwest.

Alteration:

Age of mineralization:

Unknown but probably mid-to Late Cretaceous as the mineralization postdates regional metamorphism.

Generic deposit model:

Deposit model:

Disseminated and stockwork quartz and gold mineralization in metapelitic rocks. Possibly carbonate-hosted Au-Ag and/or low sulfide Au-quartz vein (Cox and Singer, 1986; models 26a or 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

26a or 36a?

Production Status: None

Site Status: Active

Workings/exploration:

The Moose prospect was discovered by following up gold and arsenic anomalies in soils and stream sediments (Hudson and Wyman, 1983; Hudson, 1984; Cedar Mountain, 2011 [assay]; Cedar Mountain, 2011 [November 2, news release]). Cedar Mountain Exploration Inc. acquired the property in March 2010 and began aggressive exploration (Cedar Mountain Exploration Inc., 2011 [Kelly Creek]). The work on the Moose prospect has been confined to limited surface sampling and a gridded geochemical survey.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cedar Mountain Exploration Inc., 2011, New assay date upgrades Cedar Mountain's Kelly Creek Project: http://www.cedarmountainexp.com/_resources/CED_2011_01_25.pdf (News release, January 25, 2011).

Cedar Mountain Exploration Inc., 2011, Kelly Creek project: http://www.cedarmountainexp.com/projects/alaska/kelly_creek_project/ (as of Feb. 10, 2011).

Cedar Mountain Exploration, 2011, Drilling confirms bedrock gold source at Kelly Creek project: http://www.cedarmountainexp.com/news/index.php?&content_id=85 (News release, November 2, 2011).

Cedar Mountain Exploration, 2011, Cedar identified new gold targets at Kelly Creek project: http://www.cedarmountainexp.com/news/index.php?&content_id=86 (News Release, November 18, 2011)

Hudson, T.L., 1984, 1983 Seward Peninsula reconnaissance project: Anchorage, Alaska, Anaconda Minerals Company internal report (Report held by Cook Inlet Region, Inc., Anchorage, Alaska).

Hudson, T.L., and Wyman, W. F., 1983, Interim report on areas of Seward Peninsula warranting further prospecting and evaluation: Anchorage, Anaconda Minerals Company internal report, 84 p., 7 plates.

(Report held by Cook Inlet Region Inc., Anchorage, Alaska.)

Marrs, C.D., and Ivey, J.A., 1984, 1984 Prospect evaluation project; Kelly Creek (Fox claims): Anchorage, Alaska, Anaconda Minerals Company internal report. (Report held by Cook Inlet Region, Inc., Anchorage, Alaska).

Sainsbury, C.L., 1972, Geologic map of the Teller quadrangle, Seward Peninsula, Alaska: U.S. Geological Survey Map I-685, 4 p., 1 sheet, scale 1:250,000.

Primary Reference: Cedar Mountain, 2011 [November 18]

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Jaeger

Site type: Prospect

ARDF no.: TE112

Latitude: 65.7575 **Quadrangle:** TE D-2

Longitude: 165.6564

Location description and accuracy:

The Jaeger prospect is about 19.9 miles southeast of Ear Mountain. It is about 1.0 mile south of hill 1370, near elevation 1030, and about 0.5 mile south-southwest of the center of section 12, T. 4 N., R. 34 W. The location is accurate.

Commodities:

Main: Au

Other: Ag, As, Hg, Sb

Ore minerals:

Gangue minerals: Calcite, quartz

Geologic description:

The Jaeger prospect is in mica-quartz schist and graphitic quartz schist intercalated in a metasedimentary sequence that includes schistose, micaceous, dolomitic marble; mica-calcite schist; and minor micaceous quartzite (Cedar Mountain, 2011 [project]). The sequence is interpreted as a limestone-shale assemblage with facies variations. It is highly deformed and perhaps isoclinally folded. Schistosity dips moderately in various directions. All of the metavolcanic and metasedimentary rocks in area were probably Paleozoic originally and have probably been metamorphosed in the Cretaceous; Sainsbury (1972) however mapped them as Precambrian.

The Jaeger prospect is one of several similar deposits that define a district-level, west-northwest trending belt of gold mineralization about 11 miles long and 2 miles wide. The best known and most extensively explored of these is the Kelly Creek prospect (TE069) about 5.5 miles to the west; other are the South Fox (TE108), North Fox (TE109), Wolf (TE107), Wolverine (TE110), and Moose (TE111) prospects.

The prospect was discovered by following up gold and arsenic anomalies in soils and stream sediments (Hudson and Wyman, 1983; Hudson, 1984; Cedar Mountain, 2011 [assay]; Cedar Mountain, 2011 [November 2]). The gold, arsenic, and antimony values define strong, coherent, multi-element anomalies. Mercury is commonly elevated in the soils, but its distribution and concentration are more erratic and it is more widely dispersed at anomalous levels than the other three elements. Rock samples from frost boils show that the stronger anomalies are associated with silicified breccia and quartz-stockworks in sooty, black carbonaceous quartz schist.

Clay is locally present in fractures and as part of the matrix in breccia. Dolomite and calcite reportedly accompany quartz in the veins in some drill core (Marrs and Ivey, 1984). Pyrite is disseminated in pelitic schist and is present in all mineralized rocks; in part, it is probably of sedimentary origin. Quartz segregations along the foliation in pelitic schist are recrystallized, sugary textured, and vuggy in mineralized rocks.

Cedar Mountain Exploration Inc. acquired the property in March 2010 and began aggressive exploration (Cedar Mountain Exploration Inc., 2011 [Kelly Creek]). Reconnaissance samples collected in 2007 contained some anomalous gold; soil sampling in 2010 and 2011 defined an area anomalous in gold about 600 meters long. The rocks in the anomalous area are black, fine-grained carbonaceous schist and mica-quartz schist; the rocks and structural setting are similar to and may be a continuation of those seen in drill

holes at the Moose prospect (TE111) about 1.5 miles to the northwest and the Wolverine prospect (TE110) about 3.8 miles to the northwest.

Alteration:

Age of mineralization:

Unknown but probably mid-to Late Cretaceous as the mineralization postdates regional metamorphism.

Generic deposit model:

Deposit model:

Disseminated and stockwork quartz and gold mineralization in metapelitic rocks. Possibly carbonate-hosted Au-Ag and/or low sulfide Au-quartz vein (Cox and Singer, 1986; models 26a or 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

26a or 36a?

Production Status: None

Site Status: Active

Workings/exploration:

The Jaeger prospect was discovered by following up gold and arsenic anomalies in soils and stream sediments (Hudson and Wyman, 1983; Hudson, 1984; Cedar Mountain, 2011 [assay]; Cedar Mountain, 2011 [November 2]. Cedar Mountain Exploration Inc. acquired the property in March 2010 and began aggressive exploration (Cedar Mountain Exploration Inc., 2011 [Kelly Creek]). The work on the Moose prospect is confined to limited surface sampling and a gridded geochemical survey.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cedar Mountain Exploration Inc., 2011, New assay date upgrades Cedar Mountain's Kelly Creek Project: http://www.cedarmountainexp.com/_resources/CED_2011_01_25.pdf (News release, January 25, 2011).

Cedar Mountain Exploration Inc., 2011, Kelly Creek project: http://www.cedarmountainexp.com/projects/alaska/kelly_creek_project/ (as of Feb. 10, 2011).

Cedar Mountain Exploration, 2011, Drilling confirms bedrock gold source at Kelly Creek project: http://www.cedarmountainexp.com/news/index.php?&content_id=85 (News release, November 2, 2011).

Cedar Mountain Exploration, 2011, Cedar identified new gold targets at Kelly Creek project: http://www.cedarmountainexp.com/news/index.php?&content_id=86 (News Release, November 18, 2011)

Hudson, T.L., 1984, 1983 Seward Peninsula reconnaissance project: Anchorage, Alaska, Anaconda Minerals Company internal report (Report held by Cook Inlet Region, Inc., Anchorage, Alaska).

Hudson, T.L., and Wyman, W. F., 1983, Interim report on areas of Seward Peninsula warranting further prospecting and evaluation: Anchorage, Anaconda Minerals Company internal report, 84 p., 7 plates. (Report held by Cook Inlet Region Inc., Anchorage, Alaska.)

Marrs, C.D., and Ivey, J.A., 1984, 1984 Prospect evaluation project; Kelly Creek (Fox claims): Anchorage, Alaska, Anaconda Minerals Company internal report. (Report held by Cook Inlet Region, Inc., Anchorage, Alaska).

Sainsbury, C.L., 1972, Geologic map of the Teller quadrangle, Seward Peninsula, Alaska: U.S. Geological Survey Map I-685, 4 p., 1 sheet, scale 1:250,000.

Primary Reference: Cedar Mountain, 2011 [November 18]

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Coal Creek

Site type: Prospect

ARDF no.: TK005

Latitude: 62.9909 **Quadrangle:** TK D-6

Longitude: 149.8633

Location description and accuracy:

The Coal Creek prospect is at an elevation of about 2,800 feet, approximately 2 miles east of lower Eldridge Glacier and about 0.4 mile northwest of hill 2650. It is near the head of an unnamed, small south-flowing tributary of Coal Creek in the SW1/4 sec. 21, T. 22 S., R. 12 W., Fairbanks Meridian. The location is accurate and it is approximately at the center of 15 claims staked on the prospect in 2005.

Commodities:

Main: Ag, Sn, W

Other: Bi, Cu, Mo, W, Zn

Ore minerals: Arsenopyrite, bismuthinite, cassiterite, chalcopyrite, galena, loellingite, marcasite, pyrite, pyrrhotite, sphalerite, stannite, wolframite

Gangue minerals: Fluorite, quartz, sericite, topaz, tourmaline

Geologic description:

Tin-silver mineralization was discovered at Coal Creek in 1972 by C. C. Hawley (Clark and others, 1972). The deposit was staked by Houston Oil and Minerals in 1980 and they explored the deposit until 1985. Their work included geologic mapping, trenching, surface sampling, and airborne and ground geophysics; they also drilled 42 holes totaling 17,193 feet. The U.S. Bureau of Mines examined the deposit in 1984 and 1988 (Parker, 1991, Kurtak and others, 1992). In 2005, Brett Resources staked 15 State of Alaska claims over the deposit and commissioned a NI 43-101 report (Ellis, 2006) on the property. The report relied heavily on the previous studies, drill hole information, and analytical data, but also involved relogging of the old core, analysis of old core that had not previously been analyzed, and reanalysis of selected portions of the old core with more modern methods to get a better definition of its metal content. In the late summer of of 2006, Brett drilled 4 holes to confirm historic values; their results were 'significantly lower than from earlier work' (Brett Resources, Inc., 2006).

The Coal Creek silver-tin deposit is a barely eroded, sheeted tin greisen (Reed, 1978; Thurow, 1983; Parker, 1991; Ellis, 2006). The deposit is at the top of a multiphase, 50-55 Ma granitic body made up of seriate granite porphyry that is intruded at depth by fine-grained equigranular porphyritic granite. The granite intrudes Devonian clastic sedimentary rocks and limestone that is altered to skarn near the granite. The mineralization is in steeply dipping, tabular sheeted greisen bodies in the granite that are characterized by quartz, tourmaline, topaz, sericite, and minor fluorite.

The mineralization consists mainly of coarse-grained sphalerite, cassiterite, arsenopyrite, and pyrrhotite in quartz veins in the greisen; disseminated ore minerals also are in the silicified margin of the granite and in the hornfels. The veins vary in width from hairline to 1 cm, are nearly vertical, and reach a density of 10 veins per meter in the most intensely fractured zones. The veins form a stockwork along a fracture zone in granite in an area of about 4,000 square meters (Thurow, 1983). The mineralization extends to the bottom of the drill holes, about 700 feet. In addition to the primary minerals, bismuthinite, chalcopyrite, galena, loellingite, marcasite, pyrite, stannite, and wolframite also occur and samples collected by Reed (1978) contained up to 4.3 ounces of silver per ton. Selected samples collected by Balen (1990) have up to 65 ppm silver, 0.5 ppm gold, 328 ppm lead, 720 ppm tungsten, and 4.86 percent zinc. In the limited drilling in the

late summer of 2006 (Brett Resources Inc., 2006), the best intercepts were were: 1) 9.4 meters with 18.21 ppm silver, 0.41 percent tin, and 0.81 percent zinc; and 2) 9.3 meters with 11.95 ppm silver, 0.45 percent tin, and 0.29 percent zinc.

Thurlow (1982) estimated that the deposit as drilled by Houston Oil and Minerals contain 4.85 million tons of mineralized greisen with an average grade of 0.27 percent tin. However Ellis (2006) emphasized that these figures are more conceptual than adhering to modern standards for defining mineral resources.

Alteration:

Sericitization and greisenization of the granite host rock; hornfels developed at the borders of the granite.

Age of mineralization:

Probably genetically related to the 50-55 Ma granite that hosts the deposit.

Generic deposit model:

Deposit model:

Tin greisen (Cox and Singer, 1986; model 15c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

15c

Production Status: None

Site Status: Active

Workings/exploration:

Tin-silver mineralization was discovered at Coal Creek in 1972 by C. C. Hawley (Clark and others, 1972). The deposit was staked by Houston Oil and Minerals in 1980 and they explored the deposit until 1985. Their work included geologic mapping, trenching, surface sampling, and airborne and ground geophysics; they also drilled 42 holes totaling 17,193 feet. The U.S. Bureau of Mines examined the deposit in 1984 and 1988 (Parker, 1991, Kurtak and others, 1992). In 2005, Brett Resources staked 15 Alaska claims over the deposit and commissioned a NI 43-101 report on the property (Ellis, 2006). The report relied heavily on the previous studies, drill hole information, and analytical data, but also involved relogging of the old core, analysis of old core that had not previously been analyzed, and reanalysis of selected portions of the old core with more modern methods to get a better definition of its metal content. In the late summer of of 2006, Brett drilled 4 holes to confirm historic values; the results were 'significantly lower than from earlier work' (Brett Resources, Inc., 2006).

Production notes:

None.

Reserves:

Thurlow (1982) estimated that the deposit as drilled by Houston Oil and Minerals contain 4.85 million tons of mineralized greisen with an average grade of 0.27 percent tin. However Ellis (2006) emphasized that these figures are more conceptual than adhering to modern standards for defining mineral resources.

Additional comments:

MAS/MILS number 20760063.

References:

Balen, M.D., 1990, Geochemical sampling results from the Bureau of Mines investigations in the Valdez Creek mining district, Alaska: U.S. Bureau of Mines Open-File Report 34-90, 218 p., 2 plates, scale 1:250,00.0

Brett Resources Inc., 2006, Brett Announces Assays From Coal Creek, Alaska: http://www.brettresources.com/s/NewsReleases.asp?ReportID=159520&_Type=News-Releases&_Title=Brett-Announces-Assays-From-Coal-Creek-Alaska (News Release, November 23, 2006).

Cobb, E.H., and Csejtey, Bela, Jr., 1980, Summaries of data on and lists of references to metallic and selected nonmetallic mineral deposits in the Talkeetna Mountains quadrangle, Alaska: U.S. Geological Survey Open-File Report 80-716, 63 p.

Clark, Allen L., Clark, Sandra H.B., and Hawley, Charles C, 1972, Significance of Upper Paleozoic Oceanic Crust in the Upper Chulitna District, West-Central Alaska Range:U.S. Geological Survey Professional Paper 800-c, p.95-101.

Csejtey, Bela, Jr., and Miller, R.J., 1978, Map and table describing metalliferous and selected nonmetalliferous mineral deposits in the Talkeetna Mountains quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-558-B, 22 p., 1 sheet, scale 1:250,000.

Csejtey, Bela, Jr., Nelson, W.H., Jones, D.L., Silberling, N.J., Dean, R.M., Morris, M.S., Lanphere, M.A., Smith, J.G., and Silberman, M.L, 1978, Reconnaissance geologic map and geochronology, Talkeetna Mountains quadrangle, northern part of Anchorage quadrangle, and southwest part of Healy quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-558-A, 60 p., 1 sheet, scale 1:250,000.

Ellis, W.T., 2006, Technical report on the Sleitat Mountain tin-silver deposit, southwest Alaska, NI 43-101 report: Unpublished Technical Report for Brett Resources, Inc., 57 p. (posted on www.sedar.com, April 10, 2008)..

Kurtak, J.M., Southworth, D.D., Balen, M.D., and Clautice, K.H., 1992, Mineral investigations in the Valdez Creek mining district, south-central Alaska: U.S. Bureau of Mines Open-File Report 1-92, 659 p., 2 plates, scale 1:250,000.

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Parker, Tracy V.L., 1991. Mineralization in the Coal Creek Tin Prospect, South-Central Alaska: Field Report for the U.S. Dept. of the Interior, Bureau of Mines, p. 1-36.

Reed, B.L., 1978, Disseminated tin occurrences near Coal Creek, Talkeetna Mountains D-6 quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-77, 8 p.

Reed, B.L., Nelson, S.W., Curtin, G.C., and Singer, D.A., 1978. Mineral resources map of the Talkeetna quadrangle, Alaska: U.S. Geol. Survey Misc. Field Studies map MF-870-D, 1 sheet, scale 1:250,000.

Singer, D.A., Csejtey, Bela, Jr., and Miller, R.J., 1978, Map and discussion of the metalliferous and selected non-metalliferous mineral resources of the Talkeetna Mountains quadrangle, Alaska: U.S. Geological Survey Open-file Report 78-588-Q, 33 p., 1 sheet, scale 1:250,000.

Thurow, Gregory E. 1982. Coal Project Annual Report: Internal Report for Houston Oil and Minerals, Inc. p. 1-10.

Thurow, Gregory, Dec. 1983. Geology of Coal Creek Tin Prospect South-Central, AK: The Alaska Miner, vol. 11, #12, p. 24.

Warner, J.D., and Dahlin, D., 1989, Tin occurrences associated with the Ohio Creek pluton, Chulitna region, Valdez Creek mining district, south-central Alaska: U.S. Bureau of Mines Open-File Report 5-89, 25 p.

Primary Reference: Ellis, 2006

Reporter(s): R.K. Rogers (U. S. Geological Survey); D. J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Grizzly Bear; Grizzly Butte

Site type: Prospect

ARDF no.: TK032

Latitude: 62.9749 **Quadrangle:** TK D-2

Longitude: 147.873

Location description and accuracy:
The center of the Grizzly Butte prospect is at an elevation of about 4,000 feet about 1 mile northwest of VABM 5608 'Watana' and about 15 miles southwest of the bridge on the Denali Highway over the Susitna River near the community of Denali. The prospect is near the northeast corner of section 35, T. 22 S., R. 2 W. The location is accurate.

Commodities:

Main: Au, Cu

Other: Ag, W

Ore minerals: Bornite, chalcopyrite, magnetite, pyrite, pyrrhotite

Gangue minerals:

Geologic description:
The rocks in the area are mainly Triassic and/or Jurassic basalt flows with minor argillite, limestone, and tuff, intruded by gabbroic sills (Csejtey and others, 1978 [geologic map]; Full Metal Minerals, 2011). These rocks are intruded by an intrusive complex that consists of plugs and dikes of hornblende diorite and a porphyritic diorite to syenite stock. The intrusive complex is exposed for about 1.2 square kilometers but extends under surficial material to the west; the aeromagnetic data suggest it is much larger. The intrusive complex and surrounding rocks are cut by trachyte, felsic, diorite, and andesite dikes. In their regional mapping, Csejtey, Nelson and others (1978 [geologic map]) did not map an intrusive at this prospect although Tertiary granodiorite and a Cretaceous or Tertiary granite are several miles away.
As described by Csejtey and others (1978 [mineral deposits]), a sulfide-bearing felsic dike cuts Triassic metabasalt at the Grizzly Butte prospect. The sulfide minerals are bornite, chalcopyrite, pyrite, and pyrrhotite. Low-grade sulfide veins and disseminated sulfides also occur in silicified metabasalt. A U.S. Geological Survey sample of mineralized volcanic rock contained 0.5 part per million (ppm) gold; a sample of felsic intrusive rock contained 3 ppm silver and 350 ppm copper (Miller and others, 1978). A U.S. Bureau of Mines grab sample of limonitic metabasalt contains 5.17 percent copper, 0.4 parts per million gold, and 550 parts per million tungsten (Kurtak and others, 1992).
Cities Service Minerals Company held 96 claims over the prospect in 1972 and 1973 and Northland Mines held 18 claims in 1974. Kennecott Exploration staked claims in 1998, carried out rock and stream-sediment geochemical surveys, and flew an aeromagnetic survey over the area. Full Metals Minerals optioned the property from Kennecott in 2010 and staked additional claims (Full Metal Minerals, 2011). They began drilling in August 2010.
A zone of strong potassic alteration about 1,000 by 2,000 meters in area is centered on the intrusive complex (Full Metals Minerals, 2011). Disseminated and fracture-controlled chalcopyrite and bornite(?) coincide with the southwest portion of the altered zone; to the northeast, magnetite-biotite-flooded stockworks are more common. One or more zones of sericitic alteration are along the east side of the potassic alteration and epidote-magnetite alteration is along the west side. Pyrite, pyrrhotite, and magnetite occur along fracture zones in the rocks around the intrusive; sparse disseminated chalcopyrite is widespread in the diorite-syenite intrusive. The mineralization is accompanied by strong geochemical soil anomalies in

gold, silver, and copper. Rock samples contain up to 17,900 ppm copper 1,680 ppm molybdenum, and 2,660 parts per billion gold.

Alteration:

A zone of strong potassic alteration about 1,000 by 2,000 meters in size is centered on the mineralized intrusive complex. One or more zones of sericitic alteration are along the west side of the potassic alteration and epidote-magnetite alteration is along the west side.

Age of mineralization:

Probably related to an intrusive complex of uncertain age; possibly Cretaceous or Tertiary.

Generic deposit model:

Deposit model:

Unclear.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Surface sampling by U.S. Geological Survey and U.S. Bureau of Mines (Miller and others, 1977; Kurtak and others, 1992). Cities Service Minerals Company held 96 claims in 1972-73 and Northland Mines held 18 claims in 1974. Kennecott Exploration staked claims in 1998, carried out rock and stream-sediment geochemical surveys, and flew an aeromagnetic survey over the area. Full Metals Minerals optioned the property from Kennecott in 2010 and staked additional claims (Full Metal Minerals, 2011). They began drilling in August 2010.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS/MILS number 20760051.

References:

Cobb, E.H., and Csejtey, Bela, Jr., 1980, Summaries of data on and lists of references to metallic and selected nonmetallic mineral deposits in the Talkeetna Mountains quadrangle, Alaska: U.S. Geological Survey Open-File Report 80-716, 63 p.

Csejtey, Bela, Jr., and Miller, R.J., 1978, Map and table describing metalliferous and selected nonmetalliferous mineral deposits in the Talkeetna Mountains quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-558-B, 22 p., 1 sheet, scale 1:250,000.

Csejtey, Bela, Jr., Nelson, W.H., Jones, D.L., Silberling, N.J., Dean, R.M., Morris, M.S., Lanphere, M.A., Smith, J.G., and Silberman, M.L, 1978, Reconnaissance geologic map and geochronology, Talkeetna Mountains quadrangle, northern part of Anchorage quadrangle, and southwest part of Healy quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-558-A, 60 p., 1 sheet, scale 1:250,000.

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Miller, R.J., Cooley, E.F., O'Leary, R.M., Garmezy, Larry, Csejtey, Bela, Jr., Smith, T.E., and Cleveland, M.N., 1978, Analysis of geochemical samples from the Talkeetna Mountains quadrangle, Alaska: U.S. Geological Survey Open-file Report 78-1052, 279 p., 3 sheets, scale 1:250,000.

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Primary Reference: Full Metal Minerals, 2011

Reporter(s): R.K. Rogers (Contractor, USGS); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Lichen; Rush

Site type: Prospect

ARDF no.: TK045

Latitude: 62.8893 **Quadrangle:** TK D-1

Longitude: 147.3355

Location description and accuracy:

The Lichen prospect is at an elevation of about 3,150 feet, about 6 miles west of the Susitna River and 4.0 miles southeast of the center of Coal Lake. The prospect is about 0.15 mile west of the center of sec. 2, T. 32 N., R. 11 E., Seward Meridian. The location is accurate.

Commodities:

Main: Ag, Au, Cu

Other:

Ore minerals: Bornite, chalcopyrite, covellite, digenite, malachite

Gangue minerals: Epidote, feldspar, quartz

Geologic description:

The Lichen prospect is a stratabound copper deposit in Triassic(?) metavolcanic rocks. Veins and disseminated sulfides occur in a mafic, volcanic flow (Smith and others, 1975; Schmidt and others, 2002). The ore minerals are confined to a single flow, and consist of disseminations and veinlets of bornite, chalcopyrite, covellite, digenite, and malachite. The veinlets average less than 0.4 inch thick and contain quartz, feldspar, and epidote as well as sulfides. The mineralized zone is about 6 feet wide and 3,000 feet long. it strikes N60W and dips nearly vertically. The host rock has undergone greenschist-grade regional metamorphism and is coated with secondary iron and copper minerals. Samples of mineralized rock contained up to 4.5 percent copper, 16 parts per million (ppm) gold, and 68 ppm silver (Smith and others, 1975).

The prospect was explored in the 1970s by Cities Service Minerals using soil geochemical sampling, ground magnetic and EM surveys, and excavation of 2 trenches. Seraphim Engineering and Cities Service Minerals Company staked 145 claims in 1975-1976. The Amphitheater 1-25 claims were staked by Cominco American in 1988.

Alaska Ventures, Inc. (Bundtzen, 2008) began work on the Lichen deposit in 2005. They describe the prospect as a basaltic copper deposit that consists mainly of bornite and chalcopyrite in quartz veinlets in weakly metamorphosed, sub-alkaline basalt of Permian or Carboniferous age. The quartz veinlets are associated with epidote flooding in the basalt; other base metals are lacking although samples contain significant gold and silver values. In addition to the original discovery, work in 2007 located at least 6 other occurrences of similar mineralization spread over an area of several square miles. In the discovery zone, they defined an area about 360 meters long by 160 meters wide where the average value for the sulfide-quartz veinlets is about 1.75 percent copper, 30.5 grams of silver per tonne and 0.475 gram of gold per ton. Placer gold, probably of local origin, can be panned from most of the streams that drain the ridge on which the mineralization occurs. A soil geochemical survey outlined three, northwest-trending copper-silver-gold anomalies, the best of which coincided with the Lichen discovery but several were in areas covered by thick glacial cover. A ground IP survey covered an area about 1,600 meters by 2,600 meters in size and outlined several anomalies that suggest mineralization. The sampling and the geophysical and geochemical surveys indicate that the mineralization is along a northwest-striking zone about 4.0 kilometers long and 200 meters wide.

Alteration:

The volcanic host rock is altered to chlorite and epidote and stained with secondary iron and copper minerals.

Age of mineralization:

Early work suggests the deposit occurs in Triassic(?) metabasalt; later work suggests the basalt is Permian to Carboniferous.

Generic deposit model:

Deposit model:

Basaltic copper (Cox and Singer, 1986; model 23).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

23

Production Status: None

Site Status: Active

Workings/exploration:

The prospect was explored in the 1970s by Cities Service Minerals using soil geochemical sampling, ground magnetic and EM surveys, and excavation of 2 trenches. Seraphim Engineering and Cities Service Minerals Company staked 145 claims in 1975-1976. The Amphitheater 1-25 claims were staked by Cominco American in 1988. As of January 1, 2000 a large block of state mining claims and prospecting sites covered the prospect (Northern Associates Inc., written communication, 2001). In 2005-2007, Alaska Ventures, Inc. explored the deposit by surface sampling, soil geochemistry, and ground IP geophysical surveys.

Production notes:

None.

Reserves:

None.

Additional comments:

MAS/MILS number 20700053.

References:

Bundtzen, T.K., 2008, Lichen--a promising copper-silver-gold project ready for drill-testing in 2008: Unpublished report for Alaska Ventures, Inc. by Pacific Rim Geological Consulting, Inc., Fairbanks, Alaska, 10 pages.

Cobb, E.H., and Csejtey, Bela, Jr., 1980, Summaries of data on and lists of references to metallic and selected nonmetallic mineral deposits in the Talkeetna Mountains quadrangle, Alaska: U.S. Geological Survey Open-File Report 80-716, 63 p.

Csejtey, Bela, Jr., and Miller, R.J., 1978, Map and table describing metalliferous and selected nonmetalliferous mineral deposits in the Talkeetna Mountains quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-558-B, 22 p., 1 sheet, scale 1:250,000.

Csejtey, Bela, Jr., Nelson, W.H., Jones, D.L., Silberling, N.J., Dean, R.M., Morris, M.S., Lanphere, M.A., Smith, J.G., and Silberman, M.L, 1978, Reconnaissance geologic map and geochronology, Talkeetna Mountains quadrangle, northern part of Anchorage quadrangle, and southwest part of Healy quadrangle,

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Kurtak, J.M., Southworth, D.D., Balen, M.D., and Clautice, K.H., 1992, Mineral investigations in the Valdez Creek mining district, south-central Alaska: U.S. Bureau of Mines Open-File Report 1-92, 659 p., 2 plates, scale 1:250,000.

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Schmidt, J.M., Werdon, M.B., and Wardlaw, B., 2002 (2003), New mapping near Iron Creek, Talkeetna Mountains, indicates presence of Nikolai Greenstone, in Clautice, K.H., ed., Short Notes on Alaska geology 2003: Alaska Division of Geological and Geophysical Surveys Professional Report 120, p. 101-108.

Singer, D.A., Csejtey, Bela, Jr., and Miller, R.J., 1978, Map and discussion of the metalliferous and selected non-metalliferous mineral resources of the Talkeetna Mountains quadrangle, Alaska: U.S. Geological Survey Open-file Report 78-588-Q, 33 p., 1 sheet, scale 1:250,000.

Smith, T.E., Bundtzen, T.K., and Trible, T.C., 1975, Stratabound copper-gold occurrence, northern Talkeetna Mountains, Alaska: Alaska Division of Geological and Geophysical Surveys Miscellaneous Paper 3, 7 p.

Primary Reference: Bundtzen, 2008

Reporter(s): R.K. Rogers (U. S. Geological Survey contractor); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): King and Queen; Golddigger

Site type: Prospect

ARDF no.: TK088

Latitude: 62.4851 **Quadrangle:** TK B-4

Longitude: 148.7927

Location description and accuracy:
The King and Queen prospect is at an elevation of about 3,400 feet on northwest end of a ridge; it is about 2 miles south of the Talkeetna River in the SW1/4 sec. 30, T. 28 N., R. 4 E., Seward Meridian. The location is accurate to within 1/4 mile.

Commodities:

Main: Ag, Au

Other: Hg

Ore minerals: Gold, iron oxides, pyrite, silver tellurides?

Gangue minerals: Calcite, chalcedony, clay

Geologic description:
The rocks in the vicinity of this prospect are interbedded felsic and mafic volcanic rocks (Ben Porterfield, written communication, 2001). In part, the felsic rocks form a dome that consists of flow-banded rhyodacite, volcanic breccia, and possibly hot-springs sinter. Hydrobreccia occurs in float. Argillic alteration is dominant, with some propylitic alteration and silicification. Minor fine-grained pyrite and silver tellurides(?) occur in the matrix of the volcanic breccia, which weathers to conspicuous iron oxides. Based on air photos, the dome appears to be 2,000 feet long by 1,600 feet wide.
The following data are provided by Ben Porterfield (written communication, 2001), who owned the property in 2002. The prospect was discovered in 1918 by Sinclair and Foster. An old shaft is on top of the volcanic dome. The prospect was explored by Kennecott in 1919, when L.W. Storm reported that gold could be panned from almost any material selected at random. Trench samples contained 0.24 ounce of gold per ton from 'seams'; a 25-foot channel sample had 0.08 ounce of gold per ton and 1.76 ounces of silver per ton. A 6-inch-wide seam in an outcrop of felsic rock assayed 6.8 ounces of gold per ton and 15.9 ounces of silver per ton. Samples across 58 feet of trench averaged 1.82 parts per million gold. Grab samples every three feet along 190 feet of an old dump averaged 490 parts per billion gold. A grab sample of typical volcanic breccia from the shaft dump contained 1 part per million gold. Samples from the margins of the dome contained 12 parts per million mercury. Seven samples collected from a 38-foot-long northern trench contained 1 to 5.7 parts per million gold, and averaged 2.2 parts per million gold. Stream-sediment samples contained up to 870 parts per billion gold, 1.4 parts per million silver, and 5 parts per million mercury.
In 2006, Full Metal Minerals acquired the King and Queen prospect under an agreement with Ben Porterfield (Full Metal, 2007, Gold Digger). They reported that in recent years samples over a felsic dome contained 1.8 grams of gold per ton across 17.7 meters and samples from a trench vary from 0.7 to 5.7 grams of gold per ton. Full Metals also staked several other prospects nearby(?), the Toklat and Talkeetna prospects. (One or both of these may be among the unnamed prospects that have been listed in ARDF as TK049 to TK058, TK089 to TK092, and TK125). The Toklat prospect was explored by Anaconda Exploration in the 1980s and consists of silicified material with visible cinnabar in altered volcanic rocks and limestone. Samples contained 0.3 to 2.2 grams of gold per ton, 10 to 30 grams of silver per ton and 0.5 percent mercury. The Talkeetna prospect is associated with a shear zone and a 2.3-meter-long chip sample

averaged 2.5 percent copper and 5.4 grams of silver per ton.

Alteration:

Float samples on the rhyodacite dome show strong argillic alteration, mainly illite and smectite. Local propylitic alteration, with calcite veining and opaline silica is associated with mafic agglomerate north of the dome (Ben Porterfield, written communication, 2001). Conspicuous iron staining.

Age of mineralization:

A preliminary whole-rock age date on the basalt is 45±3 Ma (P. Oswald, oral commun., 2002).

Generic deposit model:

Deposit model:

Hot spring Au-Ag (Cox and Singer, 1986; model 25a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

25a

Production Status: None

Site Status: Active?

Workings/exploration:

An old shaft is on top of the dome. The prospect was explored by Kennecott in 1919, when L.W. Storm reported that gold could be panned from almost any material selected at random. As of January 1, 2000, a block of 4 prospecting sites covered this prospect (Northern Associates Inc., written communication, 2001). In 2006, Full Metal Minerals acquired the property and did some surface sampling and mapping.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Csejtey, Bela, Jr., Nelson, W.H., Jones, D.L., Silberling, N.J., Dean, R.M., Morris, M.S., Lanphere, M.A., Smith, J.G., and Silberman, M.L, 1978, Reconnaissance geologic map and geochronology, Talkeetna Mountains quadrangle, northern part of Anchorage quadrangle, and southwest part of Healy quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-558-A, 60 p., 1 sheet, scale 1:250,000.

Full Metal Minerals, 2007 (Gold Digger): http://www.fullmetalminerals.com/s/golddigger.asp; June, 2007.

Primary Reference: This record.

Reporter(s): R.K. Rogers (USGS); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Round Mountain

Site type: Prospect

ARDF no.: TL064

Latitude: 62.0619 **Quadrangle:** TL A-6

Longitude: 152.6943

Location description and accuracy:

The Round Mountain prospect is on Round Mountain about 2 miles southeast of Puntilla Lake; it is near the southeast corner of section 23, T. 22 N., R. 19 W., of the Seward Meridian. The location is generally accurate but the size of the deposit is unclear.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other: As, Sb

Ore minerals: Arsenopyrite, chalcopyrite, galena, pyrite, pyrrhotite, sphalerite, stibnite

Gangue minerals: Quartz, sericite

Geologic description:

In early 2010, the Round Mountain prospect was part of the Whistler project of Kiska Metals Corporation and was actively being explored (Wahl and others, 2008; Kiska Metals Corporation, 2010a).

Cominco Alaska began mineral exploration in the area in 1986; they found this deposit but ended their work in 1989. The work by Cominco included sampling silt, soil, and rocks, magnetic and VLF geophysical surveys, and mapping at 1:12,000 scale. From 2004 to 2006, Kennecott Exploration Company carried out major exploration in the area including, geologic mapping; soil, stream sediment, and rock geochemistry; and geophysical surveys. They staked several large blocks of ground that included the Round Mountain prospect. Geoinformatics Exploration Inc. acquired the property from Kennecott in 2007, and in 2009, Kiska Metals Corporation was formed by a merger of Geoinformatics and Rimfire Minerals Corporation. Six holes were drilled on Round Mountain or nearby, probably by Cominco or Kennecott.

The rocks in the area are Jurassic and Cretaceous sedimentary rocks and Tertiary volcanic rocks (Reed and Nelson, 1980; Wilson and others, 2009) that are intruded by intermediate to mafic sills, dikes and small plugs (Cominco American Incorporated, unpublished report). The intrusive rocks are overprinted by quartz-sericite-pyrite and magnetite-carbonate alteration. Auriferous veins, pods and stockwork, that contain variable amounts of quartz, pyrite, pyrrhotite, sphalerite, galena, chalcopyrite, stibnite and arsenopyrite are concentrated along intrusive contacts and faults (Cominco American Incorporated, unpublished report). Geochemical values in rock chip samples range from several hundred parts per billion gold to just under an ounce of gold per ton in selected high-grade samples. Some samples contain up to about an ounce of silver per ton.

Round Mountain has been identified by its anomalous geochemistry, alteration, and anomalous geophysical features (Roberts, 2014).

Alteration:

Quartz-sericite-pyrite, quartz-pyrite, carbonate, and magnetite alteration (Kiska Metals Corporation, 2010a).

Age of mineralization:

Early or middle Tertiary. The mineralization is interpreted to be coeval with or younger than Tertiary

volcanic and intrusive country rocks that Reed and Nelson (1980) correlated with plutonism of the same age in this part of the Alaska Range.

Generic deposit model:

Deposit model:

Gold-copper porphyry (Cox and Singer, 1986; model 20c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c

Production Status: None

Site Status: Active

Workings/exploration:

In early 2010, the Round Mountain prospect was part of the Whistler project of Kiska Metals Corporation and was actively being explored (Wahl and others, 2008; Kiska Metals Corporation, 2010a). Cominco Alaska began mineral exploration in the area in 1986; they found this deposit but ended their work in 1989. The work by Cominco included sampling silt, soil, and rocks, magnetic and VLF geophysical surveys, and mapping at 1:12,000 scale. From 2004 to 2006, Kennecott Exploration Company carried out major exploration in the area including, geologic mapping; soil, stream sediment, and rock geochemistry; and geophysical surveys. They staked several large blocks of ground that included the Round Mountain prospect. Geoinformatics Exploration Inc. acquired the property from Kennecott in 2007, and in 2009, Kiska Metals Corporation was formed by a merger of Geoinformatics and Rimfire Minerals Corporation. Six holes were drilled on Round Mountain or nearby, probably by Cominco or Kennecott.

In 2010, Kiska drilled two core holes to complete Kiska's requirements for their partnership with Kennecott. The two holes did not return any significant results (Kiska Metals Corp., 2010b). Kiska's 2014 Executive Summary characterizes Round Mountain as an early stage prospect (Roberts, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Kiska Metals Corporation, 2010a, Whistler project overview; http://www.kiskametals.com/s/Whistler.asp?ReportID=370036 (as of February 26, 2010).

Kiska Metals Corporation, 2010b, Kiska Delivers Whistler Trigger Program Report to Kennecott , News Release, Aug. 23, 2010: http://www.kiskametals.com/s/News.asp?ReportID=415550 (as of Sept. 21, 2014).

Reed, B.L., and Nelson, S.W., 1980, Geologic map of the Talkeetna quadrangle: U.S. Geological Survey Miscellaneous Investigations Map I-1174, 1 sheet, scale 1:250,000.

Roberts, Michael, 2014, Whistler Executive Summary, Kiska Metals Corporation: http://www.kiskametals.com/i/pdf/Kiska_Whistler_ExecutiveSummary_24Jan2014.pdf (as of March 10,

Wahl, George, Coutture, Jean-Francois, and Keller, GD., 2008, Mineral resource estimation, Whistler copper-gold project, Alaska Range, Alaska: Technical report for Geoinformatics Exploration, Inc., 124 p., (posted on www.sedar.com, February 22, 2008) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00007774&fileName=/csfsprod/data86/filings/01219440/00000001/s%3A%5Cgxl222.pdf (as of December 9, 2014).

Wilson, F.H., Hults, C.P., Schmoll, H.R., Haeussler, P.J., Schmidt, J.M., Yehle, L.A., and Labay, K.A., 2009, Preliminary geologic map of the Cook Inlet region, Alaska: U.S. Geological Survey Open-File report 209-1108, 99 p., 2 sheets, scale 1:250,000.

Primary Reference: Kiska Metals Corporation, 2010a

Reporter(s): Madelyn A. Millholland (Millholland & Associates); D.J. Grybeck (Contractor, U.S. Geological Survey); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-09

Site name(s): Oxide Ridge

Site type: Prospect

ARDF no.: TL077

Latitude: 62.0112 **Quadrangle:** TL A-6

Longitude: 152.9043

Location description and accuracy:

The Oxide Ridge prospect is about 3.3 miles northeast of Portage Pass and about 0.5 mile west of the center of section 11, T. 22 N., R. 20 W., of the Seward Meridian. The location is accurate to within 100 feet to the center of the prospect.

Commodities:

Main: Au, Cu, Mo

Other: As

Ore minerals: Arsenopyrite, chalcopyrite, gold, molybdenite, pyrite

Gangue minerals:

Geologic description:

The rocks in the area are Jurassic and Cretaceous marine sedimentary rocks that are intruded by the 65-66 Ma granodiorite of Mount Estelle (Reed and Nelson, 1980). The granodiorite at this prospect has a leucocratic equigranular phase and a porphyritic phase with potassium feldspar phenocrysts up to 10 millimeters in size (Cominco American Incorporated, unpublished report).

As described by Cominco American, chalcopyrite, pyrrhotite, arsenopyrite, molybdenite and pyrite occur as joint coatings, in veins, and as disseminations adjacent to northwest-striking mineralized joint sets. Sulfide-bearing rock samples from this site contain from 60 parts per billion (ppb) gold to more than 1 ounce of gold per ton. Silver is generally below the detection limit of 0.4 parts per million (ppm) but some samples contain as much as 11 ppm silver.

Altered granodiorite float about 2 miles to the southwest contains gold-bearing veinlets of arsenopyrite and pyrite (TL063). Curtin and others (1978) report panned-concentrate samples with visible gold from Quaternary gravels about one mile downstream from this locality (TL052).

In 2011, Millrock Resources Inc. on behalf of Teck America Inc. drilled a 457.9-meter hole. The entire hole was invariably-altered, fractured intrusive rocks cut by porphyritic dikes. The mineralization occurs in quartz veins and stockworks; gold is associated with arsenopyrite and chalcopyrite. Over 350 meters of the hole averaged 0.43 gram of gold per tonne. Some notable intercepts were: 15.73 meters that contained 0.98 gram of gold per tonne; 31.03 meters that contained 0.79 gram of gold per tonne; and 4.48 meters that contained 0.84 gram of gold per tonne.

In 2012, Millrock Resources Inc. drilled one drill hole. Mineralized intercepts include 10.7 meters of 0.51 gram of gold per tonne, and 7.6 meters of 0.75 gram of gold per tonne (Millrock Resources Inc., 2012).

Alteration:

Most of the 2011 hole was in variably-altered intrusive rocks (Millrock Resources Inc., 2011).

Age of mineralization:

Late Cretaceous/early Tertiary?; mineralization in the area is thought to be related to the 65-66 Ma, granodiorite of Mount Estelle (Cominco American Incorporated, unpublished report).

Generic deposit model:

Deposit model:

Intrusion-related gold (Millrock Resources Inc., 2011).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Cominco American Inc. mapped and collected rock-chip samples in the late 1980s. A 457.8-meter hole was drilled by Millrock Resources Inc. in 2011. Another hole was drilled in 2012. Mineralized intercepts include 10.7 meters of 0.51 gram of gold per tonne, and 7.6 meters of 0.75 gram of gold per tonne (Millrock Resources Inc., 2012).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Curtin, G.C., Karlson, R.C., O'Leary, R.M., Day, G.W., and McDanal, S.K., 1978, Geochemical and generalized geologic maps showing the distribution and abundance of gold and silver in the Talkeetna quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-870-E, 2 sheets, scale 1:250,000.

Millrock Resources Inc., 2011, Millrock intersects intrusion-related gold system at Estelle project, Alaska: http://www.millrockresources.com/news/millrock-intersects-intrusion-related-gold-system-at-estelle-project-alaska (News release, November 9, 2011, as of December 2, 2014).

Millrock Resource Inc., 2012, Millrock Discovers New Gold Zone at Estelle Project, Alaska: http://www.millrockresources.com/news/millrock-discovers-new-gold-zone-at-estelle-project-alaska (News release, September 10, 2012, as of September 20, 2014).

Reed, B.L., and Nelson, S.W., 1980, Geologic map of the Talkeetna quadrangle: U.S. Geological Survey Miscellaneous Investigations Map I-1174, 1 sheet, scale 1:250,000.

Primary Reference: Millrock Resources Inc., 2012

Reporter(s): Madelyn A. Millholland (Millholland & Associates); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-02

Site name(s): Shulin Lake

Site type: Prospect

ARDF no.: TL078

Latitude: 62.2017 **Quadrangle:** TL A-2

Longitude: 150.84

Location description and accuracy:
The Shulin Lake diamond prospect is about 2 miles northeast of the junction of Peters Creek and the Kahiltna River. Several holes were drilled on the prospect; their exact location is unknown but they are probably in or near section 1, T. T. 24 N., R. 9 W. The location is accurate to within a mile.

Commodities:

Main: Diamond

Other:

Ore minerals: Diamond

Gangue minerals:

Geologic description:
The rocks in the vicinity of the prospect near junction of Peters Creek and the Kahiltna River consist of scattered exposures of continental sandstone and siltstone of the Tertiary Tyonek Formation (Alex Geosciences Ltd., 2002). These rocks are underlain by Jurassic or Cretaceous marine sedimentary rocks that are isoclinally folded and consist of graywacke, phyllite, and shale with lenses of quartz-chert conglomerate Several miles from the prospect, several small Tertiary or Cretaceous intrusions are exposed near the contacts of the sedimentary rocks. There is a well-defined, strong, almost circular, magnetic high about 10 miles in diameter that covers much of the area between Peters Creek and Bear Creek, just west of the Kahiltna River; it may reflect a gabbroic intrusion at depth.

In 1999, several independent studies of placer concentrates collected near the junction of Peters Creek and the Kahiltna River revealed that they contained several diamond-indicator minerals, including chromite; low-iron, low-chromium clinopyroxene; high-magnesium orthopyroxene; and olivine. In 2000, Apex Geoscience Ltd. collected six samples for more detailed work and they identified 9 possible chrome diopsides, 5 possible eclogitic garnets, and 6 possible chrome grains (Apex Geoscience Ltd., 2000).

In 2001, a joint program by Golconda Resources Ltd., Shulin Lake Mining Company, and Shear Minerals Ltd. began work on a large block of claims. A detailed airborne geophysical survey showed numerous smaller anomalies in addition to the large circular anomaly (Golconda Resources Ltd., 2008; Shear Minerals, 2004, 2005). This was followed up by a ground magnetic survey that identified three targets that were drilled in 2002. Most of the holes were in sandy tuff but the northernmost two showed an increasing amount of olivine and pyroxene at depth. A sample from one hole taken at a depth of from 574 to 609 feet contained 15 microdiamonds and one macrodiamond as well as peridotite nodules. By the end of 2004, a total of 22 holes had been drilled and 20 diamonds were recovered from two holes.

Alteration:
None specifically noted.

Age of mineralization:
Insufficient data.

Generic deposit model:

Deposit model:

Diamonds associated with buried kimberlite pipe?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Several square miles east of the Kahilta River between the mouths of Bear Creek and Peters Creeks were explored for diamonds from 1999 to at least 2004. Twenty-two holes were drilled on geophysical anomalies and 20 microdiamonds and macrodiamonds were recovered from two drill holes.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Alex Geoscience Ltd., 2002, Preliminary investigation of gold and diamond potential of the Shulin Lake property, Alaska: Unpublished Technical Report for Shear Minerals, Ltd., 10 p. (posted on www.sedar.com,Sept. 28, 2000).

Golconda Resources Ltd., 2008, Shulin Lake project - Alaska: http://www.golcondaresources.com/shulin.htm (as of May 24, 2008)

Shear Minerals Ltd., 2004, Drilling discovers diamonds at Shulin Lake, Alaska: http://www.shearminerals.com/s/NewsReleases.asp?ReportID=90298&_Type=News-Releases&_Title=Drilling-Discovers-Diamonds-at-Shulin-Lake-Alaska (News Release, Oct. 6, 2004)

Shear Minerals Ltd., 2005, Update on Shulin Lake, Alaska, diamond project: http://www.shearminerals.com/s/NewsReleases.asp?ReportID=102365&_Type=News-Releases&_Title=Golconda-Resources-Ltd.-News-Release-Update-on-Shulin-Lake-Alaska-Diamond-P..

Primary Reference: Goldonda Resources Ltd., 2008

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Snow Ridge

Site type: Prospect

ARDF no.: TL079

Latitude: 62.0151 **Quadrangle:** TL A-6

Longitude: 152.7102

Location description and accuracy:

Only a general location is known for this prospect. But it is probably within a half mile of VABM 4804, which is about 5.2 miles south of the middle of Puntilla Lake and about 0.3 mile north of the center of section 11, T. 22 N., R 18 W.

Commodities:

Main: Au?, Cu?

Other:

Ore minerals: Chalcopyrite?, gold?

Gangue minerals: Quartz

Geologic description:

Cominco Alaska began mineral exploration in the area in 1986 and may have identified this deposit before they ended their work in 1989. From 2004 to 2006, Kennecott Exploration Company was active in the area and staked several large blocks of ground that included the Snow Ridge prospect. Geoinformatics Exploration Inc. acquired the property from Kennecott, and in 2009, Kiska Metals Corporation, the current holder of the claims, was formed by a merger of Geoinformatics and Rimfire Minerals Corporation.

Little is known about this property other that it is one of the centers of mineralization being explored by Kiska Metals Incorporated in early 2010 (Wahl and others, 2008; Kiska Metals Incorporated, 2010). The regional geologic maps of the area indicates it is near a swarm of andesite dikes that intrude Jurassic to Cretaceous graywacke (Wahl and others, 2008, Wilson and others, 2009). Several gold-copper porphyry deposits are nearby, notably the Whistler prospect (TY022), that may have similar mineralization.

Alteration:

Unknown.

Age of mineralization:

Younger than the Jurassic and Cretaceous host rocks.

Generic deposit model:

Deposit model:

Gold-copper porphyry (Cox and Singer, 1986; model 20c).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c

Production Status: None

Site Status: Active

Workings/exploration:

Little is known about the history of this prospect other than it being cited as one of the centers of mineralization in a large block of ground being explored by Kiska Metals Corporation (2010).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Kiska Metals Corporation, 2010, Whistler project overview; http://www.kiskametals.com/s/Whistler.asp?ReportID=370036 (as of February 26, 2010).

Wahl, George, Coutture, Jean-Francois, and Keller, GD., 2008, Mineral resource estimation, Whistler copper-gold project, Alaska Range, Alaska: Technical report for Geoinformatics Exploration, Inc., 124 p., (posted on www.sedar.com, February 22, 2008).

Wilson, F.H., Hults, C.P., Schmoll, H.R., Haeussler, P.J., Schmidt, J.M., Yehle, L.A., and Labay, K.A., 2009, Preliminary geologic map of the Cook Inlet region, Alaska: U.S. Geological Survey Open-File report 209-1108, 99 p., 2 sheets, scale 1:250,000.

Primary Reference: Wahl and others, 2008

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Oxide Valley

Site type: Prospect

ARDF no.: TL080

Latitude: 62.0082 **Quadrangle:** TL A-6

Longitude: 152.9019

Location description and accuracy:

The Oxide Valley prospect is located about 2.6 miles north-northeast from Portage Pass; about 0.3 mile west of the center of section 11, T. 22 N., R. 20 W., of the Seward Meridian. The location is accurate to within 100 feet to the center of the prospect.

Commodities:

Main: Au, Cu

Other: Bi, Te

Ore minerals: Arsenopyrite, chalcopyrite, gold, pyrite, pyrrhotite

Gangue minerals: Quartz

Geologic description:

Gold mineralization at Oxide Valley is associated with an elongate, northerly trending composite plutonic complex intruding a Jurassic to Early Cretaceous flysch sequence. The intrusives consist of ultramafic to felsic plutons of Late Cretaceous/Early Tertiary age (69.7 Ma) and are centrally located in a region of arc-magmatic related gold deposits. Gold mineralization is correlated with arsenic, bismuth, and tellurium anomalies (Millrock Resources Inc., 2014).

The Oxide Valley prospect was identified by Millrock Resource Inc. in 2008 when multiple vein zones containing arsenopyrite, pyrite and chalcopyrite were discovered. Since then, geologic mapping and rock chip sampling has resulted in the definition of multiple mineralized zones returning anomalous gold values including chip sample results of 0.91 gram of gold per tonne over 46 meters (151 feet) in Oxide Valley (Millrock Resources Inc., 2014).

In 2010, an induced polarization (IP) survey in Oxide Valley defined multiple chargeability anomalies, which appeared to align along a northwest trend similar to the trend of mineralized, extensional vein sets (Millrock Resources Inc., 2014).

During 2011, one core hole (SE11-001) was drilled in Oxide Valley targeting the IP anomaly. Encouraging results were obtained with an average grade of 0.375 gram of gold per tonne over the entire 461 meters (1,512 feet) length of the hole leading to further exploration and drilling in 2012, mainly northwest and southeast of drill hole SE11-001. Elevated gold values were returned from two of the four follow-up holes, both located southeast of SE11-001. Core hole SE12-002 averaged 0.368 gram of gold per tonne over the entire 188 meters (617 feet) length and core hole SE12-004 intersected 41.45 meters (136 feet) averaging 1.14 grams of gold per tonne (Millrock Resources Inc., 2014).

A wide-spaced Reconnaissance Induced Polarization (RIP) survey was conducted in Oxide Valley during 2012 with a follow-up tighter spaced survey done in 2013. Multiple chargeability anomalies were defined by the surveys with the majority untested by drilling. Geologic mapping in 2012 and 2013 defined several mineral trends all of which remain open along trend and down dip. Of particular interest is the Oxide Valley 'corridor' which hosts several zones of close spaced gold-bearing extensional quartz veining (Millrock Resources Inc., 2014).

Alteration:

Carbonate, chlorite, sericite, and quartz are commonly associated with the sulfide and gold mineralization (Millholland,1995; Crowe and others, 1991).

Age of mineralization:

Relative correlation of gold with arsenic, bismuth, and tellurium at Oxide Valley is similar to other deposits in the Tintina Gold Province such as Golden Zone and Shotgun in Alaska and Casino and Mt. Nansen in the Yukon suggesting a possible large scale, age-related mineralizing event. Age dating of intrusives at Oxide Valley of 69.7 Ma indicate mineralization is no older than Late Cretaceous/Early Tertiary (Millrock Resources Inc., 2014).

Generic deposit model:

Deposit model:

Intrusion-related gold (Millrock Resources Inc., 2014).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

The Oxide Valley prospect was identified by Millrock Resource Inc. in 2008 when multiple vein zones containing arsenopyrite, pyrite and chalcopyrite were discovered. Since then, geologic mapping and rock chip sampling has resulted in the definition of multiple mineralized zones returning anomalous gold values including chip sample results of 0.91 gram of gold per tonne over 46 meters (151 feet) in Oxide Valley (Millrock Resources Inc., 2014). In 2010, an induced polarization (IP) survey in Oxide Valley defined multiple chargeability anomalies, which appeared to align along a northwest trend similar to the trend of mineralized, extensional vein sets (Millrock Resources Inc., 2014). Drill holes were completed in 2011 and 2012. A wide-spaced Reconnaissance Induced Polarization (RIP) survey was conducted in Oxide Valley during 2012 with a follow-up tighter spaced survey done in 2013. Geologic mapping in 2012 and 2013 defined several mineral trends all of which remain open along trend and down dip (Millrock Resources Inc., 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Crowe, D.E., Millholland, M.A., and Brown, P.E., 1991, Precious and base metal mineralization associated with high-salinity hydrothermal fluids in the Mount Estelle pluton, south-central Alaska: Economic Geology, v. 86, p. 1103-1109.

Millholland, M.A., 1995, Geology and discovery at Mount Estelle: Newsletter of the Alaska Geological Society, v. 24, no. 8, p. 1.

Millrock Resources, Inc. 2014, Estelle: http://www.millrockresources.com/projects/estelle (as of Sept. 20, 2014).

Primary Reference: Millrock Resources Inc., 2014

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-12-10

Site name(s): Oxide North

Site type: Prospect

ARDF no.: TL081

Latitude: 62.0266 **Quadrangle:** TL A-6

Longitude: 152.8983

Location description and accuracy:

The prospect is located about 3.8 miles north-northeast of Portage Pass, and about 0.32 miles west-northwest of the center of section 2, T. 23 N., R. 20 W., of the Seward Meridian. This location is accurate to within 1/2 mile.

Commodities:

Main: Au

Other: As

Ore minerals: Gold

Gangue minerals: Arsenopyrite, tourmaline

Geologic description:

This site is a mineralized zone within Oxide, the northernmost prospect at Estelle (TY019), and is about 2.5 km north of the original Oxide Ridge showing (TL077). Oxide North lies within a plutonic complex intruding a Jurassic to Early Cretaceous flysch sequence. This zone is characterized by disseminated arsenopyrite and tourmaline returned anomalous values in talus fines sampling. Soil geochemical surveys in the valley have returned widespread arsenic anomalies with gold (Millrock Resource, Inc., 2014).

Alteration:

Not indicated.

Age of mineralization:

Late Cretaceous of younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Porphyry Cu-Au? or intrusion-related gold? (Cox and Singer, 1986; model 20c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c?

Production Status: None

Site Status: Active

Workings/exploration:

Gold mineralization was initially discovered in 2008 when multiple vein zones containing arsenopyrite,

pyrite and chalcopyrite were noted along nearby Oxide Ridge, a north-south trending ridge located in the southern part of the prospect. Extensive geologic mapping helped define the target.

In summer, 2012, Millrock Resources, Inc., executed a chip sampling of mineralized outcrops, in addition to an induced polarization geophysical survey to test for disseminated sulfides. Soil geochemical surveys in the valley have returned widespread arsenic anomalies with gold (Millrock Resource, Inc., 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Millrock Resources Inc., 2014, Estelle Gold Project overview: http://www.millrockresources.com/projects/estelle/ (as of April 3, 2014).

Millrock Resources Inc., 2014, Millrock Samples 9.1 Grams Per Tonne Gold Over 27.4 Meters At Estelle Project, Alaska: http://www.millrockresources com/news/millrock_samples_9.1_grams_per_tonne_gold_over_27.4_meters_at_estelle_/?phpMyAdmin=M5%252C2KfdT1QNf0rgfF8WupuwwKLe (as of April 3, 2014).

Reed, B.L., and Elliott, R.L., 1970, Reconnaissance geologic map, analyses of bedrock and stream sediment samples, and an aeromagnetic map of parts of the southern Alaska Range: U.S. Geological Survey Open-file Report 70-271, 24 p., 4 sheets, scale 1:250,000.

Reed, B.L., and Nelson, S.W., 1980, Geologic map of the Talkeetna quadrangle: U.S. Geological Survey Miscellaneous Investigations Map I-1174, 1 sheet, scale 1:250,000.

Reed, B.L., Nelson, S.W., Curtin, G.C., and Singer, D.A., 1978, Mineral resources map of the Talkeetna quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-870-D, 1 sheet, scale 1:250,000.

Wilson, F.H., Hults, C.P., Schmoll, H.R., Haeussler, P.J., Schmidt, J.M., Yehle, L.A., and Labay, K.A., comps., 2012, Geologic map of the Cook Inlet region, Alaska, including parts of the Talkeetna, Talkeetna Mountains, Tyonek, Anchorage, Lake Clark, Kenai, Seward, Iliamna, Seldovia, Mount Katmai, and Afognak 1:250,000-scale quadrangles: U.S. Geological Survey Scientific Investigations Map 3153,

Primary Reference: Millrock Resource, Inc., 2014

Reporter(s): V.C. Zinno (Alaska Earth Sciences)

Last report date: 2014-04-03

Site name(s): Kohlsaat

Site type: Occurrence

ARDF no.: TL082

Latitude: 62.285 **Quadrangle:** TL B-6

Longitude: 152.7352

Location description and accuracy:

The occurrence is in a drainage located about 3.9 miles west-northwest of the fork of the Kichatna River with Moose Creek and about 4.2 miles north-northeast of Kohlsaat Peak in section 2, T. 12 N., R. 19 W., of the Seward Meridian. Accurate to within about 0.25 miles.

Commodities:

Main: Ag, Au

Other: Cu, Pb

Ore minerals: Chalcopyrite, galena

Gangue minerals: Calcite, muscovite, quartz

Geologic description:

The Kohlsaat occurrence is defined by quartz carbonate vein and vein breccia with steeply dipping 3-10 foot (1-3 meters) thick vein zone cutting monzodiorite (William Ellis, Alaska Earth Sciences, personal communication, 2014).

The local geology is composed of Jurassic to Early Cretaceous flysch sequence with local composite plutonic complexes intruding the host rock (Wilson and others, 2012).

Alteration:

Quartz carbonate.

Age of mineralization:

Late Cretaceous.

Generic deposit model:

Deposit model:

Polymetallic vein (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

Mapping and sampling program executed in 2013 by Alaska Earth Resource, Inc., and Millrock

Resources, Inc.; no drilling has been performed. Over 100 samples were taken and assayed. One grab sample assayed at 4.25 ppm gold and 50 ppm silver (William Ellis, Alaska Earth Sciences, personal communication, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Alaska Earth Resources, Inc, and William Ellis (Alaska Earth Sciences, Alaska Earth Resources, Inc), personal communication.

Reed, B.L., and Elliott, R.L., 1970, Reconnaissance geologic map, analyses of bedrock and stream sediment samples, and an aeromagnetic map of parts of the southern Alaska Range: U.S. Geological Survey Open-file Report 70-271, 24 p., 4 sheets, scale 1:250,000.

Reed, B.L., and Nelson, S.W., 1980, Geologic map of the Talkeetna quadrangle: U.S. Geological Survey Miscellaneous Investigations Map I-1174, 1 sheet, scale 1:250,000.

Reed, B.L., Nelson, S.W., Curtin, G.C., and Singer, D.A., 1978, Mineral resources map of the Talkeetna quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-870-D, 1 sheet, scale 1:250,000.

Wilson, F.H., Hults, C.P., Schmoll, H.R., Haeussler, P.J., Schmidt, J.M., Yehle, L.A., and Labay, K.A., comps., 2012, Geologic map of the Cook Inlet region, Alaska, including parts of the Talkeetna, Talkeetna Mountains, Tyonek, Anchorage, Lake Clark, Kenai, Seward, Iliamna, Seldovia, Mount Katmai, and Afognak 1:250,000-scale quadrangles: U.S. Geological Survey Scientific Investigations Map 3153, pamphlet 76 p., 2 sheets, scale 1:250,000. (Available at http://pubs.usgs.gov/sim/3153/).

Primary Reference: Alaska Earth Resources, Inc., and William Ellis (Alaska Earth Sciences, Alaska Earth Resources, Inc), personal communication

Reporter(s):

V.C. Zinno (Alaska Earth Sciences)

Last report date: 2014-03-06

Site name(s): West Tanana; Ring Hill-Monday Creek

Site type: Prospect

ARDF no.: TN018

Latitude: 65.2474 **Quadrangle:** TN B-6

Longitude: 152.8676

Location description and accuracy:

The West Tanana prospect covers much of the western half of section 23, the northeast one-quarter of section 22, and the SE1/4 of section 15, T. 5 N., R. 26 W., of the Fairbanks Meridian. The coordinates are at about the center of this prospect which is about 1 mile north-northwest of the junction of Monday and Grant Creek.

Commodities:

Main: Ag, Au, Bi, Te

Other: As, Ba, Cu, Mo, Pb, Pd, Pt, Sb, Zn

Ore minerals: Gold, pyrite

Gangue minerals: Quartz

Geologic description:

The West Tanana prospect is on the southwest flank of Grant Dome in a broad divide that separates Monday and Lynx creeks. The bedrock in the area is black graphitic schist, quartz-muscovite schist, chert, and quartzite (WGM, Inc., 1998). The closest intrusive rock known in the area is the Cretaceous Melozitna pluton, which crops out about 8 miles northwest of the prospect (Chapman and others, 1982). Boulders of a diorite dike are in gravel at the American Creek placer mine, about 2 miles to the northwest (TN015) (WGM, Inc., 1998).

Although placer gold was mined in the early 1900s from nearby Grant Creek (TN071), more recent work has focused on exploring the area for lode deposits. DiMarchi (1991) postulated that concentric rings identified in air photos of Lynx Dome may represent a granitic cupola associated with mineralization. Anomalous values of 1-3 parts per million (ppm) molybdenum in geochemical samples support this possibility. Concentric circular features and intersecting lineaments at Ring Hill also suggest a buried pluton there.

During the 1990 season, 121 soil, 12 rock, and 5 stream-sediment samples were collected by Central Alaska Gold Company (DiMarchi, 1991). The sampling program delineated an area up to 5,000 feet wide of anomalous gold and arsenic values, including 15 samples with gold values between 30 and 910 parts per billion (ppb) and arsenic as high as 1,510 ppm.

Trenches dug by Central Alaska Gold Company in 1991 intersected several gold-bearing shear zones that trend N10E and dip 20W. Samples show high arsenic, barium, iron, strontium and phosphorus values. Platinum and palladium values are also elevated, but silver and base metal values are low.

Ventures Resource Corporation (1997) reported that west of Monday Creek there is a broad area of gold geochemical anomalies, quartz veins, and altered zones of silification, iron oxide and clay. Of 64 samples, 16 contained gold ranging from 50 to 580 ppb. These samples average twice background levels of arsenic and contain weakly anomalous phosphorus.

WGM, Inc., explored the Ring Hill-Monday Creek area in 1997. Their work confirmed that several large, northeast-trending, as well as smaller, northwest-trending, faults cut the prospect area (WGM, Inc., 1998). These faults may be conjugate sets associated with the east-west trending, right-lateral Kaltag fault. The northeasterly structures are traceable for up to 12 miles, and cut across Lynx Creek and Grant Creek.

Silicification appears to have occurred along all of the faults; silicified country rocks up to 1,000 feet from the faults contain up to 5 percent sulfides, mostly pyrite.

In 2006, International Tower Hill Mines, Ltd. (2007, Drilling; 2008, West Tanana) began geochemical soil surveys and mapping in this area under a exploration agreement with Doyon, Ltd. They defined a geochemical anomaly in gold, bismuth, and tellurium, about 1 kilometer in diameter. Samples from old trenches and outcrops contained 5.7 to 17.6 ppm gold, up to 11.8 ppm silver, less than 5 ppm to 1 percent arsenic, less than 2 to 96 ppm bismuth, less than 0.05 to 3.95 ppm tellurium, and minor copper, lead, zinc, and antimony. Drilling in 2007 defined a shallow, east-dipping zone of gold mineralization about 30 meters wide. Notable intercepts include 0.3 meters with 15.6 grams of gold per ton and a 4.3 meter breccia zone with 2.5 grams of gold per ton. The mineralization seems to be associated with a series of north-northeast-trending structures. The prospect is considered to be a stacked Pogo-type vein system.

Alteration:

Silicification and pyritization; iron oxide and clay.

Age of mineralization:

Mineralization may be Cretaceous based on the age of the nearby Melozitna Pluton.

Generic deposit model:

Deposit model:

Pogo-type Au-Bi-Te-quartz veins?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Although placer gold was first mined in the early 1900s from nearby Grant Creek (TN071), more recent work has focused on exploring the area for lode deposits and trenches were dug by Central Alaska Gold Co. in 1991 (DiMarchi, 1991) that intersected several gold-bearing shear zones. In 1996 Dighem Surveys of Toronto Canada flew magnetic and electromagnetic surveys, and Ventures Resource Corporation worked in the area. WGM, Inc. worked in on the prospect in 1997 and carried out a soil geochemical survey over an area of about 2 square miles (WGM, Inc., 1998). In 2006, International Tower Hill Mines, Ltd. (2007, Drilling; 2008, West Tanana) began soil geochemical surveys and surface mapping under a exploration agreement with Doyon, Ltd. Drilling in 2007 defined a shallow, east-dipping zone of gold mineralization about 30 metes wide.

Production notes:

None.

Reserves:

None.

Additional comments:

The prospect lies on land leased or owned by Doyon, Ltd.

References:

Chapman, R.M., Yeend, W.E., Brosge, W.P., and Reiser, H.N., 1982, Reconnaissance geologic map of the Tanana quadrangle: U.S. Geological Survey Open-File Report 82-734, 20 p., scale 1:250,000.

DiMarchi, J.J., 1991, Doyon, Ltd., Report 91-8a: Unpublished report held by Doyon, Ltd., Fairbanks, Alaska.

International Tower Hill Mines Ltd., 2007 (Drilling), ITH reports initial drilling results at West Tanana project, central Alaska. (September 18, 2007).

International Tower Hill Mines Ltd., 2008 (West Tanana): http://www.ithmines.com/s/WestTanana.asp (as of March 4, 2008).

McCoy, Dan, Newberry, R.J., Layer, Paul, DiMarchi, J.J., Bakke, Arne, Masterman, J.S., and Minehane, D.L., 1997, Plutonic-related gold deposits of interior Alaska, in Goldfarb, R.J., and Miller, L.D., eds., Mineral Deposits of Alaska: Economic Geology Monograph 9, p. 191-241.

Ventures Resource Corporation, 1997, Doyon, Ltd., Report 97-27: Unpublished report held by Doyon, Ltd., Fairbanks, Alaska.

WGM Inc., 1998, Doyon, Ltd., Report 98-28: Unpublished report held by Doyon, Ltd., Fairbanks, Alaska.

Primary Reference: WGM, Inc., 1998; this record

Reporter(s): G.E. Graham (ADGGS); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-03-04

Site name(s): Elephant Mountain

Site type: Prospect

ARDF no.: TN067

Latitude: 65.2742

Quadrangle: TN B-1

Longitude: 150.0279

Location description and accuracy:

The Elephant Mountain lode prospect is at an elevation of about 3,500 feet on Elephant Mountain at the head of Aloha Creek. It is just east of the center of section 9, T. 5 N., R. 12 W., of the Fairbanks Meridian. The site is the location of drilling from 1999 to 2001. The location is accurate within 1000 feet.

Commodities:

Main: Au

Other: As, Bi, Mo, Sb

Ore minerals: Arsenopyrite, bismuth, gold, molybdenite, stibnite

Gangue minerals: Quartz

Geologic description:

Elephant Mountain is underlain by a Cretaceous pluton that intrudes Jurassic or Cretaceous quartzite, sandstone, siltstone, and shale (Chapman and others, 1982; Reifenstuhl and others, 1997). The pluton is one of several 90 Ma alkalic plutons in the eastern Tanana, central Livengood, and western Circle quadrangles. Contacts of the Elephant Mountain pluton indicate that it is a northeast-trending, dike-like body about a mile wide and 5 miles long, cut off by high-angle faults at the northeastern and southwestern ends (Reifenstuhl and others, 1997). Its composition ranges from diorite to granite, but it mostly is trachytoidal, quartz-free syenite and subequigranular quartz syenite. The pluton is zoned, and has a core of altered, equigranular quartz syenite, granite, and granite pegmatite (Reifenstuhl and others, 1997).

Soil sampling completed by Placer Dome, Inc. defined an open-ended linear zone of gold and arsenic geochemical anomalies that extends for over 6,000 feet and is up to 1,500 feet wide. Gold contents in soil samples ranged up to 1,540 parts per billion (ppb) (North Star Exploration, Inc., 2000). The mineralized zone is structurally controlled, with prominent northeast- and northwest-trending, and weaker north-trending, patterns. Soil sampling completed by North Star Exploration, Inc., in 1999 indicated that the anomalous zone continues northeast for at least another 2,000 feet (North Star Exploration, Inc., 2000).

Observations from drill holes indicate that higher gold values are associated with fractured and crushed zones, which often become stockwork in nature (North Star Exploration, Inc., 2000). Visible gold also occurs in drill core. Gold is primarily associated with pervasive silicification and quartz veinlets. Arsenopyrite, molybdenite, and stibnite occur in the silicified zones, and there is a strong gold-arsenic correlation. Gold is associated in some drill holes with bismuth (North Star Exploration, Inc., 2000).

The results from a helicopter-borne magnetic-electromagnetic-radiometric survey show that the Elephant Mountain pluton is a nearly featureless, low-magnetic plateau that has coincident high resistivity. Resistivity data at higher frequencies show lineaments that are inferred by North Star to be the effects of surface weathering of fault and fracture zones in the pluton. Some of the soil geochemical anomalies coincide with these lineaments (North Star Exploration, Inc., 2000).

In 2016, Endurance Gold Corporation drill-tested soil anomalies with greater than 100 ppb gold; three holes were drilled in the South Zone and one hole in the North Zone, for a total of 598 m. The South Zone is associated with 1-kilometer-long by 0.25-kilometer-wide gold-arsenic-antimony soil anomaly. The North Zone is associated with a 1-square-kilometer surface-alteration zone with disseminated pyrite and

arsenopyrite in a pervasively silica, sericite, clay altered granodiorite and a gold-arsenic soil anomaly. Endurance Gold Corporation’s follow-up plans for 2017 include ground-based geophysical surveys, geochemical sampling, and drilling (Athey and Werdon, 2017).

Alteration:

Pervasive silicification (North Star Exploration, Inc., 2000).

Age of mineralization:

Cretaceous, assumed to be contemporaneous with the 89 +/- 1 Ma age of the Elephant Mountain pluton (Reifenstuhl and others, 1997).

Generic deposit model:

Deposit model:

Alaskan plutonic-related gold deposit (McCoy and others, 1997).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Placer Dome, Inc. discovered visible gold in an outcrop of altered granite on Elephant Mountain in 1991 (North Star Exploration, Inc., 2000). Their soil sampling defined an open-ended linear zone of gold and arsenic geochemical anomalies that extends for over 6,000 feet and is up to 1,500 feet wide. Gold contents in soil samples ranged up to 1,540 parts per billion (ppb) (North Star Exploration, Inc., 2000). Soil sampling by North Star Exploration, Inc. in 1999 indicated that the anomalous zone continues northeast for at least another 2,000 feet (North Star Exploration, Inc., 2000).

Placer Dome, Inc. conducted ground geophysical surveys over portions of Elephant Mountain after a gold-sulfide association was identified while logging drill core (North Star Exploration, Inc., 2000). Their geophysical surveys included magnetics, very low frequency (VLF) gradient induced polarization (IP), resistivity, and limited dipole-dipole IP. A large chargeable zone (1,500 feet wide and 4,500 feet long) was detected between the drilled areas, which Placer Dome, Inc.'s geophysicists attributed to a large volume of material containing a relatively low concentration of sulfides with a small increase in sulfide content at depth.

In 1992, Placer Dome, Inc. dug 6,000 feet of trenches and diamond drilled 10 diamond core holes totaling 4,000 feet (Swainbank and others, 1993). The drill logs indicate that higher gold values are associated with fractured and crushed zones, which often become stockwork in nature (North Star Exploration, Inc., 2000).

Visible gold also occurs in the drill core. Gold is primarily associated with pervasive silicification and quartz veinlets. Arsenopyrite, molybdenite, and stibnite occur in the silicified zones, and there is a strong gold-arsenic correlation. Gold is associated in some drill holes with bismuth (North Star Exploration, Inc., 2000). Placer Dome, Inc.'s best hole was DDH-2, grading an average of 0.015 ounce per ton (oz/t) gold over 326 feet that bottomed in mineralization. Other drill results include 334 feet grading 0.010 oz/t gold in hole DDH-8, 340 feet grading 0.008 oz/t gold in hole DDH-1, and 225 feet grading 0.005 oz/t gold in hole DDH-4 (North Star Exploration, Inc., 2000). The highest drill core sample contained 1,740 ppb gold and several thousand parts per million (ppm) arsenic (Harry Noyes, oral communication, 1996).

A rock sample of altered granite (sample number 96RN185) collected in 1996 by the Alaska Division of Geological and Geophysical Surveys contained 164 ppb gold, 2211 ppm arsenic, and 61 ppm antimony (Liss and others, 1997). Aeromagnetic surveys of the area completed by the Alaska Division of Geological and Geophysical Surveys indicate that the plutonic rocks have fairly low magnetic signatures, whereas the surrounding rocks are more variable (Staff and others, 1997).

North Star Exploration, Inc. conducted a helicopter-borne, magnetic-electromagnetic-radiometric survey

over Elephant Mountain (North Star Exploration, Inc., 2000). The results show that the Elephant Mountain pluton is a nearly featureless, low-magnetic plateau that has coincident high resistivity. Resistivity data at higher frequencies show lineaments that are inferred by North Star Exploration, Inc. to be the effects of surface weathering of fault and fracture zones in the pluton. Some of the soil geochemical anomalies coincide with these lineaments. In 2000, North Star Exploration, Inc. drilled two core holes totaling 631 feet at Elephant Mountain and encountered arsenopyrite with geochemically anomalous gold in silicified granite (North Star Exploration, Inc., 2001; Szumigala and others, 2001).

A 2007 prospecting and sampling program resulted in the discovery of gold values in grab samples of quartz vein material from the intrusive including 12.98 grams per tonne (g/t), 5.21 g/t, 3.02 g/t, 2.59 g/t and 2.18 g/t gold. These high gold values were collected where Placer Dome, Inc. collected a grab sample in 1991 that assayed 12 oz/t gold (411.4 g/t gold). This quartz vein is approximately one kilometer south of the best Placer Dome, Inc. drill hole and is defined by a greater than 100 ppb gold-in-soil anomaly within a 150 by 800 meter area (Endurance Gold Corporation, 2015b).

In 2013 Endurance Gold Corporation completed a reconnaissance prospecting rock and soil sampling program collecting 61 rock grab samples with the best gold values associated with altered intrusive and quartz vein stock-work material including 4,440 ppb gold, as well as 1920 ppb, and 1880 ppb gold (Endurance Gold Corporation, 2014). In 2014 Endurance Gold Corporation completed an orientation survey of 36 power-assisted auger soil samples at recovery depths of between 0.81 and 1.52 meters. These deep soil samples, with peak values up to 320 ppb gold at 1.52 meters (5 feet) depth, together with shallower soil samples collected in 2013, have confirmed a strong and continuous 600 meter long soil anomaly which exceeds 100 ppb gold (Endurance Gold Corporation, 2015a).

In 2016, Endurance Gold Corporation drill-tested soil anomalies with greater than 100 ppb gold; three holes were drilled in the South Zone and one hole in the North Zone, for a total of 598 m. Highlights of South Zone drilling include 4.09 grams of gold per tonne over 4.6 m, including 20.4 grams of gold per tonne over 0.67 meter spatially associated with 1-kilometer-long by 0.25-kilometer-wide gold-arsenic-antimony soil anomaly. Highlights of North Zone drilling include 0.40 gram of gold per tonne over 147.1 m, including 0.63 gram of gold per tonne over 48.2 meters spatially associated with a 1-square-kilometer surface-alteration zone with disseminated pyrite and arsenopyrite in a pervasively silica, sericite, clay altered granodiorite and a gold-arsenic soil anomaly. Endurance Gold Corporation’s follow-up plans for 2017 include ground-based geophysical surveys, geochemical sampling, and drilling (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

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Endurance Gold Corporation, 2014, Encouraging gold results in intrusive - Elephant Mountain Gold Prospect, Alaska: http://www.endurancegold.com/s/NewsReleases.asp?ReportID=619215&_Type=News-Releases&_Title=Encouraging-Gold-Results-In-Intrusive-Elephant-Mountain-Gold-Prospect-Alask... (News release on January 13, 2014, as of July 28, 2015).

Endurance Gold Corporation, 2015a, Significant intrusive-hosted gold targets confirmed - Elephant Mountain Gold Property, Alaska: http://www.endurancegold.com/s/NewsReleases.asp?

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Primary Reference: North Star Exploration, Inc., 2000

Reporter(s): D.J. Szumigala (ADGGS); N.V. King (Alaska Earth Sciences); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Unnamed (near Kilo Hot Spring)

Site type: Occurrence

ARDF no.: TN140

Latitude: 65.8511 **Quadrangle:** TN D-3

Longitude: 151.2172

Location description and accuracy:

This placer occurrence is about 3 miles downstream from the Kilo Hot Spring on the Kanula Kilolitna River. It is near the center of section 24, T. 12 N., R. 18 W.

Commodities:

Main: Au, Sn

Other: W

Ore minerals: Cassiterite, gold

Gangue minerals:

Geologic description:

Upstream from this site, the Kanuti Kilolitna River cuts through the Ray Mountains batholith, a Cretaceous, coarse-grained, porphyritic, biotite quartz monzonite pluton. The contact of the quartz monzonite with chlorite-quartz schist and biotite gneiss is exposed near the site.

Panned concentrate samples collected from bars on the river contained flour gold (Kurtak and others, 2002) . One panned concentrate sample assayed 6,976 parts per billion (ppb) gold, 506 parts per million (ppm) tungsten, and 90 ppm tin. Several other samples collected upstream contained 504 to 3,289 ppm tin, 310 ppm tungsten, and small amounts of gold. The source of the tin and gold was not located and none of the rock samples contained anomalous metals.

In addition to the work by the Bureau of Land Management (Kurtak and others, 2002), claims were staked on this site in 1959 and 1960, but no production is documented.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Tin placer (Cox and Singer, 1986; model 39e).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39e

Production Status: None

Site Status: Undetermined

Workings/exploration:

Only a limited amount of work by the Bureau of Land Management in about 2000 to asses the mineral potential of the area.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Primary Reference: Kurtak and others, 2002

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Ray River

Site type: Prospect

ARDF no.: TN141

Latitude: 65.9863 **Quadrangle:** TN D-1

Longitude: 150.5712

Location description and accuracy:

This site represents an approximately 30-mile-long area of placer tin-REE on the Ray River drainage basin. The prospect area is accessible from the Dalton Highway only on the extreme eastern extent, or otherwise requires helicopter or winter trail access. This placer prospect is on and follows much of the Ray River and several tributaries and numerous terraces (Barker, 1991a,b). For this record, the site is at the confluence of an unnamed tributary from the north located at the east edge of NW¼NW¼ Section 5, T. 13 N., R. 14 W., of the Fairbanks Meridian. The site is about mid-way across the area of the prospect and accurate to less than 1,000 feet.

Commodities:

Main: Sn

Other: Au, Nb, REE, Ti, W, Zr

Ore minerals: Cassiterite, gold, ilmenite, monazite, wolframite, xenotime, zircon

Gangue minerals:

Geologic description:

The Ray River drainage is underlain at the headwaters by the Sithylemenkat pluton and flows eastward approximately 30 miles, dissecting the Ray River pluton and ultimately encountering the Ft. Hamlin Hills pluton on the east where it is forced by topography to flow south to join the Yukon River. Placer tin and REE occur along the entire length of the river within the Tanana Quadrangle. The granitic rocks are all considered part of the broad northeast-trending peraluminous Ruby Batholith of central Alaska (Chapman and others, 1982; Barker and Foley, 1986: Herreid, 1969). Generally the granitic rocks are coarse-grained equigranular to porphyritic K-spar-biotite-quartz monzonite varying to granite with subordinate phases of aplite, biotite aplite, tourmaline aplite, and fine-grained quartz monzonite. Tourmaline pegmatite phases have been recognized locally. The granitic rocks cut Paleozoic schist, phyllite, quartzite, and lesser greenstone and limestone. The granitic plutons, especially the Sithylemenkat pluton, feature alteration zones including chloritic greisen veins/bodies that are the apparent source of at least some of the detrital cassiterite and REE minerals. Minor placer gold is also consistently present in heavy mineral samples and though minor commodity it would constitute an additional value.

The Ruby batholith region is within the glacial ice-free Quaternary province of Beringia, defined as the non-glaciated intermontane region extending from eastern Siberia and eastward across a then-dry Bering Sea-floor, thence transecting interior Alaska, and extending into northwestern Canada. Across the Beringia region, the fluvial processes have generally continued since the Tertiary and consequently the region is historically known for the Pleistocene mammals that survived there, as well as a multitude of placer gold camps; districts such as the Klondike and Fairbanks. In the Ruby batholith region, the on-going erosional and mineral concentration processes that can concentrate valuable heavy minerals, have apparently remained un-interrupted since the late Tertiary.

The heavy mineral concentration processes are further enhanced by multiple-stages of fluvial activity within the principal drainages that have subsequently reworked sediments in each drainage basin. Each episode of channel down-cutting leads to yet another phase of re-deposition at continually lower elevations;

the process continues locally to rework the alluvial sheet deposits at several documented locations on the Ray River (Barker, 1991b). Each repeated down-cutting event removes and transport more of the lighter aggregate downstream, thus potentially up-grading the residual heavy mineral concentrations left behind. This is best exemplified along the middle and upper Ray River. Strikingly evident, the middle Ray River alluvium-filled basin is beginning yet another episode of down-cutting due to recent breaching of barrier highland topography by the Ray River in Section 1 and 2, T. 13 N., R. 14 W. Further downstream the basin-filling of a graben-type feature(s) continues and forms at least two, lower Ray River basins (Barker, 1991b).

Remnant terraces are evidence of ancient (late Tertiary?) alluvial gravel deposition that predictably contain REE and tin in heavy mineral fractions are now perched as high as 150m (500 ft) above present-day channels of the lower Ray River. Along the northern and western Fort Hamlin Hills the tin- and REE-bearing terrace deposits have been developed for construction aggregate for the Trans-Alaska Pipeline. Predictably the grade of contained tin and REE in the high terrace deposits is lower than the re-worked and re-concentrated active basin sediments.

Alteration:

Thermal alteration from the batholith is widespread. Locally extensive, tourmalization, potassic, carbonate, and argillic styles of advanced alteration can be mapped and generally are associated with regional-scale northeast trending faults. Such zones of altered and weakened rock give rise to locally intense large-scale disintegration of the bedrock granite which has released the contained heavy minerals. Source of the placer tin- and REE- minerals appears to be local areas of argillic alteration and greisen vein-like occurrences that are particularly evident in the better exposed Sithylemenkat; a few typically dark green colored greisen fragments can generally be found in creek float at any location throughout the region (Barker and Foley, 1986). Greisen samples will generally contain 100 ppm to as much as 2500 ppm Sn and contain elevated REE. Cassiterite has also been found associated with quartz veins at a few locations. The older fluvial deposits also exhibit a degree of residual (in-place) concentration that are characterized by feldspar grains altered variably to white clayey quartz-rich sediment that are seen to grade upward into unaltered cross-bedded fluvial gravel.

Age of mineralization:

In the Ruby batholith region, the on-going erosional and mineral concentration processes that can concentrate valuable heavy minerals, have apparently remained un-interrupted since the late Tertiary (Barker, 1991b).

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Sn (Cox and Singer, 1986; model 39e).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39e

Production Status: None

Site Status: Active

Workings/exploration:

The Ray River has been explored by the U.S. Bureau of Mines as part of the Critical and Strategic Minerals Program in the 1970s-1980s (Barker, 1983, 1991a, 1991b; Barker and Foley, 1986). Gravel samples have been collected and processed from 37 locations along the Ray River and from a series of 7 auger drill holes randomly located on river gravel bars of the Ray River. All samples were processed by gravity methods for the analysis of the heavy mineral content (Barker, 1991a).

Ucore Rare Metals, Inc., through their Alaska subsidiary Landmark Alaska, acquired the property in 2011 and in 2012 announced additional sample results for 98 samples which included Ray River drainage, No Name Creek, and some sites along the Kilolitna and its tributaries (Ucore Rare Metals Inc., 2012). Follow

link to Excel data table.
Auger drill holes demonstrated higher heavy mineral values are encountered beginning about 5 to 7 ft. below the surface where gravel is more permanently clayey sand-bound as compared to the seasonally active gravel exposed in gravel bars near or at the surface. Holes were drilled to 15 to 21 ft deep. The sand fraction from a single hole in west-central area of the basin (Section 4), T. 13 N., R. 15 W., contained 897g/m3 REE+Sn while a second hole central in the basin in Section 6, T. 14 N., R. 14 W., reported 2,174g/m3 REE+Sn in the sand fraction. Surface samples from both a mile above and a mile below this location were mostly above the threshold value of 150g/m3 REE+Sn. Three auger drill holes on the east of and several miles beyond the upper basin reported similar threshold values (Barker, 1991a, Ucore, 2012).

Production notes:

None.

Reserves:

A 'very preliminary' resource estimate of the tin resource was made by the U.S. Bureau of Mines 'for the purpose of land-use management and planning purposes' consisting of between 62- to as much as -172 million pounds-tin in 300 million cubic yards of gravel (Barker, 1991). Grade is estimated between 0.2 and 0.5 pounds-tin per cubic yard; higher grade values are mostly from No Name Creek, the northern fork of the Ray River (see ARDF number BT021). No estimate was made for the REE, gold, or other possible placer minerals.

Additional comments:

The Ray River flows through lands on which the State of Alaska has filed ‘Priority Selection’ requests under the land entitlement provision of the 1959 Statehood Act. To date only a very small portion of the drainage (T. 13 N., R. 13 W.) has been transferred as ‘Tentatively Approved’ to the State from the federal government, Bureau of Land Management (BLM). The BLM will not issue any permits for surface disturbance activities including exploration under State Selection status.
Splits of most samples collected by the U.S. Bureau of Mines and referenced in this report have been archived at the Alaska Geologic Materials Center, Anchorage, Alaska and are available for review.

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Primary Reference: Barker, 1991a

Reporter(s): J.C. Barker

Last report date: 2016-03-15

Site name(s): Kilolitna River

Site type: Prospect

ARDF no.: TN142

Latitude: 65.9526 **Quadrangle:** TN D-3

Longitude: 151.204

Location description and accuracy:

This record represents occurrences of anomalous heavy minerals in samples from the Kilolitna River basin and several unnamed tributaries (Barker, 1983, 1991a, 2012; Barker and Foley, 1986; Ucore, Incorporated, 2012, 2014; Freeman, et al., 2014). For this record, the site is a gravel bar where two bulk samples of surface river bar gravel were collected in 2014 by Ucore subsidiary Landmark Alaska, LLP. The site location is accurate within 500 feet and is located in T. 13 N., R. 17 W., section 17 NW¼SW¼, Fairbanks Meridian. The general subject area of this report is a distinct lowland about 3 to 5 miles wide and up to 10 miles north-south on the north side of the Ray Mountains. The site, as described extends into the adjacent Bettles quadrangle.

Commodities:

Main: Sn

Other: Nb, REE, Ta, Ti, W, Zr

Ore minerals: Cassiterite, ilmenite, monazite, scheelite, wolframite (ferberite end-member), xenotime, yttroflourite, zircon

Gangue minerals:

Geologic description:

The Kilolitna River basin is a prominent, north trending and gently north-sloping basin feature about 10 miles long and up to 5 miles wide. The basin developed at the margin of the northern foothills of the Ray Mountains, and has been in-filled by sedimentation off the Ray Mountains pluton. Granitic rocks border the basin on the south, east, and north. The Kilolitna River basin lies between the Sithylemenkat pluton to the north-northeast and the Ray Mountains pluton to the south. The granitic rocks are all considered part of the broad northeast-trending peraluminous Ruby Batholith of central Alaska (Chapman and others, 1982; Barker and Foley, 1986; Herreid, 1969; Patton and Miller, 1970, 1973; Tuzzolino and others, 2013). Generally the granitic rocks are coarse-grained, equigranular to porphyritic orthoclase-biotite-quartz monzonite varying to granite with subordinate phases of aplite, biotite aplite, tourmaline aplite, and fine-grained quartz monzonite. Tourmaline pegmatite phases have been recognized locally. The granitic rocks cut Paleozoic schist, phyllite, quartzite, and lesser greenstone and limestone. The granitic plutons, especially the Sithylemenkat pluton, are multi-phased intrusions with trace element signatures comparable to tin-rare earth element granites elsewhere (Patton and Miller, 1973; Barker and Foley, 1986). Placer gold is not present in heavy mineral samples as it is in the Ray River alluvium to the east suggesting the gold-bearing source rocks are farther east (Barker, 1991a) of the Kilolitna drainage.

Schist and quartzite, generally silicified due to the regional plutonic intrusions, outcrop and abut the basin on the west. Satellite imagery indicates the river has progressively occupied and later successively abandoned a series of northeast-flowing channels beginning on the west and progressing to the east across the basin. The present Kilolitna River occupies the eastern-most channel along the east margin of the basin. Regional tilting due to the Porcupine-Kaltag fault system is suspected to be the cause. Consequently there is little evidence of basin downcutting; however, the present river is reworking the flood plains created by the earlier river channels along the east of the basin (T. 13 N., R. 17 W., sections 17-21, 27-33). This area

appears to be associated with the better heavy mineral concentrations, ranging from 100 up to 333 grams per cubic meter (rare earth elements plus tin), (Ucore Rare Metals Inc., 2012). The area of higher grade rare earth elements plus tin is also in agreement with heavy mineral sample results reported by Freeman and others, 2014, in a sampling campaign by the Alaska Division of Geological and Geophysical Surveys [ADGGS] (Bachmann, and others, 2013). Depth of the unconsolidated sediments in the basin is unknown and both the river gravel bed and the cut banks are particularly poorly consolidated and mostly covered by transient silt and vegetation.

In 2011 to 2013, ADGGS collected rock, stream sediment, as well as heavy mineral concentrates from the Kilolitna Basin area and reported numerous samples were anomalous for rare earth elements, tin and tungsten in rock and stream sediments. The work was part of a mineral resource evaluation of rare metals on State lands and land selections (Bachmann, et. al., 2013).

Alteration:

Thermal alteration from the Ruby Batholith is widespread. Locally extensive, tourmalization, potassic, carbonate, and argillic styles of advanced alteration can be mapped and generally are associated with regional-scale northeast trending faults. Such zones of altered and weakened rock give rise to locally intense large-scale disintegration of the bedrock granite, which has released the contained interstitial heavy minerals. Local sources of the placer tin and rare earth element minerals also include areas of argillic alteration, and chloritic greisen vein-like occurrences apparently from source areas in the Ray Mountains pluton to the south and east. Such alteration is also particularly evident in the better exposed Sithylemenkat pluton to the north (Barker and Foley, 1986). Greisen samples will generally contain 100 to as much as 2500 ppm tin and contain elevated rare earth elements. Cassiterite has also been found associated with quartz veins at a few locations, for example, the high ridge to the east of the Kilolitna basin (Bachmann, et. al., 2013).

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Alluvial tin placer (Cox and Singer, 1986; model 39e).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39e

Production Status: None

Site Status: Active

Workings/exploration:

Sample results from field investigations in the 1970s (Barker, 1983); in the 1980s (Barker and Foley, 1986); Ucore, (Ucore Rare Metals Inc., 2012; 2014); and 2014, by ADGGS (Bachmann, et. al., 2013) indicate potential economic-grade alluvial concentrations of rare earth elements and tin in the upper Kilolitna River basin. Sampling of the large area remains relatively sparse; however, as many areas are covered by soil and vegetation. Surface exposures of alluvial gravel and sand containing a threshold value of about 0.15 kilograms per cubic meter (0.25 pounds per cubic yard) of combined rare earth elements and/or tin are found along the present channel of the river. Mineral concentrates also contain by-product concentrations of tungsten, zirconium, niobium, and tantalum. Samples containing near or exceeding this threshold value are mostly concentrated in the east and southeast of the Kilolitna basin where the lower segments of older channels of the Kilolitna are being reworked by the modern river channel. Sample details for 15 heavy mineral sample sites by Landmark Alaska, LLP, including original volumes, the recovered weight of heavy mineral, rare metal analyses, and the calculated grams of total rare earth elements and tin per cubic meter can be accessed at http://ucore.com/projects/ray-mountains-alaska. Details for 10 heavy

mineral sites by ADGGS are in Bachmann and others, 2013, and data for 12 Kilolitna basin area samples by USBM are in Barker, 1983. All samples after 2010 were analyzed by ALS Minerals, Incorporated, in Vancouver, British Columbia, using lithium metaborate fusion followed by ICP-MS analyses.

Most samples were one standard gold pan in volume. Samples by Landmark Alaska, Ltd., consisted of one or more 5-gallon buckets (0.0133 cubic meter per 5-gallon bucket) of material that was later concentrated on a standard shaking table or processed by hand panning. Either procedure achieves an estimated 75 to 85 percent recovery of the heavy mineral suite, including rare earth element-bearing minerals such as monazite and xenotime, thus demonstrates amenability to physical separation in a full scale mine plant. This simple gravity separation method uses only water as the separation medium. Furthermore, extraction technology for rare earth elements from a monazite-xenotime matrix and tin from cassiterite in concentrates is well known and does not present new metallurgical challenges. Cassiterite, monazite, xenotime, wolframite (ferberite end-member), scheelite, ilmenite, and zircon have been identified in heavy mineral concentrates. A few grains of yttroflourite were reported by Barker and Foley, 1986. The total rare earth element composition includes 15 to 20 percent heavy rare earth elements gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, and yttrium in the majority of samples.

Production notes:

None.

Reserves:

None.

Additional comments:

The land in the Kilolitna Basin is held by the U.S. Bureau of Land Management. The State of Alaska has selected the area under provisions of the 1959 Statehood Act and nominated it as a priority selection. Ucore, through its local subsidiary Landmark Alaska, LLP, has located State mining claims according to the provisions provided by Alaska for locating claims on State Selected land. No surface disturbance activities, including ground-transported drilling equipment, can be permitted until Alaska receives tentative approval of the land transfer from the BLM. Ucore's subsidiary (Landmark Alaska, LLP) is planning expanded exploration once title transfer is tentatively approved by the federal government.

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Ucore Rare Metals Inc., 2014, Ucore announces field program at Ray Mountains-Alaska, July 21, 2014: http://ucore.com/ucore-announces-field-program-at-ray-mountains-alaska

Primary Reference: Ucore, 2014

Reporter(s): J.C. Barker

Last report date: 2016-03-15

Site name(s): Ray River Metalliferous Coal

Site type: Occurrence

ARDF no.: TN143

Latitude: 65.9843 **Quadrangle:** TN D-2

Longitude: 150.589

Location description and accuracy:

The site location is along the Ray River located immediately downstream of a prominent unnamed hot spring. The occurrence is in a topographic basin of the mid- to upper Ray River valley. Accuracy of the site and sample locations presented here is about 1,500 feet. The site location is in the SW¼, NE ¼ Section 6, T. 13 N., R. 14 W., of the Fairbanks Meridian. Similar mineral occurrence locations are reported approximately 10 miles farther downstream of this site and are described in the Bettles quadrangle ARDF site records.

Commodities:

Main: Ge, Pb, W

Other: Ag, Au, Cu, Ga, Mo, REE, Sb, U, Zr

Ore minerals:

Gangue minerals: Coal, coal ash

Geologic description:

This site is similar to other metalliferous coal sites farther down river that also occur in small, semi-closed basins along the Ray River immediately west of the Fort Hamlin Hills pluton (Barker, 2006). Both plutons are considered part of the broad northeast-trending peraluminous Ruby Batholith of central Alaska (Patton and Miller, 1973; Barker and Foley, 1986). Generally the granitic rocks are coarse-grained, equigranular to porphyritic, orthoclase-biotite-quartz monzonite varying to granite with subordinate phases of aplite, biotite aplite, tourmaline aplite, and fine-grained quartz monzonite. Tourmaline pegmatite phases have been locally recognized. The granitic rocks cut Paleozoic schist, phyllite, quartzite, and lesser greenstone and limestone. The Ray River coal-bearing basins are part of a regional series of Tertiary basins that occur intermittently along the southeast margin of the Ruby Batholith.

Along the Ray River these small, semi-closed basins are mapped as graben features, and range from several square miles in area to as little as 200 acres (Barker, 1991b, 2006). Metals are found highly concentrated in the calcium-rich coal ash derived from the coal. When prepared according to American Society for Testing Materials (ASTM, 1979) standards, ash samples will generally contain 0.01 to in excess of 1.0 percent each of germanium, lead, and tungsten. Ash samples also contain up to 0.5 percent total rare earth elements, and up to 0.1 percent antimony, copper, gallium, molybdenum, uranium, and zirconium. Gold and silver values are also present. All samples are variably mineralized within these limits (Barker, 2006).

The coal beds occur in soft sedimentary rock that is rarely found exposed; exposed coal beds are subject to destruction by forest fires. Sampling has relied on the fact that during high water events the Ray River will rip coal fragments from the coal beds within the mudstone and conglomerate section that comprise the bedrock under the river bed gravel in this region. Following high water events, random chips of fresh coal may be found on gravel bars, where they eventually oxidize and destruct.

Alteration:

Metal values in the coal at this site appears related to a 65-mile-long, northeast-trending series of

geothermal springs that likely altered and mineralized the organic material during and/or after the coal-forming period, possibly accentuated by overlying fissure basalt flows. An unnamed hot spring occurs about 200 meters upstream of the site, warm springs were found a few miles down river. Known geothermal springs extend about N 60 E from Ishtalitna Creek on the southwest to the Dall River on the northeast and are assumed to correlate to a splay of the Porcupine-Kaltag fault.

Age of mineralization:

A sample of tephra from the Coal Creek-Dall River section (about 30 miles to the northeast of this site) described above was dated at 38.6±1.6 Ma (Barker, 1981). Albanese, 1987, reported an age of 30.59±0.92 Ma for the basalt flows at a location nearer the Dalton Highway and immediately east of the Ray River. Coal mapped nearby is overlain by the basalt flows and therefore judged to be Eocene in age.

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

The site was explored by the U.S. Bureau of Mines as part of the Critical and Strategic Minerals Program in the 1970s-1980s (Barker, 1981, 1991b, 2006; Barker and Foley, 1986). Coal from this site was sampled, ash was prepared and analyzed as part of a group of metalliferous coal occurrences found at locations farther down river in the Bettles Quadrangle. Coal ash from this site contained 0.082 percent Ga, 1.22 percent Ge, 0.309 percent U, and 0.23 percent W. Ash constituted 14.68 percent of the coal.

All coal rank analyses and preparation of coal ash samples were done by the University of Alaska, Mineral Industry Research Laboratory. Metal values were determined by commercial laboratories.

Coal in the Ray River-Fort Hamlin Hills area, when fresh, will break with a conchoidal fracture and will have an apparent rank of high-volatile, lignite A to subbituminous B, generally with a 6-10 weight percent ash yield. Maceral composition is dominated by vitrinite. Ray River coal consistently contains higher sulfur (>1.4 percent) as compared to non-mineralized low-sulfur coal in the Dall River valley to the northeast and most other coal in central Alaska, an apparent affiliation of the Ray River coal and elevated metal content. The stratigraphic relationship of mudstone overlying coal beds in the Ray River occurrence is similar to the Dall River occurrence, but at the Dall site coal does not contain the elevated metal values, though the mudstone beds do (see ARDF number BV005) (Barker, 1981, 2006).

Microprobe studies suggest the finely disseminated mineralization found in coal of the Ray River valley mostly occurred in peat bogs prior to, or concurrent with, diagenesis and coal formation (Barker, 2006). Mineralization is likely related to geothermal activity associated with rifting in a granitic terrane and volcanism. Water samples from six of the seven known nearby hot springs/warm springs, including the spring immediately upstream of this site, were tested and determined to contain anomalous levels of tungsten. Mineralization processes affecting the original peat accumulations, or within coal beds, and were likely accentuated due to Oligocene fissure basalts that entrapped the geothermal waters in the coal-forming section. The mudstones in the Dall River-Coal Creek area contain elevated tungsten assumed concentrated during formation of lacustrine deposits in shallow lakes fed by the similar geothermal water and intermittently covered by ash falls (Barker, 1981, 2006).

Production notes:

None.

Reserves:

None.

Additional comments:

The Ray River coal occurrences are on lands on which the State of Alaska has filed ‘Priority Selection’ under the land entitlement provision of the 1959 Statehood Act. Various temporary land withdrawals remain to be lifted by the Bureau of Land Management (BLM) before these selections can be processed. The BLM will not issue any permits for surface disturbance activities including exploration until then.

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Patton, W.W., Jr., and Miller, T.P., 1973, Bedrock geologic map of Bettles and southern Wiseman quadrangles, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-492, 1 sheet, scale 1:250,000.

Primary Reference: Barker, 2006

Reporter(s): J.C. Barker

Last report date: 2016-03-15

Site name(s): St. Eugene

Site type: Prospect

ARDF no.: TY016

Latitude: 61.7092 **Quadrangle:** TY C-7

Longitude: 152.5571

Location description and accuracy:

The center of the St. Eugene prospect is about 9.8 miles north-northwest of Mount Gerdine in the Tordrillo Mountains. It is about 1.1 mile north-northeast of peak 8545, near the center of section 28, T. 19 N., R. 18 W.

Commodities:

Main: Au, Cu, Mo

Other:

Ore minerals: Azurite, chalcopyrite, chrysocolla, malachite, molybdenite, pyrite, pyrrhotite

Gangue minerals: Carbonate, quartz

Geologic description:

Lode claims were staked at this prospect in the 1970s but no information is available on that work (MacKevett and Holloway, 1977). There was no other work until 2009, when Millrock Resources Inc. restaked the property (Eden, 2010). In 2009 and 2010, Millrock did a geochemical survey over the area and collected numerous rock samples. In 2010 Brixton Metals Corp. optioned the property (Brixton Metals Corp., 2010). Their exploration is in the early stages.

The mineralization at the St. Eugene prospect covers an area about 5.3 by 6.5 kilometers (Eden, 2010). Three separate zones of mineralization have been found in hornfels adjacent to a Tertiary diorite intrusion. The largest extends about 700 meters along strike. Rock samples contained up to 1 percent copper and 2.1 grams of gold per tonne; quartz-carbonate veins are common. Chalcopyrite, molybdenite, pyrite, and pyrrhotite have been identified in the mineralized area. The rocks locally show strong silicification, quartz stockworks with quartz-sericite alteration, and chlorite-epidote alteration. The area is prominently stained with azurite, malachite, chrysocolla, hematite, jarosite after pyrite, and limonite. The areas of greatest interest are marked with deep red hematite staining. Eden (2010) suggests that the mineralization may represent a copper-gold-molybdenum porphyry system.

Alteration:

The rocks locally show strong silicification, quartz stockworks with quartz-sericite alteration, and chlorite-epidote alteration. The area is prominently stained with azurite, malachite, chrysocolla, hematite, jarosite after pyrite, and limonite.

Age of mineralization:

Probably related to an adjacent Tertiary diorite intrusion.

Generic deposit model:

Deposit model:

Copper-gold-molybdenum porphyry?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Lode claims were staked at this prospect in the 1970s but no information is available on that work (MacKevett and Holloway, 1977). There was no other work until 2009, when Millrock Resources Inc. restaked the property (Eden, 2010). In 2009 and 2010, Millrock did a geochemical survey over the area and collected numerous rock samples. In 2010 Brixton Metals Corp. optioned the property (Brixton Metals Corp., 2010). Their exploration is in the early stages.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brixton Metals Corp., 2011, Kahilt: http://www.brixtonmetals.com/upload/110111_Brixton_Kahilt_Summary.pdf (as of Feb. 15, 2011).

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MacKevett, E.M., Jr., and Holloway, C.D., 1977, Map showing metalliferous and selected non-metalliferous mineral deposits in the eastern part of southern Alaska: U.S. Geological Survey Open-File Report 77-169-A, 99 p., 1 sheet, scale 1:1,000,000.

Primary Reference: Eden, 2010

Reporter(s): Madelyn A. Millholland (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Island Mountain

Site type: Prospect

ARDF no.: TY018

Latitude: 61.7748 **Quadrangle:** TY D-8

Longitude: 152.7594

Location description and accuracy:

The center of the Island Mountain prospect is about 3.2 miles south-southwest of the mouth of Emerald Creek on the Skwentna River. It is about 0.5 mile west of the center of section 33, T. 20 N., R. 19 W., of the Seward Meridian. The prospect occupies much of the prominent mountain between Emerald Creek and the Skwentna River. The location is accurate to within 500 feet.

Commodities:

Main: Au, Cu, Mo, Zn

Other: Ag, As, Fe

Ore minerals: Arsenopyrite, chalcopyrite, gold, magnetite, molybdenite, pyrite, pyrrhotite, sphalerite

Gangue minerals: Quartz

Geologic description:

The rocks in the area are Jurassic and Cretaceous sediments of the Kahlitna terrane that are intruded by a small body of Cretaceous or Tertiary granite and quartz monzonite (Reed and Elliott, 1970; Wilson and others, 2009). As studied by Cominco American (unpublished reports, 1987 and 1988), the Island Mountain deposit consists of pyrite-chalcopyrite-quartz veins; disseminated pyrite and chalcopyrite; and arsenopyrite-gold and stockwork quartz veins with magnetite and trace molybdenite. The mineralization is in fine- to medium- grained plagioclase-hornblende porphyritic andesite and medium-grained monzonite that are probably related to the mineralization. Carbonate-rich beds in the sedimentary country rocks are locally replaced with pyrrhotite, pyrite, and sphalerite.

As mapped by Kiska Metals (2010b), the Island Mountain prospect covers an area about 3 by 4 kilometers in size. Monzonite porphyry, diorite, and monzonite intrude argillite and hornfels at the prospect. Kiska Metals drilled two holes in 2006 and two holes in 2009. The first hole in 2009 targeted a hydrothermal breccia zone 150 meters in diameter. Surface samples from the breccia zone contained actinolite, magnetite, pyrrhotite, pyrite, and chalcopyrite, and assayed up to 1.19 gram of gold per tonne, 5.2 grams of silver per tonne, and 0.2 percent copper. The hole intersected two zones of gold mineralization. A 150-meter intercept averaged 0.72 gram of gold per tonne; a 106.9 intercept averaged 1.22 grams of gold per tonne. The hole was almost entirely in diorite. The second hole averaged 0.13 gram of gold per tonne over 202.3 meters. Kiska Metals considers the deposit to be a gold-copper porphyry similar to the Whistler deposit (TY022) to the north.

The Island Mountain area has extensive gold-copper soil geochemical anomalies and significant porphyry-related mineralization, alteration and brecciation. Porphyry centers, as defined by central zones of potassic alteration associated with gold-copper mineralization and airborne magnetic high anomalies have been confirmed at four zones: the Breccia Zone, Cirque Zone, Howell Zone and Gilligan Zone. In addition, the Super Conductor is a 1 kilometer by 1.8 kilometers area defined by a strong airborne EM conductor associated with disseminated pyrrhotite and local gold mineralization (Roberts, 2014).

Roberts (2014) describes mineralization as gold-copper porphyry mineralization typical of the 'reduced'-type porphyry systems where pyrrhotite is a dominant sulfide (e.g. Catface deposit, BC). Gold-copper porphyry mineralization has been intersected in drilling at two separate centers at Island Mountain (Breccia

Zone and Cirque Zone). In contrast to the Whistler porphyry systems, which are 22 kilometers south, Island Mountain has significantly different alteration, veining, brecciation and sulfide assemblages associated with mineralization, principally the occurrence of pyrrhotite associated with gold-copper mineralization, core zones of mineralization hosted by magmatic-hydrothermal breccias, strong sodic-calcic alteration, lack of significant sulfates, very minor hydrothermal quartz and weak to insignificant phyllic alteration. For these reasons, the porphyry systems at Island Mountain may belong to the 'reduced' subclass of porphyry copper-gold deposits. In addition to these known occurrences, there are multiple zones with similar features (e.g. Howell Zone, Super Conductor). At the southern end of the Breccia Zone, the Discovery Breccia is comprised of intermingled intrusive and hydrothermal matrix breccias dominated by sodic-calcic alteration. This breccia complex records early pervasive biotite alteration, local k-feldspar alteration with disseminated followed by strong actinolite-albite alteration. Assays returned several significant intercepts of predominantly gold mineralization including a deep, strongly silicic/possibly potassic zone containing massive pyrite-dominant sulfide veins (IM11-030), a style not seen previously at Island Mountain (Roberts, 2014).

One target outside of the Breccia Zone at Island Mountain is the Howell Zone, which occurs 2 kilometers to the northeast. The Howell Zone is defined by very strong gold, copper, and molybdenum soil anomalies over significant widths. In addition, a 2011 airborne electro-magnetic (EM) survey identified a significant 1800 meters by 1000 meters conductor to the east of the Breccia Zone, which is largely hidden by colluvial and alluvial cover. This EM anomaly is interpreted to potentially represent a large zone of disseminated or net-textured pyrrhotite, which may be similar to the pyrrhotite-gold zone located east of the Discovery Breccia (Roberts, 2014).

Alteration:

In contrast to the Whistler porphyry systems, which are 22 kilometers south, Island Mountain has significantly different alteration, veining, brecciation and sulfide assemblages associated with mineralization, principally the occurrence of pyrrhotite associated with gold-copper mineralization, core zones of mineralization hosted by magmatic-hydrothermal breccias, strong sodic-calcic alteration, lack of significant sulfates, very minor hydrothermal quartz and weak to insignificant phyllic alteration. For these reasons, the porphyry systems at Island Mountain may belong to the 'reduced' subclass of porphyry copper-gold deposits. In addition to these known occurrences, there are multiple prospects with similar features (e.g. Howell Zone, Super Conductor). At the southern end of the Breccia Zone, the Discovery Breccia is comprised of intermingled intrusive and hydrothermal matrix breccias dominated by sodic-calcic alteration. This breccia complex records early pervasive biotite alteration, local k-feldspar alteration with disseminated followed by strong actinolite-albite alteration (Roberts, 2014).

Age of mineralization:

Younger than, or genetically related to the Late Cretaceous diorite to monzonite dikes, sills, and stocks, referred to as the Whistler Intrusive Suite with an Ar-Ar hornblende age date for 75 +/- 0.3 million years (Morris, 2011).

Generic deposit model:

Deposit model:

Gold-copper porphyry (Cox and Singer, 1986; model 20c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c

Production Status: None

Site Status: Active

Workings/exploration:

The Island Mountain area was discovered by Cominco Alaska, who worked in the area from 1986 to 1989

(Wahl and others, 2008). Kennecott Exploration Company was active in the area from 2004 to 2006 and staked a large block of claims that covered the Island Mountain prospect. Geoinformatics Exploration Inc. acquired the property from Kennecott in 2007 and in 2009, Kiska Metals Corporation was formed by a merger of Geoinformatics and Rimfire Minerals Corporation. In early 2010, Kiska Metals (2010a) was exploring their claim blocks as the Whistler project and they drilled the Island Mountain prospect in 2009.

Historic exploration included silt sampling, mapping, rock and contour soil sampling, soil grid geochemical surveys, magnetic and VLF geophysical surveys and diamond drilling by Cominco America in the mid-1980s. Similar work continued to 2009 by Kennecott and Kiska Metals. Kiska Metals drilled two holes in 2006 and 2 holes in 2009 (Kiska Metals Corporation, 2009).

During the 2009 to 2010 field seasons, Kiska completed 8,660 meters of diamond drilling in 23 drill holes, 224 line-kilometers of 3D induced polarization (IP) geophysics, 40 line-kilometers of 2D IP geophysics, geological mapping, geochemical sampling and metallurgical testing of mineralization from the Breccia Zone at Island Mountain (Roberts, 2014).

Kiska continued to drill and explore Island Mountain for the duration of the 2010 and 2011 field seasons, including step-out drilling at the Island Mountain Breccia Zone, an airborne EM survey of the Island Mountain area (Roberts, 2014).

The Island Mountain area has extensive gold-copper soil geochemical anomalies and significant porphyry-related mineralization, alteration and brecciation. Porphyry centers, as defined by central zones of potassic alteration associated with gold-copper mineralization and airborne magnetic high anomalies have been confirmed at four zones: the Breccia Zone, Cirque Zone, Howell Zone and Gilligan Zone. In addition, the Super Conductor is a 1 kilometer by 1.8 kilometers area defined by a strong airborne EM conductor associated with disseminated pyrrhotite and local gold mineralization (Roberts, 2014).

Kiska drilled the first drill hole in the Breccia Zone in 2009 (IM09-001), in which 150 meters averaged 0.72 gram of gold per tonne and 0.16 percent copper primarily in actinolite-magnetite breccia, and 106.9 meters averaged 1.22 grams of gold per tonne and 0.05 percent copper in a deeper pyrrhotite-gold zone. Kiska has conducted a total of 15,572 meters of exploration drilling at Island Mountain from 40 diamond drill holes, with the majority of those holes targeting the Breccia Zone (34 drill holes). At the southern end of the Breccia Zone, the Discovery Breccia is comprised of intermingled intrusive and hydrothermal matrix breccias dominated by sodic-calcic alteration. Assays returned several significant intercepts of predominantly gold mineralization including a deep, strongly silicic/possibly potassic zone containing massive pyrite-dominant sulfide veins (IM11-030), a style not seen previously at Island Mountain. This zone returned 73.9 meters averaging 0.72 gram of gold per tonne, 2.24 grams of silver per tonne and 0.09 percent copper (Roberts, 2014).

One target outside of the Breccia Zone at Island Mountain is the Howell Zone, which occurs 2 kilometers to the northeast. The Howell Zone is defined by very strong gold, copper, and molybdenum soil anomalies over significant widths. The core of the zone is defined by a semicircular 650 meters diameter zone with greater than 90th percentile gold-in-soil values (greater than 0.362 part per million (ppm) gold) with coincident greater than 90th percentile copper (greater than 498 ppm copper) and molybdenum (greater than 17 ppm molybdenum) soil anomalies extending a further 250 meters to the southwest. The core of this anomaly is coincident with a very strong, sub-circular magnetic high anomaly (Roberts, 2014).

In addition, a 2011 airborne electro-magnetic (EM) survey identified a significant 1800 meters by 1000 meters conductor to the east of the Breccia Zone, which is largely hidden by colluvial and alluvial cover. This EM anomaly is interpreted to potentially represent a large zone of disseminated or net-textured pyrrhotite, which may be similar to the pyrrhotite-gold zone located east of the Discovery Breccia. Kiska subsequently tested this anomaly with three widely spaced diamond drill holes for a total of 602 meters. Only one of these holes adequately tested this anomaly, and returned two gold-bearing intervals associated with net-textured pyrrhotite that averaged 0.61 gram of gold per tonne equivalent over 21 meters and another averaging 0.45 gram of gold per tonne equivalent over 30.0 meters (Roberts, 2014).

Production notes:

None.

Reserves:

In 2016, Brazil Resources Inc. (now Gold Mining Inc.) is evaluating prospects it acquired from Kiska Metals Corporation in 2015. Although no on-site work was performed in 2016 at the Whistler (TY022),

Raintree West (TY038), and Island Mountain porphyry copper–gold–silver prospects, in May of 2016, Brazil Resources Inc. released a new technical report announcing the first resource estimates for the Raintree West (TY038) and Island Mountain deposits, largely based on drilling by Kiska Metals Corporation between 2009 and 2011 (Giroux, 2016; Athey and Werdon, 2017).

The Island Mountain deposit contains an indicated resource of 31.08 million tonnes averaging 0.49 gram of gold per tonne (490,000 ounces of gold), 1.10 grams of silver per tonne (1.1 million ounces of silver), and 0.06 percent copper (41.12 million pounds of copper). Additionally, Island Mountain contains an inferred resource of 82.02 million tonnes averaging 0.47 gram of gold per tonne (1.24 million ounces of gold), 1.02 grams of silver per tonne (2.69 million ounces of silver), and 0.05 percent copper (90.43 million pounds of copper). The resource is based on 12,668 meters of drilling in 34 holes on the southwest slope of Island Mountain and a cut-off grade of 0.3 gram gold equivalent per tonne (Giroux, 2016).

Additional comments:

The 2009 to 2010 field program was operated by Kiska under the direction of a Technical Committee comprised of two Kennecott and two Kiska employees. In August of 2010, Kiska delivered a Technical Report to Kennecott summarizing the results of the completed 'Trigger Program'. In September of 2010, Kennecott informed Kiska that it would not exercise its back-in right on the project and hence retained a 2 percent Net Smelter Royalty on the property (Kiska Metals Corporation, 2010a).

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Giroux, G.H., 2016, NI 43-101 resource estimate for the Whistler project, 253 p. http://www.goldmining.com/projects/united_states/whistler/ (last accessed 8/25/2017)

Kiska Metals Corporation, 2009, Kiska drills 106.9 metres of 1.22 g/t gold at Island Mountain area, Whistler, Alaska: (News release, November 2, 2009) http://www.kiskametals.com/s/News.asp?ReportID=369977 (as of January 7, 2015).

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Morris, R.J., 2011, Resource Estimate Update for the Whistler Gold Copper Deposit and Results of Property Wide Exploration, Yentna Mining District, Alaska: Technical Report (43-101) for Kiska Metals Corporation, 133 p. (posted on www.sedar.com, March 18, 2011) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00007774&fileName=/csfsprod/data115/filings/01703222/00000003/i%3A%5CSEDAR%5CKMTchRpAM.PDF (as of January 8, 2015).

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Wahl, George, Coutture, Jean-Francois, and Keller, G.D., 2008, Mineral resource estimation, Whistler copper-gold project, Alaska Range, Alaska: Technical report for Geoinformatics Exploration, Inc., 124 p.

lang=EN&docClass=24&issuerNo=00007774&fileName=/csfsprod/data86/filings/01219440/00000001/s%3A%5Cgxl222.pdf (as of January 8, 2015).

Wilson, F.H., Hults, C.P., Schmoll, H.R., Haeussler, P.J., Schmidt, J.M., Yehle, L.A., and Labay, K.A., 2009, Preliminary geologic map of the Cook Inlet region, Alaska: U.S. Geological Survey Open-File report 209-1108, 99 p., 2 sheets, scale 1:250,000.

Primary Reference: Kiska Metals Corporation, 2010; Roberts, 2014

Reporter(s): Madelyn A. Millholland (Anchorage); D.J. Grybeck (Contractor, U.S. Geological Survey); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Unnamed (Near Mount Estelle)

Site type: Prospects

ARDF no.: TY019

Latitude: 61.8497 **Quadrangle:** TY D-8

Longitude: 152.8928

Location description and accuracy:

This records includes numerous prospects are in a 10-mile-square area near Mt. Estelle. The coordinates are at about the center of this area that includes parts of T. 20 N., R. 20 W., T. 21 N., R., 19 W., and T. 21 N., R. 20 W.

Commodities:

Main: Au, Cu

Other: As, Mo, Pb, Sb, Zn

Ore minerals: Arsenopyrite, chalcopyrite, galena, malachite, molybdenite, native gold, pentlandite, pyrite, pyrrhotite, sphalerite, stibnite

Gangue minerals: Carbonate, chlorite, limonite, quartz, sericite

Geologic description:

Note: This is an early ARDF record that describes work in the general area of Mount Estelle. Exploration work from 2000 to 2008 (Hidefield Gold, Plc., 2008; International Tower Hill Mines, Ltd., 2007; Millrock Resources Inc., 2008) has defined several specific prospects in or near this area within this area or nearby that are described separately, e.g., the Train (T031) and Shoeshine (TY032) prospects. This record is retained for its general geologic information on the geology and mineralization in the area.

The Mount Estelle pluton, dated at 65 to 66 Ma by Reed and Lanphere (1972), is the southern-most Late Cretaceous/early Tertiary composite pluton in the Yentna trend. This trend is described by Reed and Nelson (1980) as a 65-km-long, curvilinear belt extending from Mount Estelle in the south to Cascade Creek in the northeast. These plutons primarily intrude Mesozoic marine sedimentary rocks of the Kahiltna terrane. The Mount Estelle pluton (Reed and Elliott, 1970) is zoned from a granite core to marginal phases of quartz monzonite, quartz monzodiorite, augite monzodiorite, diorite and lamprophyric mafic and ultramafic rocks (Millholland, 1995; Crowe and others, 1991; Crowe and Millholland, 1990). Xenoliths of the country rocks and of the various intrusive phases occur throughout the pluton. Sheeted joint sets and unusual spherical, onion-skin-like features occur in the core of the pluton. Sparse tourmaline and beryl occur in and adjacent to the pluton. Foley and others (1997) note that the composite plutons at the southwestern end of the Yentna trend are more granitic in composition and probably have not been as deeply eroded as the more mafic and ultramafic bodies to the northeast in the Talkeetna quadrangle. Adjacent to the Mount Estelle pluton, the country rock is hornfelsed and locally exhibits red staining and sericite-clay alteration, and pyrite in disseminations and along fractures.

Float and stream-sediment samples taken in the vicinity of the Mount Estelle pluton suggest widespread polymetallic mineralization. Stream sediments consistently contain anomalous gold, copper, arsenic, and silver. Mineralized rock samples typically give high values for gold and copper, and some contain anomalous amounts of silver, arsenic, molybdenum, bismuth, boron, lead, antimony, tin, zinc and manganese. Cominco American Incorporated's work (unpublished reports, 1985-1989) shows gold values. Native gold occurs with chalcopyrite, pyrite, arsenopyrite, and pyrrhotite associated with sericite, carbonate and chlorite alteration in sheeted joints, stockwork veinlets, and circular structures that range from 1 inch to more than 15 feet in diameter (Millholland, 1995; Crowe and others, 1991; Crowe and Millholland, 1990).

These structures are in the felsic and intermediate phases of the pluton. Gold associated with pyrrhotite, chalcopyrite, pentlandite and molybdenite also occurs in ultramafic rocks on the south side of the pluton. Mineralization is less common in the sedimentary rocks. In Muddy Creek, one zone of coarse galena, pyrrhotite, sphalerite and chalcopyrite replaces carbonate-rich horizons in the hornfelsed sedimentary rocks.

Anomalous gold, platinum-group elements, copper, chrome, nickel and arsenic are reported from many of the composite plutons of the Yentna trend (Reed and others, 1978; Reed and Nelson, 1980; Nelson and others 1992). Gold and platinum-group-element placers have been worked at several sites downstream from the plutons (Mertie, 1919; Cobb, 1973; ARDF records TL001, TL 002, TL003, TL020, TL023, TL051, TL052, and TL053).

There are notable similarities between the Mount Estelle pluton and the Kohlsaat pluton described by Reiners, Nelson, and Nelson (1996). The Kohsaat pluton is a concentrically-zoned body with a biotite-granite-porphyry core that intrudes seriate and porphyritic, intermediate composition rocks. The latter include olivine-, pyroxene-, and biotite-bearing quartz syenite, quartz monzonite, and monzonite. Lamprophyric mafic and ultramafic rocks that range in composition from peridotite to alkali gabbro and monzonite form large xenoliths at the northeastern margin of the pluton. The granite-porphyry core is altered to sericite, quartz, carbonate and tourmaline assemblages, with minor enrichments of copper, gold, lead, molybdenum, and zinc. The composite Kohlsaat pluton may have formed from depleted mantle melts that were contaminated by crustal components during several stages of mafic magma generation. Also see ARDF record TL052.

Alteration:

Alteration is weak and restricted to vein and joint selvages. Carbonate, chlorite, sericite, and quartz are commonly associated with the sulfide and gold mineralization (Millholland, 1995; Crowe and others, 1991; Crowe and Millholland, 1990; Cominco American Incorporated, unpublished reports, 1985 through 1989).

Age of mineralization:

Late Cretaceous to Early Tertiary based on 65 to 66 Ma. intrusions that are probably related to the mineralization (Reed and Lanphere, 1972).

Generic deposit model:

Deposit model:

Intrusive-hosted gold-copper deposits.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Prospecting in the area has been conducted by several private companies since the 1970s. From 1980 to 1985, many of the claims were held for their placer potential; however, they were never mined to any great extent because the large glacial boulders in the stream gravels hampered recovery. Work in the area included: silt and rock geochemistry, mapping, magnetic, VLF, IP and radar geophysical surveys, and diamond drilling. To evaluate the steep, glaciated terrain, technical climbers from Dihedral Exploration were employed.

This is an early ARDF record that describes work in the general area of Mount Estelle and has been retained for its regional geologic and mineral information. Exploration work from 2000 to 2008 (Hidefield Gold, Plc., 2008; International Tower Hill Mines, Ltd., 2007; Millrock Resources Inc., 2008) has defined several prospects in or near that are described separately, e.g., the Train (TY031) and Shoeshine (TY032) prospects.

Production notes:

None.

Reserves:

None.

Additional comments:

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Primary Reference: Millrock Resources Inc., 2008 (Estelle)

Reporter(s): Madelyn A. Millholland (Anchorage, AK), James Riehle (USGS); D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Stoney; North Stoney; Trundle; Tomahawk; Kid; Stoney Vein

Site type:

Prospects

ARDF no.: TY020

Latitude: 61.9115 **Quadrangle:** TY D-8

Longitude: 152.9159

Location description and accuracy:

The Stoney prospect area is a locally discontinuous 6.8 mile north-northeast trending gold-silver-copper anomaly. The location point is centered on the Stoney Vein about 0.5 mile northwest of Mount Stoney, in the NE1/4 section 15, T. 21 N., R. 20 W., of the Seward Meridian. The location is accurate to within about a half mile.

Commodities:

Main: Ag, Au, Cu, Pb

Other: As, Sb, Zn

Ore minerals: Arsenopyrite, chalcocite, chalcopyrite, native copper, galena, gold, pyrite, pyrrhotite, sphalerite, stibnite

Gangue minerals: Calcite, dolomite, epidote, graphite, quartz, siderite, tourmaline

Geologic description:

The Stoney prospect and others in the vicinity are on the Yentna trend of Late Cretaceous/early Tertiary composite plutons described by Reed and Nelson (1980). The Mount Estelle pluton (Reed and Elliott, 1970) extends from Timber Creek on the south to the Portage Creek area in the north. In the central part of the pluton, a biotite-hornblende-quartz monzonite intrudes Mesozoic marine sedimentary rocks of the Kahiltna terrane.

Two veins follow dilatant zones in the pluton along its west side (Cominco American Incorporated, unpublished reports, 1986-1987). The main Stoney mineralized zone dips steeply and has been traced for more than 3 miles. It is 14 to 60 feet wide and has a vertical relief of at least 1000 feet. The quartz-calcite-dolomite-siderite-tourmaline veins alternate with altered intrusive rocks and the veins contain pyrrhotite, chalcopyrite, arsenopyrite, pyrite, stibnite, and, locally, sphalerite and galena. The North Stoney vein is a sub-parallel feature just west of the northern end of the main Stoney vein. It is up to 35 feet wide and has similar mineralogy to the main Stoney vein. A third vein is one mile to the west.

There was considerable work in the area by government and industry as far back as the 1970's that identified widespread mineralization in the Mount Estelle area (see TY019). From 2005 to 2008, several companies (Hidefield Gold Plc. (2008), International Tower Hill Mines Ltd. (2007) and Millrock Resources Inc. (2008)) have worked in the area and identified several specific prospects. Millrock began exploring the area in 2008 as part of the Estelle project that covers a large block of claims north and south of Mount Estelle. The Stoney vein is within that block and Millrock has sampled it. Hidefield (2008) shows several other veins to the north and south; the Trundle vein and another unnamed vein are about two miles to the north, the Tomahawk vein is about 4 miles to the north, and the Kid vein is about 4 miles the south. All are in the Mount Estelle pluton and are probably similar to the Stoney, Shoeshine (TY032), and Train (TY031) prospects to the south.

Millrock Resources Inc. (2014) reports the Stoney prospect area contains locally discontinuous north-northeast trending gold-silver-copper anomalies defined by both soil and rock samples. The anomalies are all greater than 2.5 kilometers in length with the longest greater than 8 kilometers. The distance from the

northernmost to southernmost anomaly is about 11 kilometers. None of the anomalies have been drill tested (Millrock Resources Inc., 2014).

One such anomaly hosts the Stoney vein system, a series of high angle, east-dipping, north-northeast-trending shear-hosted massive sulfide veins. The main Stoney vein varies in width from 1 meter to 3 meters and has a vertical relief greater than 300 meters. The vein follows a greater than 5 kilometer long north-trending dilational shear zone in highly alkaline biotite-hornblende-quartz monzonite. In this location, an intersection of strong northwest-southeast and east-west trending magnetic lineaments coincides with veins of quartz-calcite-dolomite-siderite-tourmaline-pyrrhotite-chalcopyrite-arsenopyrite-pyrite-stibnite ± graphite, chalcocite, native copper, sphalerite and galena. Samples of vein material have returned results up to 11.05 parts per million (ppm) gold. Samples from the nearby T-5 prospect show increased silver and copper values with assays as high as 1,140 ppm silver and 7.43 percent copper (Millrock Resources Inc., 2014).

Alteration:

Calcite, epidote, sericite, tourmaline, quartz (Millrock Resources Inc., 2014).

Age of mineralization:

Late Cretaceous/early Tertiary?; mineralization in the area is thought to be related to the 65-66 Ma, granodiorite of Mount Estelle (Millrock Resources Inc., 2014).

Generic deposit model:

Deposit model:

Polymetallic vein (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

There was considerable work in the area by government and industry as far back as the 1970s that identified widespread mineralization in the Mount Estelle area (see TY019). From 2005 to 2008, several companies (Hidefield Gold Plc. (2008), International Tower Hill Mines Ltd. (2007) and Millrock Resources Inc. (2008)) have worked in the area and defined several specific prospects Millrock began exploring the area in 2008 as part of its Estelle project, which covers a large block of claims north and south of Mount Estelle. The Stoney vein is in that block and Millrock has sampled it.

Millrock Resources Inc. (2014) reports the Stoney prospect area contains locally discontinuous north-northeast trending gold-silver-copper defined by both soil and rock samples. The anomalies are all greater than 2.5 kilometers in length with the longest greater than 8 kilometers. The distance from the northernmost to southernmost anomalies is about 11 kilometers. None of the anomalies have been drill tested (Millrock Resources Inc., 2014).

One such anomaly hosts the Stoney vein system, a series of high angle, east-dipping, north-northeast-trending shear-hosted massive sulfide veins. The main Stoney vein varies in width from 1 meter to 3 meters and has a vertical relief greater than 300 meters. The vein follows a greater than 5 kilometers long north-trending dilational shear zone in highly alkaline biotite-hornblende-quartz monzonite. In this location, an intersection of strong northwest-southeast and east-west trending magnetic lineaments coincides with veins of quartz-calcite-dolomite-siderite-tourmaline-pyrrhotite-chalcopyrite-arsenopyrite-pyrite-stibnite ± graphite, chalcocite, native copper, sphalerite and galena. Samples of vein material have returned results up to 11.05 parts per million (ppm) gold. Samples from the nearby T-5 prospect show increased silver and copper values with assays as high as 1,140 ppm silver and 7.43 percent copper (Millrock Resources Inc., 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

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Reed, B.L., and Nelson, S.W., 1980, Geologic map of the Talkeetna quadrangle: U.S. Geological Survey Miscellaneous Investigations Map I-1174, 1 sheet, scale 1:250,000.

Primary Reference: Millrock Resources Inc., 2014

Reporter(s): Madelyn A. Millholland (Anchorage); D.J. Grybeck (Port Ludlow, WA); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2015-01-08

Site name(s): Whistler

Site type: Prospect

ARDF no.: TY022

Latitude: 61.9638 **Quadrangle:** TY D-8

Longitude: 152.6799

Location description and accuracy:

The center of the Whistler prospect is about 3.8 miles west of the junction of Portage Creek and the Skwentna River, near the center of section 29, T. 22 N., R. 18 W., of the Seward Meridian. The location is accurate to within 500 feet.

Commodities:

Main: Ag, Au, Ba, Cu, Pb, Zn

Other: Fe

Ore minerals: Chalcopyrite, galena, gold, magnetite, pyrite, sphalerite

Gangue minerals: Carbonate, chlorite, gypsum, quartz

Geologic description:

In early 2010, the Whistler prospect was the most developed property of the Whistler project of Kiska Metals Corporation and was aggressively being explored (Kiska Metals Corporation, 2010). Cominco Alaska began mineral exploration in the area in 1986; they drilled 15 short holes on the Whistler prospect but dropped it in 1989. It was restaked in 1999 and leased to Kennecott Exploration Company in late 2002. From 2004 through 2006, Kennecott carried out major exploration in the area, including geologic mapping; soil, stream sediment, and rock geochemistry; ground induced-polarization and airborne magnetic geophysical surveys; and they drilled 15 core holes in the Whistler prospect that totaled 7,948 meters. In 2007, Geoinformatics Exploration Inc. optioned the property from Kennecott. As of 2008, the Whistler prospect is on a block of 732 State of Alaska mining claims (Wahl and others, 2008). In 2009, Kiska Metals Corporation, was formed through a merger of Geoinformatics and Rimfire Minerals Corporation (Morris, 2011).

The Whistler prospect is a porphyry copper-gold deposit that in 2010 extended over an area at least 1,000 meters in diameter (Kiska Metals Corporation, 2010; Wahl and others, 2008). It is closely associated with a [Cretaceous-]Tertiary extrusive igneous complex that overlays and intrudes feldspathic sandstone of Jurassic-Cretaceous age (Wilson and others, 2009). At least three diorite porphyry intrusive phases intrude the feldspathic sandstone unit and are associated with the sulfide mineralization event at Whistler, although strong phyllic alteration has obliterated primary textures, making it difficult to differentiate lithologies and determine intrusive contacts. The oldest intrusive phase (‘main stage’) exhibits the best gold-copper mineralization; the second oldest phase (‘inter-mineral stage’) is strongly altered and carries weak gold-copper mineralization, while the third and youngest is altered but typically barren. Most of the complex consists of 'inter-mineral stage' and 'main stage' diorite porphyry; the best mineralization is in the main-stage porphyry. The complex is cut by dikes of 'late stage' diorite porphyry and porphyritic andesite. The structure is not well constrained because of the wide spacing of the drill holes but there is at least one major fault and several breccia zones (Wahl and others, 2008). Roberts (2014) reported diorite porphyry bodies at the Whistler deposit occur as batholiths, stocks, and dikes and generally have a northwest-oriented elongation that is sub-parallel to significant regional-scale faults, such as the Alger Peak fault and the Timber Creek fault.

The paragenesis of the mineralization is: 1) early barren, quartz-magnetite veins associated with secondary

biotite alteration; 2) 'main' stage, quartz-magnetite-chalcopyrite veins, associated with secondary biotite, quartz-pyrite and pyrite veins, and pervasive quartz-sericite-pyrite alteration, and 3) late calcite veins with sphalerite and galena. Gypsum is common. Near the complex, the original textures of the sedimentary rocks are almost obliterated by strong phyllitic alteration that makes it hard to distinguish them from the igneous rocks (Wahl and others, 2008).

In January of 2011, Kiska announced a new estimate of the resources of the Whistler deposit that incorporated the drilling through 2010 (Kiska Metals Corporation, 2011; Morris, 2011). They estimate it has 79.2 million tonnes of 'indicated resource' with a grade of 0.51 gram of gold per tonne, 1.97 grams of silver per tonne, and 0.17 percent copper, and an 'inferred resource' of 145.8 million tonnes with an average grade of 0.40 gram of gold per tonne, 1.75 grams of silver per tonne, and 0.15 percent copper (Morris, 2011).

Alteration:

Early secondary biotite alteration in the porphyry; intense quartz-sericite-pyrite alteration during the main stage of mineralization in the porphyry; and strong phyllitic alteration in the sandstone around the intrusion (Wahl and others, 2008).

Age of mineralization:

Younger than or related to a Cretaceous-Tertiary diorite porphyry, intrusive-extrusive complex (Morris, 2011).

Generic deposit model:

Deposit model:

Gold-copper porphyry (Cox and Singer, 1986; model 20c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c

Production Status: None

Site Status: Active

Workings/exploration:

In early 2010, the Whistler prospect was the most developed property of the Whistler project of Kiska Metals Corporation and was aggressively being explored (Kiska Metals Corporation, 2010). Cominco Alaska began mineral exploration in the area in 1986; they drilled 16 diamond drillholes (1,677 meters) and completed 8.4 line-kilometers of 2D Induced Polarization (IP) geophysics for the Whistler deposit, but dropped it in 1989 (Morris, 2011). It was restaked in 1999 and leased to Kennecott Exploration Company in late 2002. From 2004 through 2006, Kennecott carried out major exploration in the area, including geologic mapping; soil, stream sediment, and rock geochemistry; ground induced-polarization and airborne magnetic geophysical surveys; and they drilled 15 core holes in the Whistler prospect that totaled 7,948 meters. In 2007, Geoinformatics Exploration Inc. optioned the property from Kennecott. As of 2008, the Whistler prospect is on a block of 732 State of Alaska mining claims (Wahl and others, 2008). From 2007 through 2008, Geoinformatics drilled 12 holes for 5,784 meters in order to infill the Whistler deposit to sections spaced at 75 meters and to test for the extent of the deposit to the north and south (Morris, 2011).

Results from airborne magnetic surveys (using 50-meter spacing) by Kennecott in 2004 showed that the Whistler deposit displays a strong 900 meter by 700 meter positive magnetic anomaly attributed to the Whistler Diorite intrusive complex, secondary magnetite alteration and veining associated with gold-copper mineralization. Additionally, two IP lines run over the deposit magnetic anomaly showed that mineralization is coincident with a strong chargeability anomaly. Soil grids over the deposit showed anomalous gold-copper results that were also coincident with the magnetic high (Morris, 2011).

In 2009, Kiska Metals Corporation, was formed through a merger of Geoinformatics and Rimfire Minerals Corporation. In 2010, Kiska drilled 5 holes in the Whistler deposit totaling 4,456 meters in order to infill

gaps from previous drilling and to test the edges and depth of the intrusive complex that hosts the deposit (Morris, 2011). In 2011, Kiska performed minor infill drilling at the Whistler Deposit, followed by publication of an updated 43-101 compliant resource estimate (Roberts, 2014).

Production notes:

None.

Reserves:

In 2011, Kiska announced a new estimate of the resources of the Whistler deposit that incorporated the drilling through 2010 (Morris, 2011). The pit delineated resource has 79.2 million tonnes of 'indicated resource' with a grade of 0.51 gram of gold per tonne, 1.97 grams of silver per tonne, and 0.17 percent copper, and an 'inferred resource' of 145.8 million tonnes with an average grade of 0.40 gram of gold per tonne, 1.75 grams of silver per tonne, and 0.15 percent copper (Morris, 2011).

In 2016, Brazil Resources Inc. (now Gold Mining Inc.) is evaluating prospects it acquired from Kiska Metals Corporation in 2015. Although no on-site work was performed in 2016 at the Whistler, Raintree West (TY038), and Island Mountain (TY018) porphyry copper–gold–silver prospects, in May of 2016, Brazil Resources Inc. released a new technical report announcing the first resource estimates for the Raintree West (TY038) and Island Mountain (TY018) deposits, largely based on drilling by Kiska Metals Corporation between 2009 and 2011 (Giroux, 2016). Their report also re-states the resource estimate for the Whistler gold-copper deposit (initially released in 2015), based largely on the historic resource estimate completed by Kiska Metals Corporation in March 2011 (Athey and Werdon, 2017).

The Whistler deposit contains an indicated resource of 79.2 million tonnes, averaging 0.51 gram of gold per tonne (1.28 million ounces of gold), 1.97 grams of silver per tonne (5.03 million ounces of silver), and 0.17 percent copper (302 million pounds of copper). Additionally, Whistler contains an inferred resource of 145.8 million tonnes grading 0.40 gram of gold per tonne (1.85 million ounces gold), 1.75 grams of silver per tonne (8.21 million ounces silver), and 0.15 percent copper (467 million pounds copper). Metal recoveries reported for the Whistler deposit resource estimate include 85 percent for copper, 75 percent for gold, and 75 percent for silver (Giroux, 2016).

Additional comments:

References:

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Giroux, G.H., 2016, NI 43-101 resource estimate for the Whistler project, 253 p. http://www.goldmining.com/projects/united_states/whistler/ (last accessed 8/25/2017)

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Morris, R.J., 2011, Resource Estimate Update for the Whistler Gold Copper Deposit and Results of Property Wide Exploration, Yentna Mining District, Alaska: Technical Report (43-101) for Kiska Metals Corporation, 133 p. (posted on www.sedar.com, March 18, 2011) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00007774&fileName=/csfsprod/data115/filings/01703222/00000003/i%3A%5CSEDAR%5CKMTchRpAM.PDF (as of January 8, 2015).

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Wahl, George, Coutture, Jean-Francois, and Keller, G.D., 2008, Mineral resource estimation, Whistler copper-gold project, Alaska Range, Alaska: Technical report for Geoinformatics Exploration, Inc., 124 p. (posted on www.sedar.com, February 22, 2008) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00007774&fileName=/csfsprod/data86/filings/01219440/00000001/s%3A%5Cgxl222.pdf (as of January 8, 2015).

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Primary Reference: Wahl and others, 2008

Reporter(s): Madelyn A. Millholland (Anchorage); D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Old Man Breccia

Site type: Prospect

ARDF no.: TY025

Latitude: 61.9398 **Quadrangle:** TY D-7

Longitude: 152.3248

Location description and accuracy:

The Old Man Breccia prospect is about 3.8 miles west-southwest of the junction of Old Man Creek and Happy River. It is about 0.5 mile west of the center of section 1, T. 21 N., R. 17 W. The location is accurate.

Commodities:

Main: Au, Cu

Other: Fe

Ore minerals: Chalcopyrite, gold, pyrite, pyrrhotite

Gangue minerals: Carbonate, quartz

Geologic description:

In early 2010, the Old Man Breccia prospect was part of the Whistler project of Kiska Metals Corporation and was is actively being explored (Kiska Metals Corporation, 2010a). Cominco Alaska began mineral exploration in the area in 1986; they found the deposit but ended their work in 1989. From 2004 to 2006 Kennecott Exploration Company carried out major exploration in the area, including geologic mapping; soil, stream sediment, and rock geochemistry; and geophysical surveys. They staked several large blocks of ground that included the Old Man Breccia prospect. In 2005, Geoinformatics Exploration Inc. acquired the property from Kennecott, and in 2009, Kiska Metals Corporation was formed by a merger of Geoinformatics and Rimfire Minerals Corporation.

A float sample of quartz with pyrrhotite, chalcopyrite, and pyrite, that assayed contained several ounces of gold per ton led to the discovery of the deposit. It consists of breccia in siltstone of Upper Jurassic and Lower Cretaceous flysch (KJs) of the Kahiltna terrane (Cominco American Incorporated, unpublished reports, 1986-1988; Wilson and others, 2009). The breccia is exposed over an area approximately 105 feet by 90 feet. It consists of angular clasts of argillite from less than one inch to a few inches cemented by milky quartz and lesser carbonate. The quartz-argillite breccia forms sinuous, sub-vertical zones around large argillite blocks. Sulfides in the breccia are sparse (generally less than 1 percent) and consist of pyrrhotite, pyrite, chalcopyrite, and rare coarse-grained arsenopyrite. Quartz veins with pyrrhotite, pyrite, and chalcopyrite that crosscut the breccia zone vary from a few inches to 2 feet thick; they contain occasional specks of visible gold. There is no obvious alteration.

In 2009, three trenches showed substantial gold values in an area of breccia about 30 meters in diameter (Kiska Metals Corporation, 2010b). Channel samples included: 0.74 gram of gold per tonne along 16 meters; 1.94 grams of gold per tonne along 24 meters; 3.34 grams of gold per tonne along 28 meters; and 7.12 grams of gold per tonne along 10 meters. Only small sections of the trenches had gold values below 0.30 gram of gold per tonne.

Alteration:

Iron-oxide.

Age of mineralization:

The breccia is younger than the Jurassic-Cretaceous host rock.

Generic deposit model:

Deposit model:

Gold-bearing sulfide breccia.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Discovered by Cominco in the early 1980s. Exploration work included mapping, rock chip geochemistry, soil sampling, magnetic and VLF geophysical surveys, and diamond drilling. Kennecott Exploration Company probably did some work from 2004 to 2006. Trenched and sampled by Kiska Metals Exploration in 2009.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Kiska Metals Corporation, 2010a, Whistler project overview; http://www.kiskametals.com/s/Whistler.asp?ReportID=370036 (as of February 26, 2010)

Kiska Metals Corporation, 2010b, Old Man Breccia returns 28 meters of 23.34 g/t gold i channel sampling at Whistler project, Alaska: http://www.kiskametals.com/s/Kiska_News.asp?ReportID=380655 (News release dated January 14, 2010)

Wilson, F.H., Hults, C.P., Schmoll, H.R., Haeussler, P.J., Schmidt, J.M., Yehle, L.A., and Labay, K.A., 2009, Preliminary geologic map of the Cook Inlet region, Alaska: U.S. Geological Survey Open-File report 209-1108, 99 p., 2 sheets, scale 1:250,000.

Primary Reference: Kiska Metals Corporation, 2010a and 2010b

Reporter(s): Madelyn A. Millholland (Anchorage); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Train

Site type: Prospect

ARDF no.: TY031

Latitude: 61.8314 **Quadrangle:** TY D-8

Longitude: 152.9157

Location description and accuracy:

The center of the Train prospect is about 1.5 miles south of Mount Estelle; it is about 0.5 mile south of the center of section 9, T 20 N., R. 20 W. The location is accurate.

Commodities:

Main: Ag, Au

Other: Cu, Pb, Zn

Ore minerals: Arsenopyrite, pyrite (and probably others)

Gangue minerals: Quartz, tourmaline

Geologic description:

The Train prospect is near the periphery of the Cretaceous (65-66 Ma) Mount Estelle pluton, which is zoned from a granite core to marginal phases of quartz monzonite, quartz monzodiorite, augite monzodiorite, diorite and lamprophyric mafic and ultramafic rocks (Reed and Elliott, 1970; Millholland, 1995; Crowe and others, 1991; Crowe and Millholland, 1990). The pluton intrudes Jurassic and Cretaceous sedimentary rocks that are hornfelsed adjacent to the pluton, are locally stained red, and have been altered to sericite and clay. Pyrite occurs as disseminations and along fractures.

There was considerable work in the area by government and industry as far back as the 1970s that identified mineralization, but the work was more general than prospect specific (see TY019). From 2005 to 2008, several companies, Hidefield Gold Plc. (2008), International Tower Hill Mines Ltd. (2007) and Millrock Resources Inc. (2008), have defined several specific prospects in the area, including the Train prospect and the nearby Shoeshine prospect (TY032). Millrock is currently (2008) exploring the deposit as part of its Estelle project that covers a large block of claims north and south of Mount Estelle.

International Tower Hills collected a sample of a quartz-sulfide vein at the Train prospect that contained 57 parts per million (ppm) gold, 212 ppm silver, 3.6 ppm copper, and 0.3 ppm lead. The vein trends north and dips steeply. Millrock collected numerous samples along a north- to north-northeast trending zone about 1.5 miles long; many of the samples contained more than 2 grams of gold per ton. Of the 83 samples they collected, the average gold content was 7.61 grams per tonne; the minimum was 0.01 gram per ton, and the highest was 56.9 grams per tonne. The possible porphyry-style mineralization consists mainly of quartz-arsenopyrite veins; auriferous quartz stockworks; and breccia zones cemented by quartz, oxidized sulfides, and tourmaline.

Alteration:

The alteration associated with the quartz veins, stockworks, and breccia is not specifically noted.

Age of mineralization:

Later than the 65-66 Ma Mount Estelle pluton that hosts the mineralization; may be genetically related to the pluton.

Generic deposit model:

Deposit model:
Gold-arsenopyrite-quartz veins, stockworks, and breccias.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:
Limited sampling by a succession of companies since the 1970s.

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Crowe, D.E., and Millholland, M.A., 1990, High-grade gold mineralization associated with high salinity hydrothermal fluids, Mt. Estelle pluton, central Alaska Range [abs.]: Geological Society of America, Abstracts with Programs, v. 22, p. A41.

Crowe, D.E., Millholland, M.A., and Brown, P.E., 1991, Precious and base metal mineralization associated with high-salinity hydrothermal fluids in the Mount Estelle pluton, south-central Alaska: Economic Geology, v. 86, p. 1103-1109.

Hidefield Gold Plc., 2008, South Estelle: http://www.hidefieldgold.com/s/SouthEstelle.asp (as of May 25, 2008)

International Tower Hill Mines Ltd., 2007, ITH further defines mineralization at South Estelle: http://www.ithmines.com/s/NewsReleases.asp?ReportID=267305&_Type=News-Releases&_Title=ITH-Further-Defines-Mineralization-at-South-Estelle (News release, October 18, 2007)

Millrock Resources Inc., 2008, Estelle: http://www.millrockresources.com/index.php/projects/estelle/ (as of May 25, 2008).

Millholland, M.A., 1995, Geology and discovery at Mount Estelle: Newsletter of the Alaska Geological Society, v. 24, no. 8, p. 1.

Reed, B.L., and Elliott, R.L., 1970, Reconnaissance geologic map, analyses of bedrock and stream sediment samples, and an aeromagnetic map of parts of the southern Alaska Range: U.S. Geological Survey Open-file Report 70-271, 24 p., 4 sheets, scale 1:250,000.

Primary Reference: Crowe and others, 1991; Millrock Resources Inc., 2008 (Estelle)

Reporter(s): D.J. Grybeck (Port Ludlow, WA)

Last report date: 2008-06-05

Site name(s): Shoeshine

Site type: Prospect

ARDF no.: TY032

Latitude: 61.8278 **Quadrangle:** TY D-8

Longitude: 152.8869

Location description and accuracy:

The Shoeshine prospect is on the east-facing slopes of peak 6952, about 2.0 miles southeast of Mount Estelle. It is about 0.4 mile northwest of the center of section 15, T. 20 N., R. 20 W., of the Seward Meridian. The center of the prospect location is accurate to within 500 feet.

Commodities:

Main: Ag, Au

Other: As, Cu, Pb, Zn

Ore minerals: Arsenopyrite, chalcopyrite, pyrite, pyrrhotite

Gangue minerals: Quartz

Geologic description:

The Shoeshine prospect is in the Cretaceous (65-66 Ma) Mount Estelle pluton, which is zoned from a granite core to marginal phases of quartz monzonite, quartz monzodiorite, augite monzodiorite, diorite, and lamprophyric mafic and ultramafic rocks. The pluton intrudes Jurassic and Cretaceous sedimentary rocks that are hornfelsed adjacent to the pluton, are locally stained red, and have been altered to sericite and clay. Pyrite occurs as disseminations and along fractures (Reed and Elliott, 1970; Millholland, 1995; Crowe and others, 1991; Crowe and Millholland, 1990).

The highest grades of mineralization and the most significant alteration in the Shoeshine area occur in the leucocratic phase of the composite pluton, one of five igneous phases mapped at this prospect. Intrusion-hosted mineralization is represented by multi-episodic quartz vein arrays. In one location, a 300 meter wide sheeted vein swarm has been traced for a strike length of more than 1 kilometer and through a vertical range of up to 200 meters. Individual veins, ranging from several millimeters to 20 centimeters thick, have assayed greater than 200 grams of gold per tonne (Millrock Resources Inc., 2014).

There was considerable work in the area by government and industry as far back as the 1970's that identified mineralization, but the work was more general than prospect specific (see TY019). From 2005 to 2008, several companies (Hidefield Gold Plc. (2008), International Tower Hill Mines Ltd. (2007), and Millrock Resources Inc. (2008)) have defined several specific prospects in the area, including the Shoeshine prospect. In 2011, Millrock explored the Shoeshine prospect as part of their Estelle project, which covers a large block of claims north and south of Mount Estelle (Millrock Resources Inc., 2011).

International Tower Hill (2007) collected 3 samples of quartz-sulfide veins at the Shoeshine prospect that contained 63 to 238 parts per million (ppm) gold, 14 to 389 ppm silver, 0.3 to 1.0 ppm copper, and 0.0 to 2.0 ppm lead. The veins trend north-northwest and dip steeply to the northeast or southwest. Millrock collected numerous samples in an area about 3,500 feet by 2,500 feet in size on the east slope of peak 6952; many of the samples contained more than 2.0 grams of gold per ton. Of the 58 samples they collected, the average gold content was 5.29 grams per tonne; the minimum was 0.09 gram of gold per tonne, and the highest value was 238.0 grams of gold per tonne. The porphyry-style(?) mineralization consists mainly of quartz-arsenopyrite veins; auriferous quartz stockworks; and breccia zones cemented by quartz, oxidized sulfides, and tourmaline.

In 2011, Millrock drilled a 388.8-meter hole that went through altered, mineralized rock for most of its

length. The mineralization consists of narrow quartz veins and disseminated sulfides. Gold is associated with arsenopyrite and minor chalcopyrite. The best intercept was 241.8 meters that averaged 0.24 gram of gold per tonne; this included 8.32 meters that averaged 1.18 grams of gold per tonne and 5.82 meters that average 1.62 grams of gold per tonne (Millrock Resources Inc., 2011).

Alteration:

Plutons have hornfelsed adjacent sedimentary rocks, which may be locally stained red and altered to sericite and clay (Reed and Elliott, 1970; Millholland, 1995; Crowe and others, 1991; Crowe and Millholland, 1990). Quartz + gold in multi-episodic quartz vein arrays are present in intrusion-hosted mineralization. Extensive but otherwise undefined (Millrock Resources Inc., 2014).

Age of mineralization:

Late Cretaceous/early Tertiary?; mineralization in the area is thought to be related to the 65 to 66 Ma granodiorite of Mount Estelle (Millrock Resources Inc., 2014).

Generic deposit model:

Deposit model:

Auriferous, arsenopyrite-quartz veins and stockworks (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: None

Site Status: Active

Workings/exploration:

There was considerable work in the area by government and industry as far back as the 1970's that identified mineralization, but the work was more general than prospect specific (see TY019). From 2005 to 2008, several companies (Hidefield Gold Plc. (2008), International Tower Hill Mines Ltd. (2007), and Millrock Resources Inc. (2008)) have defined several specific prospects in the area, including the Shoeshine. Millrock explored the deposit as part of its Estelle project, which covers a large block of claims north and south of Mount Estelle. They drilled one hole in 2011; the best intercept was 241.8 meters that averaged 0.24 gram of gold per tonne; this included 8.32 meters that averaged 1.18 grams of gold per tonne and 5.82 meters that average 1.62 grams of gold per tonne (Millrock Resources Inc., 2011).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Crowe, D.E., and Millholland, M.A., 1990, High-grade gold mineralization associated with high salinity hydrothermal fluids, Mt. Estelle pluton, central Alaska Range [abs.]: Geological Society of America, Abstracts with Programs, v. 22, p. A41.

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Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

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International Tower Hill Mines Ltd., 2007, ITH further defines mineralization at South Estelle: (News release, October 18, 2007) http://www.ithmines.com/archives/past_news_releases/index.php?&content_id=165 (as of January 7, 2015).

Millholland, M.A., 1995, Geology and discovery at Mount Estelle: Newsletter of the Alaska Geological Society, v. 24, no. 8, p. 1.

Millrock Resources Inc., 2008, Estelle: http://www.millrockresources.com/index.php/projects/estelle/ (as of May 25, 2008).

Millrock Resources Inc., 2011, Millrock reports additional drill results from Estelle project, Alaska: (News release, December 8, 2011) http://www.millrockresources.com/news/millrock-reports-additional-drill-results-from-estelle-project-alaska (as of January 7, 2015).

Millrock Resources Inc., 2014, Estelle: http://www.millrockresources.com/projects/estelle/ (as of January 7, 2014).

Reed, B.L., and Elliott, R.L., 1970, Reconnaissance geologic map, analyses of bedrock and stream sediment samples, and an aeromagnetic map of parts of the southern Alaska Range: U.S. Geological Survey Open-file Report 70-271, 24 p., 4 sheets, scale 1:250,000.

Primary Reference: Millrock Resources Inc., 2014

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2015-01-07

Site name(s): Rainmaker

Site type: Prospect

ARDF no.: TY033

Latitude: 61.9557 **Quadrangle:** TY D-7

Longitude: 152.6082

Location description and accuracy:

The center of the Rainmaker prospect is about 1.6 miles southwest of the mouth of Portage Creek on the Skwentna River and about 0.3 mile northeast of the center of section 32, T. 22 N., R. 18 W., of the Seward Meridian. The location is accurate to within 500 feet.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena, gold, sphalerite

Gangue minerals: Carbonates, quartz

Geologic description:

The Rainmaker prospect is situated in a Cretaceous to Tertiary continental margin arc. It is underlain by flysch sediments of the Kahiltna assemblage and is one of several gold-copper porphyry deposits that form a belt that trends north-northwest for at least 9 miles (Wahl and others, 2008; Kiska Metals Corporation, 2010). The best known is the Whistler deposit (TY022), about 3 kilometers to the west-northwest of Rainmaker. As of early 2010, relatively little detail is available on the Rainmaker prospect; it is largely covered by surficial material, but it is probably similar to the Whistler deposit.

The Rainmaker prospect occurs in a low-lying, glacial-till covered valley floor (Morris, 2011). Rainmaker is hosted by diorite porphyry dikes cutting porphyritic andesite centers within a volcanic basin. A large, semi-circular induced polarity (IP) chargeability high anomaly at Rainmaker has been confirmed by mapping and drilling to be related to extensive phyllic alteration of quartz-sericite-pyrite indicative of porphyry potential. An intense circular aeromagnetic high also exists (Roberts, 2014).

The style of alteration, mineralization, veining and cross-cutting relationships displayed is generally typical of porphyry systems associated with relatively oxidized magma series (quartz vein stockwork, chalcopyrite-pyrite ore assemblage, presence of sulfates, and core of potassic alteration with well-developed peripheral phyllic alteration zones). Mineralization occurs at bedrock surfaces immediately below till cover (Roberts, 2014).

Alteration:

Typical of porphyry systems associated with relatively oxidized magma series (quartz vein stockwork, chalcopyrite-pyrite ore assemblage, presence of sulfates, core of potassic alteration with well-developed peripheral phyllic alteration zones) (Morris, 2011).

Age of mineralization:

Paleocene to Late Cretaceous based on age of host diorite, monzonite and granite (Roberts, 2014).

Generic deposit model:

Deposit model:

Gold-copper porphyry (Cox and Singer, 1986; model 20c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c

Production Status: None

Site Status: Active

Workings/exploration:

The prospect is at the southern end of a belt of porphyry gold-copper mineralization that has been extensively explored by several companies since the early 1980s.

Cominco Alaska began mineral exploration in the area in 1986 but they ended their work in 1989. From 2004 to 2006, Kennecott Exploration Company was active in the area and staked several large blocks of claims that included the Raintree prospect. Geoinformatics Exploration Inc. acquired the property from Kennecott (Wahl and others, 2008). In 2009, Kiska Metals Corporation, the current (2010) holder of the claims, was formed by a merger of Geoinformatics and Rimfire Minerals Corporation (Morris, 2011).

Rainmaker was discovered during the 2004 to 2006 exploration period by Kennecott Exploration Company. In that time, Kennecott conducted extensive exploration of the region, including geological, geochemical, and ground induced polarization surveys, and drilling (Roberts, 2014).

There were at least 7 holes drilled on the Raintree prospect by 2008. In 2008, Geoinformatics drilled at least one hole on Raintree. A 184-meter intercept contained 0.44 grams of gold per tonne and 0.16 percent copper (Wahl and others, 2008).

Since 2010, it was being actively explored by Kiska Metals Corporation. Kiska's work has included detailed mapping, geochemical and geophysical surveys, sampling, and at least seven drill holes between 2008 and 2011. Significant drilling intercepts include hole 05-DD-WH-REC-08, which returned 168.5 meters of 0.47 gram of gold per tonne, 2.25 grams of silver per tonne, 0.17 percent copper. As of 2014, drilling suggests that this prospect resembles approximately 100 meters diameter, steeply-dipping 'pencil'-shaped porphyries (Roberts, 2014).

Five drill holes were drilled in 2011 by Kiska. Hole WH11-049 returned 104.4 meters that averaged 0.59 gram of gold per tonne and 0.20 percent copper (1.04 grams of gold per tonne equivalent) indicating improving grades with depth. Hole WH11-047 was successful in extending the Rainmaker zone 110 meters to the southeast, returning 58 meters of 0.35 gram of gold per tonne and 0.14 percent copper (0.69 gram of gold per tonne equivalent). Three holes stepping-out 350 meters to the southeast (holes WH11-043 and WH11-045) and 150 meters to the northwest (hole WH11-051) tested geophysical anomalies and shallow grid-drilling results and intersected strongly altered volcanic rocks with anomalous gold and copper values and local high grade silver-lead-zinc values (WH11-043: 34 meters averaging 44 grams of silver per tonne, 0.35 percent zinc, 0.27 percent lead) that may indicate stronger gold-copper porphyry mineralization in the vicinity (Kiska Metals Corporation, 2011).

Production notes:

None.

Reserves:

None.

Additional comments:

The Whistler Deposit (TY022), which is within 3 kilometers of the Rainmaker prospect, has an existing 43-101 compliant resource: 2.25 million ounces of gold equivalent (Indicated category) and 3.35 million ounces of gold equivalent (Inferred category) (Morris, 2011).

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Geoinformatics Exploration Inc., 2008, Geoinformatics provides update on regional targeting at Whistler project: http://www.kiskametals.com/i/pdf/2008-02-29_NR.pdf (News release, Feb. 29, 2008).

Kiska Metals Corporation, 2010, Whistler project overview; http://www.kiskametals.com/s/Whistler.asp?ReportID=370036 (as of Feb. 26, 2010).

Kiska Metals Corporation, 2011, Kiska Releases 2011 Drilling Results from the Whistler Orbit area, Whistler Projects, Alaska: (News release, Nov. 29, 2011) http://www.kiskametals.com/s/News.asp?ReportID=493101 (as of Jan. 12, 2015).

Kiska Metals Corportation, 2014, Whistler project overview; http://www.kiskametals.com/s/Whistler.asp?ReportID=370036 (as of March 10, 2014).

Morris, R.J., 2011, Resource Estimate Update for the Whistler Gold Copper Deposit and Results of Property Wide Exploration, Yentna Mining District, Alaska: Technical Report (43-101) for Kiska Metals Corporation, 133 p. (posted on www.sedar.com, March 18, 2011) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00007774&fileName=/csfsprod/data115/filings/01703222/00000003/i%3A%5CSEDAR%5CKMTchRpAM.PDF (as of Jan. 8, 2015).

Roberts, Michael, 2014, Whistler Project Executive Summary Report, Kiska Metals Corporation: http://www.kiskametals.com/i/pdf/Kiska_Whistler_ExecutiveSummary_24Jan2014.pdf (as of March 10, 2014).

Wahl, George, Coutture, Jean-Francois, and Keller, G.D., 2008, Mineral resource estimation, Whistler copper-gold project, Alaska Range, Alaska: Technical report for Geoinformatics Exploration, Inc., 124 p. (posted on www.sedar.com, February 22, 2008) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00007774&fileName=/csfsprod/data86/filings/01219440/00000001/s%3A%5Cgxl222.pdf (as of Jan. 8, 2015).

Wilson, F.H., Hults, C.P., Schmoll, H.R., Haeussler, P.J., Schmidt, J.M., Yehle, L.A., and Labay, K.A., 2009, Preliminary geologic map of the cook Inlet region, Alaska: U.S. Geological Survey Open-File report

Primary Reference: Roberts, 2014

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2015-01-12

Site name(s): Muddy Creek West

Site type: Prospect

ARDF no.: TY034

Latitude: 61.8521 **Quadrangle:** TY D-8

Longitude: 152.8623

Location description and accuracy:

The center of the Muddy Creek West prospect is about 1.8 miles east of Mount Estelle and about 0.4 mile west of the center of section 2, T. 20 N., R. 20 W. The location is accurate.

Commodities:

Main: Ag, Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

The date of the discovery of the Muddy Creek West prospect is uncertain; it probably was sometime between 1986 to 1989 when Cominco Alaska worked in the area (Wahl and others, 2008). Kennecott Exploration Company was active from 2004 to 2006 and staked a large block of claims that covered the Muddy Creek West prospect. Geoinformatics Exploration Inc. acquired the property from Kennecott in 2007, and in 2009, Kiska Metals Corporation was formed by a merger of Geoinformatics and Rimfire Minerals Corporation. In early 2010, Kiska Metals (2010a) was actively exploring their claim block as part of their Whistler project.

The Muddy Creek West prospect covers a north-northwest trending area about 1 kilometer by 4 kilometers in size (Kiska Metals Corporation, 2010b). Numerous rock samples were collected at the prospect. A high percentage of them contained more than 1 gram of gold per tonne, 10 contained more than 5 grams of gold per tonne, and the best sample contained 56.60 grams of gold per tonne. There is little information on the prospect other than that it and the other prospects in the Muddy Creek area have 'high-grade gold-silver and base metals' and that the host rocks in the area are monzonite, monzonite porphyry, and biotite monzonite. These are probably part of the Mount Estelle pluton to the east (Wilson and others, 2009) that Reed and Lanphere (1972) dated at 65 to 66 Ma. See ARDF record TY019 for a general description of the mineralization associated with the Mount Estelle pluton.

Alteration:

Not mentioned.

Age of mineralization:

Probably coeval with or younger than the 65 to 66 Ma Mount Estelle pluton.

Generic deposit model:

Deposit model:

'... high-grade gold-silver and base metals...' mineralization.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Apparently only surface sampling.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Kiska Metals Corporation, 2010a, Whistler project overview; http://www.kiskametals.com/s/Whistler.asp?ReportID=370036 (as of February 26, 2010).

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Wilson, F.H., Hults, C.P., Schmoll, H.R., Haeussler, P.J., Schmidt, J.M., Yehle, L.A., and Labay, K.A., 2009, Preliminary geologic map of the Cook Inlet region, Alaska: U.S. Geological Survey Open-File report 209-1108, 99 p., 2 sheets, scale 1:250,000.

Primary Reference: Kiska Metals Corporation, 2010b

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Muddy Creek Central; Muddy Creek

Site type: Prospect

ARDF no.: TY035

Latitude: 61.8455 **Quadrangle:** TY D-8

Longitude: 152.8505

Location description and accuracy:

The center of the Muddy Creek Central prospect is about 2.2 miles east-southeast of Mount Estelle and about 0.4 mile southwest of elevation 4785. It is 0.5 mile south of the center of section 2, T. 20 N., R. 20 W., of the Seward Meridian. The location is accurate to within 500 feet.

Commodities:

Main: Ag, Au

Other: As, Bi

Ore minerals: Arsenopyrite, chalcopyrite, gold, pyrite, pyrrhotite

Gangue minerals: Feldspar, quartz, tourmaline

Geologic description:

The date of the original discovery of the Muddy Creek Central prospect is uncertain; it probably was discovered when Cominco Alaska worked in the area from 1986 to 1989 (Wahl and others, 2008). Kennecott Exploration Company was active in the area from 2004 to 2006 and staked a large block of claims that covered the Muddy Creek Central prospect. Geoinformatics Exploration Inc. acquired the property from Kennecott in 2007, and in 2009, Kiska Metals Corporation was formed by a merger of Geoinformatics and Rimfire Minerals Corporation. As of early 2010, Kiska Metals (2010a) was actively exploring their claim blocks, which they named the Whistler project.

The Muddy Creek Central prospect covers a north-northwest trending area about 1 kilometer by 2 kilometers in size (Kiska Metals Corporation, 2010b). Numerous rock samples were collected in the area. A high percentage of them contained more than 1 gram of gold per tonne, eight contained more than 5 grams of gold per tonne, and the two best samples contained 81.1 and 111.5 grams of gold per tonne. Muddy Creek and other nearby prospects have 'high-grade gold-silver and base metals' and the rocks in the area consist of monzonite and biotite monzonite. These are probably part of the Mount Estelle pluton to the east (Wilson and others, 2009) that Reed and Lanphere (1972) dated at 65 to 66 Ma. See ARDF record TY019 for a general description of the mineralization associated with the Mount Estelle pluton in this area.

Gold mineralization is restricted to systematic sheeted vein zones with narrow millimeter-scale veinlets and pegmatitic veinlets of quartz, feldspar, tourmaline and sulfides that include arsenopyrite, minor chalcopyrite and pyrite-pyrrhotite. Gold mineralization is largely confined to the minute veinlets whereas the intervening intrusive rocks are largely unaltered and unmineralized (Roberts, 2014).

In 2011, Kiska's exploration program at Muddy Creek that focused on drilling three diamond drill holes totaling 955 meters. The first two holes tested the southwestern edge of the Phoenix Creek anomaly. The northeast directed hole, MC11-001, returned significant gold-bearing intersections including 38.8 meters averaging 0.51 gram of gold per tonne equivalent within a broader interval of 138.8 meters averaging 0.29 gram of gold per tonne equivalent. The southwest directed hole MC11-002 also had significant intersections with 45.0 meters averaging 0.52 gram of gold per tonne equivalent and 44.2 meters average 0.51 gram of gold per tonne equivalent within a broad 338.1 meters interval averaging 0.30 gram of gold per tonne equivalent. Hole MC11-003 did not reach target depth due to difficult drilling. These are the first holes at Muddy Creek and have tested a small portion of the surface geochemical anomalies (Roberts, 2014).

Alteration:

Systematic sheeted vein zones with narrow millimeter-scale veinlets and pegmatitic veinlets of quartz, feldspar, tourmaline and sulphides that include arsenopyrite, minor chalcopyrite and pyrite-pyrrhotite (Roberts, 2014).

Age of mineralization:

Probably coeval with or younger than the 65 to 66 Ma Mount Estelle pluton (Wilson and others, 2009; Reed and Lanphere, 1972).

Generic deposit model:

Deposit model:

Intrusion related gold (intrusion related gold-arsenic-bismuth-type associated with reduced plutons).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

In 2011, Kiska's exploration program at Muddy Creek that focused on drilling three diamond drill holes totaling 955 meters. The first two holes tested the southwestern edge of the Phoenix Creek anomaly. The northeast directed hole, MC11-001, returned significant gold-bearing intersections including 38.8 meters averaging 0.51 gram of gold per tonne equivalent within a broader interval of 138.8 meters averaging 0.29 gram of gold per tonne equivalent. The southwest directed hole MC11-002 also had significant intersections with 45.0 meters averaging 0.52 gram of gold per tonne equivalent and 44.2 meters average 0.51 gram of gold per tonne equivalent within a broad 338.1 meters interval averaging 0.30 gram of gold per tonne equivalent. Hole MC11-003 did not reach target depth due to difficult drilling. These are the first holes at Muddy Creek and have tested a small portion of the surface geochemical anomalies (Roberts, 2014).

Production notes:

None.

Reserves:

None.

Additional comments:

The Whistler Deposit (TY022), which is part of the Whistler project area (as is Muddy Creek), has an existing 43-101 compliant resource: 2.25 million ounces of Au equivalent (Indicated category) and 3.35 million ounces of Au equivalent (Inferred category) (Morris, 2011). However, Muddy Creek is over 16 kilometers from the Whistler Deposit and is part of a different intrusive suite than the Whistler Deposit (Roberts, 2014).

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Kiska Metals Corporation, 2010a, Whistler project overview; http://www.kiskametals.com/s/Whistler.asp?ReportID=370036 (as of February 26, 2010).

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Roberts, Michael, 2014, Whistler Project Executive Summary Report, Kiska Metals Corporation: http://www.kiskametals.com/i/pdf/Kiska_Whistler_ExecutiveSummary_24Jan2014.pdf (as of March 10, 2014).

Wahl, George, Coutture, Jean-Francois, and Keller, G.D., 2008, Mineral resource estimation, Whistler copper-gold project, Alaska Range, Alaska: Technical report for Geoinformatics Exploration, Inc., 124 p. (posted on www.sedar.com, February 22, 2008) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00007774&fileName=/csfsprod/data86/filings/01219440/00000001/s%3A%5Cgxl222.pdf (as of January 8, 2015).

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Primary Reference: Roberts, 2014

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2015-01-09

Site name(s): Bonanza

Site type: Prospect

ARDF no.: TY036

Latitude: 61.8346 **Quadrangle:** TY D-8

Longitude: 152.83

Location description and accuracy:

The Bonanza prospect is about 3.2 miles east-southeast of Mount Estelle and about 0.5 mile southwest of the center of section 12, T. 20 N., R. 20 W. The location is accurate.

Commodities:

Main: Ag, Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

The date of the original discovery of the Bonanza prospect is uncertain; it probably was discovered when Cominco Alaska worked in the area from 1986 to 1989 (Wahl and others, 2008). Kennecott Exploration Company was active in the area from 2004 to 2006 and staked a large block of claims that covered the Bonanza prospect. Geoinformatics Exploration Inc. acquired the property from Kennecott in 2007, and in 2009, Kiska Metals Corporation was formed by a merger of Geoinformatics and Rimfire Minerals Corporation. As of early 2010, Kiska Metals (2010a) was actively exploring their claim blocks as the Whistler project.

The Bonanza prospect is along about 600 meters of the contact of diorite with hornfelsed sediments (Kiska Metals Corporation, 2010b). Twenty samples were collected. Eleven contained more than 1 gram of gold per tonne and the best contained 69.12 grams of gold per tonne. There is little more information on the prospect other than it and their other prospects in the Muddy Creek area have 'high-grade gold-silver and base metals' and the rocks in the general area consist of monzonite porphyry and hornfels. The plutonic rocks are probably part of the Mount Estelle pluton to the east (Wilson and others, 2009) that Reed and Lanphere (1972) dated at 65 to 66 Ma. See ARDF record TY019 for a general description of the mineralization associated with the Mount Estelle pluton in this area.

Alteration:

Not mentioned.

Age of mineralization:

Probably coeval with or younger than the 65 to 66 Ma Mount Estelle pluton.

Generic deposit model:

Deposit model:

'... high-grade gold-silver and base metals...' mineralization.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:
Apparently only surface sampling.

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Kiska Metals Corporation, 2010a, Whistler project overview; http://www.kiskametals.com/s/Whistler.asp?ReportID=370036 (as of February 26, 2010).

Kiska Metals Corporation, 2010b, Geoinformatics portfolio - Muddy Creek, Alaska: http://www.kiskametals.com/s/MuddyCreek.asp (as of February 27, 2010).

Reed, B.L., and Elliott, R.L., 1970, Reconnaissance geologic map, analyses of bedrock and stream sediment samples, and an aeromagnetic map of parts of the southern Alaska Range: U.S. Geological Survey Open-file Report 70-271, 24 p., 4 sheets, scale 1:250,000.

Wahl, George, Coutture, Jean-Francois, and Keller, GD., 2008, Mineral resource estimation, Whistler copper-gold project, Alaska Range, Alaska: Technical report for Geoinformatics Exploration, Inc., 124 p. (posted on www.sedar.com, February 22, 2008).

Wilson, F.H., Hults, C.P., Schmoll, H.R., Haeussler, P.J., Schmidt, J.M., Yehle, L.A., and Labay, K.A., 2009, Preliminary geologic map of the Cook Inlet region, Alaska: U.S. Geological Survey Open-File report 209-1108, 99 p., 2 sheets, scale 1:250,000.

Primary Reference: Kiska Metals Corporation, 2010b

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Stockwork

Site type: Prospect

ARDF no.: TY037

Latitude: 61.8458 **Quadrangle:** TY D-8

Longitude: 152.805

Location description and accuracy:
The Stockwork prospect is about 3.8 miles east of Mount Estelle near the southeast corner of section 1, T. 20 N., R. 20 W. The location is accurate.

Commodities:

Main: Ag, Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:
The date of the original discovery of the Stockwork prospect is uncertain; it probably was discovered when Cominco Alaska worked in the area from 1986 to 1989 (Wahl and others, 2008). Kennecott Exploration Company was active in the area from 2004 to 2006 and staked a large block of claims that covered the Stockwork prospect. Geoinformatics Exploration Inc. acquired the property from Kennecott in 2007, and in 2009, Kiska Metals Corporation was formed by a merger of Geoinformatics and Rimfire Minerals Corporation. As of early 2010, Kiska Metals (2010a) was actively exploring their claim blocks as the Whistler project.
The Stockwork prospect is a north-northeast trending area about 1,000 meters long (Kiska Metals Corporation, 2010b). Of the numerous samples that were collected, four contained 0.52 to 4.64 grams of gold per tonne. There is little more information on the prospect other than it and their other prospects in the Muddy Creek area have 'high-grade gold-silver and base metals' and the rocks in the general area consist of monzonite porphyry and hornfels. The plutonic rocks are probably part of the Mount Estelle pluton to the east (Wilson and others, 2009) that Reed and Lanphere (1972) dated at 65 to 66 Ma. See ARDF record TY019 for a general description of the mineralization associated with the Mount Estelle pluton in this area.

Alteration:

Age of mineralization:
Probably coeval with or younger than the 65 to 66 Ma Mount Estelle pluton.

Generic deposit model:

Deposit model:
'... high-grade gold-silver and base metals...' mineralization.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:
Apparently only surface sampling.

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Kiska Metals Corporation, 2010a, Whistler project overview; http://www.kiskametals.com/s/Whistler.asp?ReportID=370036 (as of February 26, 2010).

Kiska Metals Corporation, 2010b, Geoinformatics portfolio - Muddy Creek, Alaska: http://www.kiskametals.com/s/MuddyCreek.asp (as of February 27, 2010).

Reed, B.L., and Elliott, R.L., 1970, Reconnaissance geologic map, analyses of bedrock and stream sediment samples, and an aeromagnetic map of parts of the southern Alaska Range: U.S. Geological Survey Open-file Report 70-271, 24 p., 4 sheets, scale 1:250,000.

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Wilson, F.H., Hults, C.P., Schmoll, H.R., Haeussler, P.J., Schmidt, J.M., Yehle, L.A., and Labay, K.A., 2009, Preliminary geologic map of the Cook Inlet region, Alaska: U.S. Geological Survey Open-File report 209-1108, 99 p., 2 sheets, scale 1:250,000.

Primary Reference: Kiska Metals Corporation, 2010b

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Raintree (West, North, and South); Raintree

Site type: Prospects

ARDF no.: TY038

Latitude: 61.9769 **Quadrangle:** TY D-7

Longitude: 152.6072

Location description and accuracy:

The Raintree prospect is about 1.6 miles northwest of the mouth of Portage Creek on the Skwentna River and about 0.6 mile southeast of the center of section 20, T. 22 N., R. 18 W., of the Seward Meridian. The location is accurate to within 500 feet.

Commodities:

Main: Ag, Au, Cu

Other: Pb, Zn

Ore minerals: Chalcopyrite, galena, gold, magnetite, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The Raintree (West, North, and South) prospect is one of several gold-copper porphyry deposits that form a belt that trends north-northwest for at least 9 miles (Wahl and others, 2008; Kiska Metals Corporation, 2010). The best known is the Whistler deposit (TY022) about two and half miles to the west-southwest. Relatively little detail is available for the Raintree prospect. It is largely covered by surficial material but it is probably similar to the adjacent Whistler prospect (TY022). The rocks in the vicinity are mainly extrusive porphyritic andesite cut by porphyritic diorite dikes.

Cominco Alaska began mineral exploration in the area in 1986 but they ended their work in 1989. From 2004 to 2006, Kennecott Exploration Company was active in the area and staked several large blocks of claims, which included the Raintree prospect. Geoinformatics Exploration Inc. acquired the property from Kennecott, and in 2009, Kiska Metals Corporation was formed by a merger of Geoinformatics and Rimfire Minerals Corporation.

There are two significant zones of gold-copper porphyry mineralization at Raintree West, a near surface zone on the east side of the Alger Peak fault and a deeper zone on the west side of the fault. The near surface porphyry mineralization is coincident with a northwest-elongate aeromagnetic (AMAG) high anomaly that measures 250 meters long and 150 meters wide, which pinches out to the northwest and southeast. The host rock to mineralization in both zones (diorite porphyry) and the general style of gold-copper mineralization and alteration (disseminated chalcopyrite and quartz-chalcopyrite veins associated with magnetite and potassic alteration) is almost identical to the Whistler Deposit. In contrast, there is a significant component of gold-silver-lead-zinc mineralization overprinting both the gold-copper porphyry mineralization and the adjacent volcanic wall-rocks associated with quartz-carbonate veins that contain sphalerite + galena + pyrite ± chalcopyrite. These veins are interpreted as intermediate sulphidation epithermal veins that typically overlie and commonly telescope onto the core of porphyry systems. The near surface zone of porphyry mineralization has a defined strike length of 200 meters, remains open to the south, and occurs from surface down to a maximum depth of approximately 170 meters, where it is truncated by post-mineral diorite porphyry intrusions and/or faulting (Roberts, 2014).

There were several (shallow?) holes drilled at the Raintree prospect before 2008. In 2008, Geoinformatics drilled two holes, including the first at Raintree West (Kiska Metals Corporation, 2008). The area is covered by up to 5 meters of gravel and the holes were sited using proprietary targeting techniques. The first hole cut

160 meters that contained 0.59 gram of gold per tonne, 6.02 grams of silver per tonne, and 0.1 percent copper, and was entirely in porphyritic diorite. In 2009, Kiska drilled a 471.6-meter hole that cut porphyritic andesite, porphyritic diorite, and trachyandesite; it bottomed in mineralization (Kiska Metals Corporation, 2009 and 2010). The best intervals were 128.7 meters that contained 0.56 gram of gold per tonne, and 6.7 grams of silver per tonne; and 97.2 meters that contained 0.61 gram of gold per tonne, 6.94 grams of silver per tonne, 0.16 percent copper, 0.25 percent lead, and 0.59 percent zinc. The entire hole averaged 0.38 gram of gold per tonne, 4.67 grams of silver per tonne, 0.09 percent copper, 0.15 percent lead, and 0.35 percent zinc. The presence of late-stage lead- and zinc-bearing quartz-carbonate veins suggests that the drilling ended at the top of a gold-porphyry system distinct from the Whistler deposit (TY022).

Alteration:

Phyllic alteration is noted widely around the prospect at the surface. Alteration is typical of porphyry systems associated with relatively oxidized magma series (quartz vein stockwork, chalcopyrite-pyrite ore assemblage, presence of sulfates, core of potassic alteration with well-developed peripheral phyllic alteration zones) (Morris, 2011).

Age of mineralization:

Early or middle Tertiary; mineralization is interpreted to be coeval with or younger than the Tertiary volcanic, host rocks (Wahl and others, 2008).

Generic deposit model:

Deposit model:

Gold-copper porphyry (Cox and Singer, 1986; model 20c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c

Production Status: None

Site Status: Active

Workings/exploration:

The area has been explored by several companies since the early 1980s and has been one of the principal interests of Kiska Metals Corporation's Whistler project. Their work has included detailed mapping, geochemical and geophysical surveys, sampling, and at least 6 drill holes, including two in 2008 and another in 2009.

There were several (shallow?) holes drilled at the Raintree prospect before 2008. In 2008, Geoinformatics drilled two holes, including the first at Raintree West (Kiska Metals Corporation, 2008). The area is covered by up to 5 meters of gravel and the holes were sited using proprietary targeting techniques. The first hole cut 160 meters that contained 0.59 gram of gold per tonne, 6.02 grams of silver per tonne, and 0.1 percent copper, and was entirely in porphyritic diorite. In 2009, Kiska drilled a 471.6-meter hole that cut porphyritic andesite, porphyritic diorite, and trachyandesite; it bottomed in mineralization (Kiska Metals Corporation, 2009 and 2010). The best intervals were 128.7 meters that contained 0.56 gram of gold per tonne, and 6.7 grams of silver per tonne; and 97.2 meters that contained 0.61 gram of gold per tonne, 6.94 grams of silver per tonne, 0.16 percent copper, 0.25 percent lead, and 0.59 percent zinc. The entire hole averaged 0.38 gram of gold per tonne, 4.67 grams of silver per tonne, 0.09 percent copper, 0.15 percent lead, and 0.35 percent zinc. The late-stage lead- and zinc-bearing quartz-carbonate veins suggests that the drilling ended at the top of a gold-porphyry system distinct from the Whistler deposit (TY022).

Kennecott Exploration Company carried out systematic exploration of the Whistler project area between 2003 and 2006, which included reconnaissance mapping and prospecting; airborne geophysical and radiometric surveying; rock, soil and stream sediments sampling; detailed mapping over selected areas and ground induced polarization (IP) surveying (Wahl and others, 2008).

Since the first hole that discovered mineralization at the Raintree West prospect (Hole RN08-06, drilled

by Geoinformatics in 2008) there has been a total of 8,538 meters drilled (Roberts, 2014). Five holes were drilled by Kiska in 2009 and 2010 (Morris, 2011).

The near surface porphyry mineralization is coincident with a northwest-elongate aeromagnetic (AMAG) high anomaly that measures 250 meters long and 150 meters wide, which pinches out to the northwest and southeast. Drilling has intersected porphyry mineralization on two 100 meter-spaced east-west AMAG cross-sections (6,871,350 millinewtons and 6,871,450 millinewtons). Hole WH09-002 (drilled at an opposing azimuth to hole RN08-06) confirmed the near surface zone of mineralization discovered in hole RN08-06, returning 128.7 meters of 0.56 gram of gold per tonne and 0.16 percent copper from 59.0 meters downhole. In addition, this hole crossed to the west of the Algers Peak fault and intersected the deeper zone of porphyry mineralization returning 40 meters of 0.98 gram of gold per tonne and 0.21 percent copper from 429.0 meters downhole (Roberts, 2014).

The deep zone of mineralization on the west side of the fault has been drilled along a northwest-trending strike length of 325 meters and is open to the north, west and to depth. The AMAG and 3D IP data could not resolve the mineralization due to the limited depth penetration of these surveys and a masking effect caused by the presence of narrow, but strongly magnetic, dykes in the near subsurface. A cross-section of the AMAG anomaly at 6,871,650 millinewtons shows significant grades and widths of porphyry mineralization, and demonstrates that this strong system remains open to depth. Significant intercepts include 172.0 meters averaging 1.13 grams of gold per tonne and 0.18 percent copper from 619.0 meters in hole WH10-030 and 218.0 meters averaging 0.53 gram of gold per tonne and 0.11 percent copper from 480.1 meters in hole WH11-033 (Roberts, 2014).

Drilling at Raintree North and Raintree South has confirmed that porphyry stocks in these areas host gold-copper porphyry mineralization, with alteration and veining remarkably similar to that characteristic of the Whistler Deposit and Raintree West. Gold-copper mineralization in all three prospects occurs immediately below till cover at the top of bedrock. Significant drilling intercepts include: Raintree North: WH11-034 returned 77.3 meters averaging 0.58 gram of gold per tonne, 1.6 grams of silver per tonne and 0.19 percent copper (0.99 gram of gold per tonne equivalent) within a larger interval averaging 0.40 gram of gold per tonne, 1.53 grams of silver per tonne and 0.14 percent copper over 148.5 meters (Roberts, 2014).

In 2016, Brazil Resources Inc. (now Gold Mining Inc.) is evaluating prospects it acquired from Kiska Metals Corporation in 2015. Although no on-site work was performed in 2016 at the Whistler (TY022), Raintree West, and Island Mountain (TY018) porphyry copper–gold–silver prospects, in May of 2016, Brazil Resources Inc. released a new technical report (Giroux, 2016) announcing the first resource estimates for the Raintree West and Island Mountain (TY018) deposits, largely based on drilling by Kiska Metals Corporation between 2009 and 2011. Metal recoveries reported for the Whistler deposit (TY022) resource estimate, and assumed for the Raintree West deposit, include 85 percent for copper, 75 percent for gold, and 75 percent for silver (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

At a 0.6 gram of gold-equivalent per tonne cut-off grade below the 100-m elevation level, the new resource estimate for Raintree West includes an inferred resource of 51.76 million tonnes grading 0.68 gram of gold per tonne (1.13 million ounces of gold), 3.74 grams of silver per tonne (6.22 million ounces of silver), and 0.10 percent copper (114.13 million pounds of copper). At a 0.3 gram gold-equivalent per tonne cut-off above the 250-m elevation level, Raintree West also contains an inferred resource of 31.68 million tonnes grading 0.40 gram of gold per tonne (410,000 ounces of gold), 5.39 grams of silver per tonne (5.49 million ounces of silver), and 0.06 percent copper (41.91 million pounds of copper). The Raintree West resource is based on 7,078 meters of drilling in 14 holes (Giroux, 2016).

Additional comments:

The Whistler Deposit (TY022), which is within 3 kilometers of the Raintree prospect, has an existing 43-101 compliant resource: 2.25 million ounces of gold equivalent (Indicated category) and 3.35 million ounces of gold equivalent (Inferred category) (Morris, 2011). However, Raintree seems to be a different system from Whistler based on the presence of late-stage lead- and zinc-bearing quartz-carbonate veins (Kiska Metals Corporation, 2010).

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Giroux, G.H., 2016, NI 43-101 resource estimate for the Whistler project, 253 p. http://www.goldmining.com/projects/united_states/whistler/ (last accessed 8/25/2017)

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Kiska Metals Corporation, 2009, Kiska intersects 471.6 metres of 0.93 g/t gold-equivalent at Raintree target, Whistler project , Alaska: (News release, December 8, 2009) http://www.kiskametals.com/s/News.asp?ReportID=376377(as of January 9, 2015).

Kiska Metals Corporation, 2010, Whistler project overview; http://www.kiskametals.com/s/Whistler.asp?ReportID=370036 (as of February 26, 2010).

Morris, R.J., 2011, Resource Estimate Update for the Whistler Gold Copper Deposit and Results of Property Wide Exploration, Yentna Mining District, Alaska: Technical Report (43-101) for Kiska Metals Corporation, 133 p. (posted on www.sedar.com, March 18, 2011) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00007774&fileName=/csfsprod/data115/filings/01703222/00000003/i%3A%5CSEDAR%5CKMTchRpAM.PDF (as of January 8, 2015).

Roberts, Michael, 2014, Whistler Project Executive Summary Report, Kiska Metals Corporation: http://www.kiskametals.com/i/pdf/Kiska_Whistler_ExecutiveSummary_24Jan2014.pdf (as of March 10, 2014).

Wahl, George, Coutture, Jean-Francois, and Keller, G.D., 2008, Mineral resource estimation, Whistler copper-gold project, Alaska Range, Alaska: Technical report for Geoinformatics Exploration, Inc., 124 p. (posted on www.sedar.com, February 22, 2008) http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00007774&fileName=/csfsprod/data86/filings/01219440/00000001/s%3A%5Cgxl222.pdf (as of January 8, 2015).

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Primary Reference: Morris, 2011

Reporter(s): D.J. Grybeck (Contractor, U.S. Geological Survey); V.C. Zinno (Alaska Earth Sciences, Inc.); M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Monte Cristo

Site type: Prospect

ARDF no.: TY039

Latitude: 61.7649 **Quadrangle:** TY D-7

Longitude: 152.4617

Location description and accuracy:

The center of the Monte Cristo prospect is about 13 miles north of Mount Gerdine in the Tordrillo Mountains. It is about 1.5 miles north of lake 2885 on the 1:63,360-scale topographic map, near the center of section 1, T. 19 N., R. 18 W., of the Seward Meridian. This location is accurate to within 500 feet.

Commodities:

Main: Au

Other: Fe

Ore minerals: Arsenopyrite, pyrite, pyrrhotite

Gangue minerals: Quartz, sericite

Geologic description:

The Monte Cristo prospect was first identified by Millrock Resources Inc. in 2009 and was optioned to Brixton Metals Corp. in 2010 (Eden, 2010). This prospect is located in the Kahlitna Terrain. There has been little past exploration in this area due to the challenges posed by the mountainous terrain and alpine glaciers. However, the glacial retreat of recent years has improved exposure and access (Millrock Resources Inc., 2014).

The rocks in the vicinity of the Monte Cristo prospect are highly altered Jurassic and Cretaceous volcaniclastic rocks and Tertiary granitic rocks (Wilson and others, 2009). There is little iron-staining, but carbonate alteration covers an area about 3.5 by 4.5 kilometers in size. Eden (2010) suggests that the mineralization is part of a gold porphyry system.

In 2009 and 2010, Millrock did a geochemical survey over the area consisting of 213 soil samples, and collected 80 rock samples. This exploration work showed that the gold mineralization at Monte Cristo is hosted in zones of highly hydrothermally altered volcaniclastic and porphyritic intrusive rocks. Mineralized zones occur on two parallel ridge-backs separated by about 300 m of shallow glacial debris cover. Rock samples assayed up to 4.2 grams per tonne gold and soil samples (talus fines) assayed up to grams per tonne gold. Alteration is dominated by carbonate with quartz-sericite assemblages (Millrock Resources Inc., 2014).

In 2011, Brixton (2011) collected rock samples and carried out soil and stream-sediment geochemical surveys over the area. Samples they collected typically included 1-3 percent pyrite, pyrrhotite, and arsenopyrite that occurs along fractures and disseminated. Brixton terminated their agreement with Millrock in January, 2012.

Alteration:

Widespread carbonate alteration (Eden, 2010) with quartz and sericite (Millrock Resources Inc., 2014).

Age of mineralization:

May be related to a nearby Tertiary granitic intrusion (Eden, 2010).

Generic deposit model:

Deposit model:

Polymetallic vein? (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Active

Workings/exploration:

The Monte Cristo prospect was first identified by Millrock Resources Inc. in 2009 and was optioned to Brixton Metals Corp. in 2010 (Eden, 2010). In 2009 and 2010, Millrock did a geochemical survey over the area and collected numerous rock samples (Millrock Resource Inc., 2012). Brixton Metals sampled the property in 2011 and carried out soil and stream-sediment surveys (Brixton Metals, 2011).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brixton Metals, 2011, Brixton metals provides an exploration update and issues incentive stock options: http://brixtonmetals.com/brixton-metals-provides-an-exploration-update-and-issues-incentive-stock-options/ (News release, September 6, 2011).

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Eden, Karsten, 2010, Cristo property, Kahiltna region, south-central Alaska: Unpublished technical report for Brixton Metals Corporation, 217 p. (posted on www.sedar.com, Jan 11, 2011).

Millrock Resources Inc., 2010, Millrock Finalizes Exploration Agreement With Brixton Metals And Reports On Exploration Results, Cristo Property, Alaska: http://millrock.yourmanagedserver.com/news/millrock-finalizes-exploration-agreement-with-brixton-metals-and-reports-on (News Release, October 29, 2010).

Millrock Resources Inc., 2012, Millrock announces termination of option on Cristo property, Kahiltna region: http://www.millrockresources.com/news/millrock_announces_termination_of_option_on_cristo_property_kahiltna_r/ (News release, January 12, 2012).

Millrock Resource Inc., 2014, Cristo: http://www.millrockresources.com/projects/cristo (as of April 28, 2014).

Wilson, F.H., Hults, C.P., Schmoll, H.R., Haeussler, P.J., Schmidt, J.M., Yehle, L.A., and Labay, K.A., 2009 Preliminary geologic map of the Cook Inlet region, Alaska: U.S. Geological Survey Open-File report 209-1108, 99 p., 2 sheets, scale 1:250,000.

Primary Reference: Eden, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS); V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-04-28

Site name(s): El-10

Site type: Prospect

ARDF no.: TY040

Latitude: 61.541 **Quadrangle:** TY C-5

Longitude: 151.8393

Location description and accuracy:

This prospect is located about equidistant between Strandine Lake and Coal Creek; NW1/4 of section 29, T. 17 N., R. 14 W., of the Seward Meridian. The location is accurate to within 500 feet.

Commodities:

Main: Ag, Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, pyrite, sphalerite

Gangue minerals: Chlorite, quartz

Geologic description:

El-10 is a prospect in the Beluga Project area. This area has been intruded by younger 62 million year old felsic intrusive volcanic and sedimentary package with that exhibit porphyry style alteration and lead-zinc-silver mineralization. This area is thought to be part of the Jurassic Talkeetna Formation. Numerous color anomalies were noted in the lower parts of the stream valleys within the felsic package and semi-massive float boulders were also discovered (Ellis, 1994).

The showing at El-10 is characterized by chlorite-sulfide stock work, gossanous breccias, and vein breccias. Pyrite, chalcopyrite, and sphalerite are found in dark chlorite and silica. The breccias and veins crosscut rhyolite crystal tuffs in a 1-200 foot area. The style of mineralization and alteration resembles footwall stringers of a VMS-type system. The alteration type is chloritic (Ellis, 1994).

Exploration by American Copper and Nickel Company in 1994 focused on mapping, sampling and prospecting. Eight rock samples and four stream and pan samples from El-10 were collected and analyzed. Average results were 12 parts per million (ppm) silver, 0.03 percent copper,0.6 percent lead, and 3.8 percent with a high of 10.0 percent zinc (Ellis, 1994).

Analysis from a fine-grained porphyry returned an age of 62 million years using argon-argon dating analyzed by the University of British Columbia petrology lab (Ellis, 1994).

Alteration:

Chloritic (Ellis, 1994).

Age of mineralization:

Analysis from a fine-grained porphyry returned an age of 62 million years using argon-argon dating analyzed by the University of British Columbia petrology lab (Ellis, 1994).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
28a

Production Status: None

Site Status: Inactive

Workings/exploration:
In 1993, a reconnaissance effort was carried out by American Copper and Nickel Company's 'Alaska Task Force' to identify targets for future work (Ellis, 1994).
Exploration by American Copper and Nickel Company in 1994 focused on mapping, sampling and prospecting. Eight rock samples and four stream and pan samples from El-10 were collected and analyzed. Average results were 12 parts per million (ppm) silver, 0.03 percent copper, 0.6 percent lead, and 3.8 percent with a high of 10.0 percent zinc (Ellis, 1994).

Production notes:
None.

Reserves:
None.

Additional comments:

References:
Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Ellis, W.T., 1994, Reconnaissance Geologic Map of the Beluga Project: American Copper and Nickel, 10 p., scale 1:63,360 (Report held at Alaska Earth Sciences, Inc., Anchorage, AK).

Wilson, F.H., Hults, C.P., Schmoll, H.R., Haeussler, P.J., Schmidt, J.M., Yehle, L.A., and Labay, K.A., 2009 Preliminary geologic map of the Cook Inlet region, Alaska: U.S. Geological Survey Open-File report 209-1108, 99 p., 2 sheets, scale 1:250,000.

Primary Reference: Ellis, 1994

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-04-08

Site name(s): Squirrel Head; Squirrel Head East

Site type: Prospect

ARDF no.: TY041

Latitude: 61.5308 **Quadrangle:** TY C-5

Longitude: 151.8643

Location description and accuracy:

This prospect is located about 1.8 miles east of Strandine Lake; about 0.27 miles north-northeast from the southwest corner of section 29, T. 17 N., R. 14 W., of the Seward Meridian. The location is accurate to within 500 feet.

Commodities:

Main: Ag, Cu, Pb, Zn

Other: Ba

Ore minerals: Barite, galena, pyrite, pyrrhotite, sphalerite

Gangue minerals: Chlorite, fluorite, quartz

Geologic description:

Squirrel Head is a prospect in the Beluga Project area. This area has been intruded by younger 62 million year old felsic intrusive volcanic and sedimentary package with that exhibit porphyry style alteration and lead-zinc-silver mineralization. This area is thought to be part of the Jurassic Talkeetna Formation. Numerous color anomalies were noted in the lower parts of the stream valleys within the felsic package and semi-massive float boulders were also discovered (Ellis, 1994).

The showings at Squirrel Head and Squirrel Head East are characterized by mineralized silica-sulfide breccias. Variable amounts of pyrite-pyrrhotite + galena and sphalerite plus trace chalcopyrite mineralization within intensely silicified and banded to stockworked occur in zones up to 50 feet by 300 feet. Gangue minerals are barite, quartz, chlorite, and rare fluorite. This area exhibits footwall stockwork VMS feeder zones. The alteration is baritic, silicification, and sericitization barite, quartz, and sericite (Ellis, 1994).

Analysis from a fine-grained porphyry returned an age of 62 million years using argon-argon dating analyzed by the University of British Columbia petrology lab (Ellis, 1994).

Alteration:

Barite, sericite, and quartz alteration (Ellis, 1994).

Age of mineralization:

Analysis from a fine-grained porphyry returned an age of 62 million years using argon-argon dating analyzed by the University of British Columbia petrology lab (Ellis, 1994).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Inactive

Workings/exploration:

In 1993, a reconnaissance effort was carried out by American Copper and Nickel Company's 'Alaska Task Force' to identify targets for future work (Ellis, 1994).

Exploration by American Copper and Nickel Company in 1994 focused on mapping, sampling and prospecting. 30 rock samples and five stream samples from Squirrel Head and Squirrel head East were collected and analyzed. Average results were 50 parts per billion (ppb) Au with a high of 430 ppb gold, 47 parts per million (ppm) silver, 0.2 percent copper, 4.4 percent lead, 8.9 percent zinc (Ellis, 1994).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Ellis, W.T., 1994, Reconnaissance Geologic Map of the Beluga Project: American Copper and Nickel, 10 p., scale 1:63,360 (Report held at Alaska Earth Sciences, Inc., Anchorage, AK).

Wilson, F.H., Hults, C.P., Schmoll, H.R., Haeussler, P.J., Schmidt, J.M., Yehle, L.A., and Labay, K.A., 2009 Preliminary geologic map of the Cook Inlet region, Alaska: U.S. Geological Survey Open-File report 209-1108, 99 p., 2 sheets, scale 1:250,000.

Primary Reference: Ellis, 1994

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2014-04-08

Site name(s): West Wing

Site type: Prospect

ARDF no.: TY042

Latitude: 61.9151 **Quadrangle:** TY D-8

Longitude: 152.9557

Location description and accuracy:

West Wing is located about 2.7 miles south of Cathedral Mountain; about 0.3 mile north-northeast of the center of section 16, T. 21 N., R. 20 W., of the Seward Meridian. This location is accurate to within 500 feet from the center of the prospect.

Commodities:

Main: Au, Cu

Other: As, Bi, Fe, Te

Ore minerals: Arsenopyrite, chalcopyrite, gold, pyrite, pyrrhotite

Gangue minerals: Quartz

Geologic description:

West Wing is a mineralized prospect that is part of the Estelle gold property (TY019). West Wing lies within a plutonic complex intruding a Jurassic to Early Cretaceous flysch sequence (Reed and Nelson, 1980). The intrusive complex consists of ultramafic to felsic plutons of Late Cretaceous/Early Tertiary age (69.7 Ma) and are centrally located in a region of arc-magmatic related gold deposits (Millrock Resources Inc., 2014).

West Wing is characterized by roof pendants of hornfels that are cut by biotite-rich diorite. Hydrothermal breccia, quartz sulfide veins and carbonate veins cut all lithologies. Mineralization occurs as disseminated sulfides and as sulfides associated with veins. The highest sulfide content is associated with a diorite sill containing 1 to 3 percent disseminated arsenopyrite ± pyrite ± chalcopyrite ± pyrrhotite. This unit and the hornfels unit are cut by high density quartz ± pyrite ± chalcopyrite ± arsenopyrite ± pyrrhotite veinlets also containing 1 to 3 percent sulfide, and appears to increase in intensity toward the lower contact of the sill (Millrock Resources Inc., 2014).

Alteration:

Hornfelsed sedimentary rocks cut by biotite-rich diorite are cross-cut by hydrothermal breccia, quartz-sulfide veins and carbonate veins (Millrock Resources Inc., 2014).

Age of mineralization:

Late Cretaceous/early Tertiary?; mineralization in the area is thought to be related to the 65 to 66 Ma granodiorite of Mount Estelle (Reed and Lanphere,1972).

Generic deposit model:

Deposit model:

Porphyry Cu-Au or intrusion-related gold? (Cox and Singer, 1986; model 20c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c?

Production Status: None

Site Status: Active

Workings/exploration:

Geologic mapping in 2012 defined a zone of strong hydrothermal alteration surrounding a diorite sill. At surface, copper, iron and arsenic sulfide mineralization with gold in quartz veins and veinlets appears to increase in intensity toward the lower contact of the sill (Millrock Resources Inc., 2012).

In 2012, soil and rock sampling at West Wing defined multiple surface gold and copper anomalies with individual sample results as high as 18 parts per million (ppm) gold in soil and 108 ppm gold in rock. Composited chip sample results, collected near the site of the 2012 drilling, included 20 meters (66 feet) averaging 0.94 ppm gold and 4050 ppm copper (Millrock Resources Inc., 2014).

Drill results from hole SE12-007 are 0.68 gram of gold per tonne from 50.29 to 61.87 meters, including 1.01 grams of gold per tonne from 50.29 to 57.30 meters. Results from hole SE12-007 are 1.20 grams of gold per tonne from 75.29 to 76.51 meters. Results from SE12-009 are 0.52 gram of gold per tonne from 48.77 to 52.43 meters. Note: Listed composites are those averaging greater than 0.50 gram of gold per tonne calculated using a 0.20 gram of gold per tonne cutoff with a maximum 3 meters internal dilution. Elevated copper values are also present in core from this prospect and range between 1000 and 4580 ppm copper. This newly discovered mineralization appears to be hosted by a shallow dipping diorite dike or sill (Millrock Resources Inc., 2012).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Millrock Resource, Inc., 2014, Estelle: http://www.millrockresources.com/projects/estelle/ (as of April 7, 2014).

Millrock Resource, Inc., 2012, Millrock Discovers New Gold Zone at Estelle Project, Alaska: (News release, September 10, 2012) http://www.millrockresources.com/news/millrock-discovers-new-gold-zone-at-estelle-project-alaska (as of December 9, 2014).

Reed, B.L., and Lanphere, M.A., 1972, Generalized geologic map of the Alaska-Aleutian range batholith showing potassium-argon ages of the plutonic rocks: U.S. Geological Survey Miscellaneous Field Studies Map MF-372, 2 sheets, scale 1:1,000,000.

Reed, B.L., and Nelson, S.W., 1980, Geologic map of the Talkeetna quadrangle: U.S. Geological Survey Miscellaneous Investigations Map I-1174, 1 sheet, scale 1:250,000.

Primary Reference: Millrock Resources Inc., 2014

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2015-01-07

Site name(s): RPM

Site type: Prospect

ARDF no.: TY043

Latitude: 61.7759

Quadrangle: TY D-8

Longitude: 152.9555

Location description and accuracy:

The RPM prospect is located about 2.0 miles northwest of Emerald Creek; about 0.2 mile from the southwest corner of section 32, T. 29 N., R. 20 W., of the Seward Meridian. This location is accurate to within 500 feet from the center of the prospect.

Commodities:

Main: Au, Cu

Other: As, Bi, Te

Ore minerals: Arsenopyrite, chalcopyrite, gold, pyrite

Gangue minerals: Quartz, tourmaline

Geologic description:

RPM is a mineralized prospect that is part of the Estelle gold property. RPM lies within a plutonic complex intruding a Jurassic to Early Cretaceous flysch sequence (Reed and Nelson, 1980). The intrusive complex consist of ultramafic to felsic plutons of Late Cretaceous/Early Tertiary age (69.7 Ma) and are centrally located in a region of arc-magmatic related gold deposits. Though mineralization at Estelle is generally restricted to the intrusive rocks, mineralization at RPM occurs in both intrusive and hornfels (Millrock Resources Inc., 2014).

At RPM roof pendants of hornfels occur overlying multiple intrusive units. Fingers of fine grained aplite, monzonite and biotite-rich diorite cut the hornfels. All of the lithologic units are in turn cut by stockwork and/or sheeted veins. Veins range in size and character from meter wide quartz ± sulfide to millimeter scale quartz-arsenopyrite veins and centimeter scale quartz-tourmaline-sulfide veins. A granitic intrusive body, which underlies the hornfels and crops out in the southern part of the prospect area appears to be potentially related to mineralization (Millrock Resources Inc., 2014).

The RPM prospect is contained in a 3,500 meter long, northwest trending gold anomaly defined by soils assaying over 0.010 part per million (ppm) gold including individual samples containing up to 13.25 ppm gold. Copper values are also elevated with the majority of samples returning assays over 200 ppm copper. The copper values outline a broader, more dispersed anomaly. In addition to soil sampling, extensive rock chip sampling has been done returning composited sample results up to 90 meters (295 feet) averaging 0.54 gram of gold per tonne (Millrock Resources Inc., 2014).

Alteration:

Hornfelsed sedimentary rock roof pendants overlying multiplie intrusive units are cut by aplite, monzonite, and biotite-rich diorite dikes. All of these units are cut by stockwork and/or sheeted quartz +/- sulfide veins (Millrock Resources Inc., 2014).

Age of mineralization:

Late Cretaceous/early Tertiary?; mineralization in the area is thought to be related to the 66 to 67 Ma granodiorite of Mount Estelle (Reed and Lanphere,1972).

Generic deposit model:

Deposit model:

Porphyry Cu-Au or intrusion-related gold? (Cox and Singer, 1986; model 20c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

20c?

Production Status: None

Site Status: Active

Workings/exploration:

Millrock Resources Inc. conducted a 2012 exploration program consisting of prospecting, soil sampling, rock sampling, and drilling at RPM prospect. RPM is contained in a 3,500 meter long, northwest trending gold anomaly defined by soils assaying greater than 0.010 part per million (ppm) gold including individual samples containing up to 13.25 ppm copper. Copper values are also elevated with the majority of samples returning assays greater than 200 ppm copper. The copper values outline a broader, more dispersed anomaly. In addition to soil sampling, extensive rock chip sampling has been done returning composited sample results up to 90 meters (295 feet) averaging 0.54 gram of gold per tonne (Millrock Resources Inc., 2014).

One drillhole completed in 2012 targeted a mineralized monzonite plug cut by sheeted and stockwork quartz veins. The hole encountered significant gold mineralization returning an intercept of 2.07 grams of gold per tonne over 21.94 meters (72 feet) within a 102.11 meters (335 feet) interval averaging 1.04 grams of gold per tonne with mineralization open in all directions (Millrock Resources Inc., 2012).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Millrock Resources Inc., 2012, Millrock Discovers New Gold Zone at Estelle Project, Alaska: (News release, September 10, 2012) http://www.millrockresources.com/news/millrock-discovers-new-gold-zone-at-estelle-project-alaska (as of January 7, 2015).

Millrock Resources Inc., 2014, Estelle: http://www.millrockresources.com/projects/estelle/ (as of April 9, 2014).

Reed, B.L., and Lanphere, M.A., 1972, Generalized geologic map of the Alaska-Aleutian range batholith showing potassium-argon ages of the plutonic rocks: U.S. Geological Survey Miscellaneous Field Studies Map MF-372, 2 sheets, scale 1:1,000,000.

Reed, B.L., and Nelson, S.W., 1980, Geologic map of the Talkeetna quadrangle: U.S. Geological Survey Miscellaneous Investigations Map I-1174, 1 sheet, scale 1:250,000.

Primary Reference: Millrock Resources Inc., 2014

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2015-01-07

Site name(s): T-bird

Site type: Occurrence

ARDF no.: TY044

Latitude: 61.7083 **Quadrangle:** TY C-5

Longitude: 151.7876

Location description and accuracy:

T-Bird is located about 3.5 miles southeast of Hayes River Pass; about 0.2 mile east of the center of section 27, T. 19 N., R. 14 W., of the Seward Meridian. The location is accurate to within 100 feet of the center of the occurrence (Ellis, 1994).

Commodities:

Main: Ag, Au, Cu, Mo, Pb, Zn

Other: Ba

Ore minerals: Barite, chalcopyrite, galena, pyrite, pyrrhotite, sphalerite

Gangue minerals:

Geologic description:

T-bird is an occurrence in the Beluga Project Area. This area is made of Cretaceous sedimentary units that have been intruded by 62 Ma felsic hypabyssal rocks and exhibits porphyry style alteration and lead-zinc-silver mineralization. Numerous color anomalies were noted in the lower parts of the stream valleys within the felsic package and massive sulfide float boulders were also discovered (Ellis, 1994). The Cook Inlet region geologic map (Wilson and others, 2012) shows that this occurrence occurs in an area of intermediate composition Cretaceous volcanic and sedimentary rocks overlain by Tertiary or Cretaceous age felsic tuff.

The T-bird occurrence is characterized by a fault-controlled massive sulfide vein consisting of massive pyrite-pyrrhotite + chalcopyrite, galena and sphalerite in a silica-rich matrix. This vein is 1-2 feet thick and can be traced about 50 feet. It trends north, is near vertical and is hosted by rhyolite. High-grade base metal samples carried up to 4 ounces of silver per ton and up to 0.68 percent molybdenum. Drainages below and to the north of T-bird contained from 20 to 73 parts per million (ppm) molybdenum and 50 to 356 ppm copper. Copper and molybdenum anomalies have been identified in stream sediment samples (Ellis, 1994).

Alteration:

Silicification (Ellis, 1994).

Age of mineralization:

Analysis from a fine-grained porphyry returned an age of 62 million years using argon-argon dating analyzed by the University of British Columbia petrology lab (Ellis, 1994).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Inactive

Workings/exploration:

In 1993, a reconnaissance effort was carried out by American Copper and Nickel Company's 'Alaska Task Force' to identify targets for future work (Ellis, 1994).

Exploration by American Copper and Nickel Company in 1994 focused on mapping, sampling and prospecting. Seven rock samples and five stream samples from T-bird were collected and analyzed. Average results were 25 parts per billion (ppb) gold, 134 parts per million (ppm) silver, 1.6 percent copper, 10.3 percent lead, and 0.7 percent molybdenum (Ellis, 1994).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Ellis, W.T., 1994, Reconnaissance geologic map of the Beluga Project: American Copper and Nickel unpublished report. 10 p., scale 1:63,360 (Report held by Alaska Earth Sciences, Anchorage, Alaska).

Wilson, F.H., Hults, C.P., Schmoll, H.R., Haeussler, P.J., Schmidt, J.M., Yehle, L.A., and Labay, K.A., 2012, Geology of the Cook Inlet region, Alaska, including parts of the Talkeetna, Talkeetna Mountains, Tyonek, Anchorage, Lake Clark, Kenai, Seward, Iliamna, Seldovia, Mount Katmai, and Afognak 1:250,000-scale quadrangles: U.S. Geological Survey Scientific Investigations Map SIM-3153, pamphlet 71 p., 2 sheets, scale 1:250,000.

Primary Reference: Ellis, 1994

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Lucky Bear

Site type: Occurrence

ARDF no.: TY045

Latitude: 61.6812

Quadrangle: TY C-5

Longitude: 151.7752

Location description and accuracy:

Lucky Bear is located about 4.2 miles southeast of Hayes River Pass; about 0.5 mile west-northwest of the center of section 2, T. 18 N., R. 14 W., of the Seward Meridian. The location is accurate to within about 500 feet from the center of the occurrence (Ellis, 1994).

Commodities:

Main: Ag, Au, Cu, Mo, Pb, Zn

Other: Ba

Ore minerals: Galena, molybdenite, pyrite, pyrrhotite, sphalerite

Gangue minerals:

Geologic description:

Lucky Bear is an occurrence in the Beluga Project Area. This area is made of Cretaceous sedimentary units that have been intruded by 62 Ma felsic hypabyssal rocks and exhibits porphyry style alteration and lead-zinc-silver mineralization. Numerous color anomalies were noted in the lower parts of the stream valleys within the felsic package and massive sulfide float boulders were also discovered (Ellis, 1994). The Cook Inlet region geologic map (Wilson and others, 2012) shows that this occurrence occurs in an area of intermediate composition Cretacous volcanic and sedimentary rocks.

This area has been intruded by younger 62 million year old felsic intrusive volcanic and sedimentary packages that exhibit porphyry style alteration and lead-zinc-silver mineralization. Lucky Bear is characterized by veins and breccias with sphalerite and galena and stratiform massive sulfide pods and lenses of pyrrhotite and sphalerite up to 2 feet thick and 20 feet long. They are intermittently exposed within a 1 to 200 foot thick interval of thin-bedded siltstone, fine-grained tuff and chert. Mineralization can be traced a few thousand feet along strike. Quartz-calcite gangue is locally recrystallized and epidote-altered. Mineralization is either exhalative volcanic massive sulfides (VMS) or replacement (Ellis, 1994).

Alteration:

Quartz-calcite gangue is locally recrystallized and epidote-altered (Ellis, 1994).

Age of mineralization:

A fine-grained porphyry returned an age of 62 million years using argon-argon dating analyzed by the University of British Columbia petrology lab (Ellis, 1994).

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Inactive

Workings/exploration:

In 1993, a reconnaissance effort was carried out by American Copper and Nickel Company's 'Alaska Task Force' to identify targets for future work (Ellis, 1994).

Exploration by American Copper and Nickel Company in 1994 focused on mapping, sampling and prospecting. Twenty rock samples and five stream and pan samples from Lucky Bear were collected and analyzed. Average results were 470 parts per billion (ppb) gold, 3 parts per million (ppm) silver, 0.2 percent copper, 8.6 percent zinc (Ellis, 1994).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Ellis, W.T., 1994, Reconnaissance geologic map of the Beluga Project: American Copper and Nickel unpublished report. 10 p., scale 1:63,360 (Report held by Alaska Earth Sciences, Anchorage, Alaska).

Wilson, F.H., Hults, C.P., Schmoll, H.R., Haeussler, P.J., Schmidt, J.M., Yehle, L.A., and Labay, K.A., 2012, Geology of the Cook Inlet region, Alaska, including parts of the Talkeetna, Talkeetna Mountains, Tyonek, Anchorage, Lake Clark, Kenai, Seward, Iliamna, Seldovia, Mount Katmai, and Afognak 1:250,000-scale quadrangles: U.S. Geological Survey Scientific Investigations Map SIM-3153, pamphlet 71 p., 2 sheets, scale 1:250,000.

Primary Reference: Ellis, 1994

Reporter(s): V.C. Zinno (Alaska Earth Sciences, Inc.)

Last report date: 2016-03-15

Site name(s): Opal; Tiger Mining Co.

Site type: Mine

ARDF no.: VA021

Latitude: 61.5371 **Quadrangle:** VA C-2

Longitude: 144.6462

Location description and accuracy:

This prospect is located in the cirque at the southwest head of Liberty Creek. It is in the southeast headwall of this cirque, about nine-tenths of a mile north of elevation 5,285. It is at an elevation of 4,400 feet in the NW1/4 section 11, T. 4 S, R. 4 E., of the Copper River Meridian. This prospect is approximately located, perhaps to within one-half mile. It is locality 54 of of Cobb and Matson (1972) and locality 45 of Winkler and others (1981 [OFR 80-892-B]). The location used in this report is that shown by Winkler and others (1981 [OFR 80-892-B]); it is nine-tenths of a mile north of the location shown by Cobb and Matson (1972).

Commodities:

Main: Au

Other: Ag, Pb, Zn

Ore minerals: Arsenopyrite, galena, gold, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

Widely spaced quartz veins as much as 1 meter wide cut the schist of both the Liberty Creek terrane and Eocene tonalite (Winkler and others, 1981 [OFR 80-892-B]; Winkler and others, 1981 [OFR 80-892-A]). The veins contain arsenopyrite, pyrite, galena, and sphalerite.

The Opal prospect, being evaluated by Ben Porterfield, contains gold-bearing, polymetallic quartz veins hosted in a white mica-altered, 52 million-year-old tonalite sill. In 2016, exploration was conducted on high-angle shear zones cutting the sill and on pods at the wall-rock contact at the top of the sill (Athey and Werdon, 2017).

Alteration:

Age of mineralization:

Tertiary; the quartz veins cut tonalite with a K/Ar age of 52.4 +/- 2.6 m.y. (Winkler and others, 1981 [OFR 80-892-A]).

Generic deposit model:

Deposit model:

Polymetallic veins (Cox and Singer, 1986; model 22c)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c

Production Status: Yes; small

Site Status: Active?

Workings/exploration:

The Opal prospect, being evaluated by Ben Porterfield, contains gold-bearing, polymetallic quartz veins hosted in a white mica-altered, 52 million-year-old tonalite sill. High gold grades, up to 4 ounces of gold per ton, are present, visible gold is common, and it is associated with galena, sphalerite, pyrite, and arsenopyrite. In 2016, exploration was conducted on high-angle shear zones cutting the sill and on pods at the wall-rock contact at the top of the sill (Athey and Werdon, 2017).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Athey, J.E. and Werdon, M.B., 2017, Alaska's mineral industry 2016: Alaska Division of Geological & Geophysical Surveys Special Report 72. http://doi.org/10.14509/29748

Cobb, E.H., and Matson, N.A., Jr., 1972, Metallic mineral resources map of the Valdez quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-438, 1 sheet, scale 1:250,000.

Winkler, G.R., Miller, R.J., MacKevett, E.M., Jr., and Holloway, C.D., 1981, Map and summary table describing mineral deposits in the Valdez quadrangle, southern Alaska: U.S. Geological Survey Open-File Report 80-892-B, 2 sheets, scale l:250,000.

Winkler, G.R., Silberman, M.L., Grantz, Arthur, Miller, R.J., and MacKevett, E.M., Jr., 1981, Geologic map and summary geochronology of the Valdez quadrangle, southern Alaska: U.S. Geological Survey Open-File Report 80-892-A, 2 sheets, scale 1:250,000.

Primary Reference: Winkler and others, 1981 (OFR 80-892-B)

Reporter(s): Travis L. Hudson; M.B. Werdon (DGGS)

Last report date: 2017-08-26

Site name(s): Unnamed (on lower Walkaround Creek)

Site type: Occurrence

ARDF no.: WI002

Latitude: 67.858 **Quadrangle:** WI D-6

Longitude: 152.5947

Location description and accuracy:

Following Brosge and Reiser (1960), this occurrence is on Walkaround Creek at an elevation of about 430 meters; it is about 0.3 mile west of the center of section 17, T. 35 N., R. 22 W. The location is accurate within 1 mile. Early reports by Berg and Cobb (1967), Cobb (1972), and Grybeck (1977) commonly refer to both this site and WI001 as 'Hunt Fork'.

Commodities:

Main: Cu, Pb

Other:

Ore minerals: Chalcopyrite, galena

Gangue minerals: Quartz

Geologic description:

This occurrence is a galena-bearing quartz vein (Brosge and Reiser, 1960). The country rocks are black slate and phyllite of the Upper Devonian Hunt Fork Shale. The area was re-examined by Kurtak and others (2002) who found no more than phyllite with quartz lenses parallel to the foliation. The quartz contained only trace amounts of galena and chalcopyrite; on analysis, a sample did not contain anomalous lead or copper. (The Kurtak and others (2002) work also probably included an examination of a nearby site with similar mineralization (WI001).

Alteration:

None noted.

Age of mineralization:

Upper Devonian or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Quartz veins.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Examined by several parties of government geologists.

Production notes:

None.

Reserves:

None.

Additional comments:

The site is in Gates of the Arctic National Park.

References:

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T., Jr., 1988, Maps and descriptions of lode and placer deposits, prospects, and occurrences in the Wiseman 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p., 2 plates, scale 1:250,000.

Brosgé, W.P., and Reiser, H.N., 1960, Progress map of the geology of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 60-19, 2 sheets, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Grybeck, Donald, 1977, Map showing known mineral deposits of the Brooks Range, Alaska: U.S. Geological Survey Open-File Report 77-166-C, 45 p., 1 sheet, scale 1:1,000,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Primary Reference: Brosge and Reiser, 1960

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): John River

Site type: Occurrence

ARDF no.: WI003

Latitude: 67.7596 **Quadrangle:** WI D-5

Longitude: 152.3832

Location description and accuracy:

The original reference for this occurrence only describes its location as being on the John River below the mouth of the Hunt Fork (Joesting, 1942). Based on subsequent descriptions (Berg and Cobb, 1967; Cobb, 1972; Maas, 1987), it may be at an elevation of about 1,500 feet on the east side of John River, about 1.5 miles downstream from the mouth of Hunt Fork. y Kurtak and others (2002) searched he area but they found no sign of this occurrence and there is no other evidence of its location other than the brief Joesting reference. The location of this occurrence is suspect.

Commodities:

Main: Sb

Other:

Ore minerals: Stibnite

Gangue minerals:

Geologic description:

Joesting (1942) listed a stibnite lode, a sample of which assayed 42 percent antimony, on an unnamed tributary to the John River about a mile downstream from the mouth of the Hunt Ford. The rocks in the area consists of Upper Devonian, Hunt Fork Shale in fault contact with Middle or Upper Devonian(?) or older(?), black slate, phyllite. and limestone (Dillon and others, 1986). Kurtak and others (2002) searched the area for this occurrence but found no sign of it. The location of this occurrence is suspect.

Alteration:

Not noted.

Age of mineralization:

Devonian or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Simple Sb deposit? (Cox and Singer, 1986; model 27d?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

27d?

Production Status: None

Site Status: Inactive

Workings/exploration:

The only evidence of this occurrence is that it is reported by Joesting (1942).

Production notes:

None.

Reserves:

None.

Additional comments:

As best that it can be located, this occurrences is in Gates of the Arctic National Park.

References:

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in the Wiseman quadrangle, Alaska; Supplement to Open-File Report 76-340; Part B, Lists of references to January 1, 1981: U.S. Geological Survey Open-File Report 81-732-B, 22 p.

Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

Joesting, H.R., 1942, Strategic mineral occurrences in interior Alaska: Alaska Territorial Department of Mines Pamphlet 1, 46 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Maas, K.M., 1987, Maps summarizing land availability for mineral exploration and development in northern Alaska, 1986: U.S. Bureau of Mines Open-File Report 10-87, 33 quadrangle overlays.

Primary Reference: Joesting, 1942

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (east of VABM Allen)

Site type: Prospect

ARDF no.: WI005

Latitude: 67.5469 **Quadrangle:** WI C-5

Longitude: 152.0431

Location description and accuracy:

This prospect is in a high saddle about 0.8 mile east-northeast of VABM Allen and about 4 miles northeast of the junction of Sheep Creek and John River. The prospect is at an elevation of about 4,000 feet near the southeast corner of section 32, T. 32 N., R. 20 W.. The location is accurate.

Commodities:

Main: Cu

Other: Mo

Ore minerals: Azurite, bornite, chalcocite, chalcopyrite, covellite, malachite

Gangue minerals: Quartz

Geologic description:

Brosge and Reiser (1960) described copper sulfides and malachite at this prospect in fault contact between Devonian Skajit Limestone and a Devonian phyllite and siltstone unit. Dillon and others (1981, sample 284) described disseminated covellite and bornite and malachite stain in pale-green calc-schist and quartz veins. A sample contained up to 5,000 parts per million (ppm) copper and 10 ppm molybdenum. Kurtak and others (2002) analyzed one rock sample of chlorite-quartz schist that contained chalcocite, malachite and azurite. It contained 1,664 ppm copper, 4.8 ppm silver, and 23 parts per billion (ppb) gold. Degenhart and others (1978) reported minor amounts of chalcopyrite, bornite and malachite in metamorphosed, reef limestone near VABM Allen, only a short distance west of this location. Prior to the mid-1970s, at least five companies including Bear Creek Mining Company, General Crude Oil Company, New Jersey Zinc Company, Alvenco Inc., and BP Alaska prospected and sampled in the area as part of their work in a 5-mile-long, northeast-trending belt of mineral occurrences along a thrust fault (Degenhart, and others, 1978).

Alteration:

Local oxidation of copper minerals.

Age of mineralization:

Devonian or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Unclear from the limited information.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Prior to the mid-1970s, at least five companies including Bear Creek Mining Company, General Crude Oil Company, New Jersey Zinc Company, Alvenco Inc., and BP Alaska prospected and sampled in the area as part of their work in a 5-mile-long, northeast-trending belt of mineral occurrences along a thrust fault (Degenhart and others, 1978). Examined and sampled by the U.S. Geological Survey (Brosge and Reiser, 1960), the Alaska Division of Geological and Geophysical Survey (Dillon and others, 1981), and the Bureau of Land Management (Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

See also WI016 and WI006.

References:

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T., Jr., 1988, Maps and descriptions of lode and placer deposits, prospects, and occurrences in the Wiseman 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p., 2 plates, scale 1:250,000.

Brosgé, W.P., and Reiser, H.N., 1960, Progress map of the geology of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 60-19, 2 sheets, scale 1:250,000.

Cobb, E.H., 1972, Metallic mineral resources map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-469, 1 sheet, scale 1:250,000

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in the Wiseman quadrangle, Alaska; Supplement to Open-File Report 76-340; Part B, Lists of references to January 1, 1981: U.S. Geological Survey Open-File Report 81-732-B, 22 p.

Degenhart, C.E., Griffis, R.J., McQuat, J.F., and Bigelow, C.G., 1978, Mineral studies of the western Brooks Range performed under contract to the U.S. Bureau of Mines, Contract #JO155089: U.S. Bureau of Mines Open-File Report 103-78, 529 p., 11 sheets.

Dillon, J.T., Cathrall, J.B., and Moorman, M.A., 1981, Geochemical reconnaissance of the southwest Wiseman quadrangle-summary of data on rock samples: Alaska Division of Geological and Geophysical Surveys Open-File Report 133B, 164 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, 2 vols., 845 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (near VABM Pink)

Site type: Prospect

ARDF no.: WI007

Latitude: 67.5142 **Quadrangle:** WI C-5

Longitude: 152.3057

Location description and accuracy:

This prospect is at an elevation of about 3,700 feet , about 0.5 mile northwest of VABM Pink, in the NE1/4 section 18, T. 31 N., R. 21 W. The prospect is the location of sample 518 in Dillon and others (1981). The location is accurate.

Commodities:

Main: Ag, Cu, Pb, Sb

Other:

Ore minerals: Azurite, chalcocite, galena, malachite, tetrahedrite?

Gangue minerals: Quartz

Geologic description:

This rocks in the vicinity of this prospect are marble of the Middle Devonian Skajit Limestone in fault contact with calcareous schist and mudstone of the Upper Devonian Hunt Fork Shale (Dillon and others, 1986). Dillon and others (1981) identified a vein, more than 2 centimeters thick, of azurite, malachite, and chalcocite, in a unit of metamorphosed conglomerate, sandstone and shale, below marble. A sample of the vein contained 66.4 percent copper and 21.7 parts per million (ppm) silver.

Kurtak and others (2002) examined the site as part of a regional mineral resource assessment and collected several samples. Several pieces of quartz float contained minor amounts of tetrahedrite(?), with rims of malachite and galena. A sample contained 1,744 ppm lead, 921 ppm antimony, and 585 ppm copper. Prior to the mid-1970s, at least five companies including Bear Creek Mining Company, General Crude Oil Company, New Jersey Zinc Company, Alvenco Inc., and BP Alaska prospected and sampled in the area as part of their work in a 5-mile-long, northeast-trending belt of mineral occurrences along a thrust fault. (Degenhart, and others, 1978).

Alteration:

Oxidation of copper minerals.

Age of mineralization:

Devonian or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Prior to the mid-1970s, at least five companies including Bear Creek Mining Company, General Crude Oil Company, New Jersey Zinc Company, Alvenco Inc., and BP Alaska prospected and sampled in the area as part of their work in a 5-mile-long, northeast-trending belt of mineral occurrences along a thrust fault. (Degenhart, and others, 1978). Examination and limited surface sampling by the Alaska Division of Geological and Geophysical Surveys (Dillon and others, 1981) and the Bureau of Land Management (Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T., Jr., 1988, Maps and descriptions of lode and placer deposits, prospects, and occurrences in the Wiseman 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p., 2 plates, scale 1:250,000.

Degenhart, C.E., Griffis, R.J., McQuat, J.F., and Bigelow, C.G., 1978, Mineral studies of the western Brooks Range performed under contract to the U.S. Bureau of Mines, Contract #JO155089: U.S. Bureau of Mines Open-File Report 103-78, 529 p., 11 sheets.

Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

Dillon, J.T., Cathrall, J.B., and Moorman, M.A., 1981, Geochemical reconnaissance of the southwest Wiseman quadrangle-summary of data on rock samples: Alaska Division of Geological and Geophysical Surveys Open-File Report 133B, 164 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, 2 vols., 845 p.

WGM, 1976, 1975 Annual progress report Alaska project, Part III Wiseman quadrangle, Part IV Heady-Fairbanks area: unpublished report, p. 68-69 (Report held by Doyon Ltd., Fairbanks, Alaska).

Primary Reference: Kurtak, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Surprise Creek; Summit Creek

Site type: Mine

ARDF no.: WI009

Latitude: 67.518 **Quadrangle:** WI C-4

Longitude: 151.5192

Location description and accuracy:

Surprise Creek (named Summit Creek in reports from the 1930s) flows into the east side of Wild Lake about 0.2 mile north of the mouth of Spring Creek. There is evidence of placer mining along a 2-mile stretch of the Surprise Creek, but the mine workings appear to be concentrated along a 500-foot segment about 0.5 mile above the mouth of the creek. This mining is in the NW1/4 section 14, T. 31 N., R 18 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

The rocks in Surprise Creek are described by Reed (1938) as quartzite, greenstone, and graphitic and micaceous schists that are cut by several quartz veins in the lower valley. Quartz also constitutes a substantial portion of the detrital material in the creek. Dillon and others (1986) map the area as Middle Devonian siliceous clastic rocks.

Placer gold was discovered in 1904 in the modern stream bed of Surprise Creek (Summit Creek in old reports) and mining began that year (Reed, 1938). Surprise Creek was sporadically mined from 1904 through about 1937 (Kurtak and others, 2002). There is no record of claims after 1938. There are limited production figures available for Surprise Creek. Kurtak and others (2002) indicate that only 41 ounces of gold were produced from 1932 to 1937 but no figures are available for the mining from 1904 to 1932.

Mining has been sporadic and in many cases the workings failed to reach bedrock. Where it was reached, the depth to bedrock is 12 to 14 feet but the bedrock surface apparently slopes to the north under talus and becomes progressively deeper. The gravel in the creek is not frozen. It is very coarse and angular, and contains many large boulders at the top of the section. Much of the gold was produced in a 500-foot section of the creek by 'booming'. That is the dams ponded water which was then periodically released to wash the gravel over the bedrock. The boulders that remained were stacked to the side and the gold was recovered by hand methods. The gold is coarse and many nuggets accompany the fine gold. The gold occurs in the lower 3 feet of the gravel and on top of the bedrock; it is about 920 fine. Smith (1932) reported that a boulder of quartz float found in Summit (Surprise) Creek was 'liberally spangled with gold'.

Samples collected by Kurtak and others (1999) along Surprise Creek include panned concentrates that contained up to 3,888 ppb gold, limonite-stained quartz-carbonate float that contained 163 ppb gold, and a piece of malachite-stained schist.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:
Placer deposits (Garnett and Bassett, 2005)

Deposit model:
Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: Yes

Site Status: Inactive

Workings/exploration:
Placer gold was discovered in 1904 in the modern stream bed and mining began that year; it continued sporadically to 1937 (Reed, 1938; Kurtak and others, 2002). There is no record of claims after 1938.

Production notes:
There are limited production figures available for Surprise Creek. Kurtak and others (2002) indicate that only 41 ounces of gold were produced from 1932 to 1937 but no figures are available for the mining from 1904 to 1932.

Reserves:
None.

Additional comments:

References:

Cobb, E.H., 1972, Metallic mineral resources map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-469, 1 sheet, scale 1:250,000

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Williams, E.M., 1999, Mineral investigations in the Koyukuk mining district, northern Alaska--Progress Report: U.S. Bureau of Land Management Open-File Report 74, 158 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Smith, P.S., 1932, Mineral industry of Alaska in 1929, in Smith, P.S., and others Mineral resources of Alaska, report on progress of investigations in 1929: U.S. Geological Survey Bulletin 824-A, p. 1-81.

Smith, P.S., 1933, Mineral industry of Alaska in 1930: U.S. Geological Survey Bulletin 836-A, p. 1-83.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Spring Creek

Site type: Mine

ARDF no.: WI010

Latitude: 67.5114 **Quadrangle:** WI C-4

Longitude: 151.5305

Location description and accuracy:

Spring Creek is a small, west-flowing stream that empties into the east side of the middle of Wild Lake. Mining on Spring Creek has occurred from its mouth to the forks about 1.5 miles upstream. The site is plotted at an elevation of about 1,300 feet, about at the midpoint of the workings and about 0.5 mile east of the center of section 15, T. 31 N., R. 18 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Reed (1938) described the bedrock in Spring Creek as quartzite, and graphitic and greenstone schists. Dillon and others (1986) map the rocks in the Spring Creek area as Middle Devonian(?) siliceous clastic rocks.

Placer gold was discovered on Spring Creek in 1903 and the creek was mined for 22 of the years between 1904 to 1948, mainly by hand mining (Reed, 1938; Kurtak and others, 2002). Several mining operations described by Reed indicate that the depth to bedrock along Spring Creek varied from 5 to 25 feet and occasionally as much as 50 feet. The gravels were frozen, coarse, and waterworn, with numerous boulders on top of the gravel. The gold was coarse and unworn; it was in the lower 3 feet of the gravel and in the upper foot of the bedrock. The gold values determined from mining operations in the 1920s and 1930s were from $0.18 to $0.90 per square foot of bedrock; the fineness ranged from about 920 to 940.

Maddren noted that $7,000 in gold (about 350 ounces) was produced from 1907 to 1909. Reed (1938) estimated that the total production through 1937 had been $59,500 (about 2975 ounces). Kurtak and others (2002) document fairly consistent production from 1904 to 1948 of from 4 to 142 ounces per year; the total production during those years was 1,922 ounces of gold. Brosge and Reiser (1960) reported recent mining and that claims were active from 1969 to 1973 (Kurtak and others, 2002).

Kurtak and others (1999) collected six panned-concentrate samples along a 1.2-mile stretch of Spring Creek. The samples contained no visible gold but assays of the six samples averaged 1,260 parts per billion gold.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

Placer gold was discovered on Spring Creek in 1903 and the creek was mined for 22 of the years between 1904 to 1948, mainly by hand and drift mining (Reed, 1938; Kurtak and others, 2002). Brosge and Reiser (1960) reported recent mining and that claims were active from 1969 to 1973 (Kurtak and others, 2002).

Production notes:

Placer gold was discovered on Spring Creek in 1903 and the creek was mined for 22 of the years between 1904 to 1948, mainly by hand mining (Reed, 1938; Kurtak and others, 2002). Maddren noted that $7,000 in gold (about 350 ounces) was produced from 1907 to 1909. Reed (1938) estimated that the total production through 1937 was $59,500 (about 2975 ounces). Kurtak and other (2002) document fairly consistent production from 1904 to 1948 of 4 to 142 ounces per year; the total production during those years was 1,922 ounces of gold. Brosge and Reiser (1960) reported recent mining but did not indicate the amount of production.

Reserves:

Probably none of substantial size.

Additional comments:

References:

Brosgé, W.P., and Reiser, H.N., 1960, Progress map of the geology of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 60-19, 2 sheets, scale 1:250,000.

Chipp, E.R., 1972, Analyses of rock and stream sediment samples, Wild Lake area, Wiseman quadrangle, Arctic Alaska: Alaska Division Geological Survey Geochemical Report 25, 2 sheets.

Cobb, E.H., 1972, Metallic mineral resources map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-469, 1 sheet, scale 1:250,000

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Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk

mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Williams, E.M., 1999, Mineral investigations in the Koyukuk mining district, northern Alaska--Progress Report: U.S. Bureau of Land Management Open-File Report 74, 158 p.

Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (between Sirr Creek and Wild Lake)

Site type: Occurrence

ARDF no.: WI011

Latitude: 67.5217 **Quadrangle:** WI C-4

Longitude: 151.5889

Location description and accuracy:

This occurrence is located on a ridge between Sirr Creek and Wild Lake, about 1.6 miles north of the mouth of Seward Creek on Wild Lake. It is about 0.4 mile south-southwest of the center of section 9, T. 31 N,, R. 18 W. The occurrence is the site of sample 128 of Chipp (1972). Several other samples were collected for about 1.5 miles up the ridge to the north by Chipp (1972), and Kurtak and others (2002) The location is accurate.

Commodities:

Main: Ag, Au, Cu, Sb

Other: Pb, Zn

Ore minerals: Chalcopyrite, galena, malachite, pyrite, tetrahedrite?

Gangue minerals: Ankerite, calcite, quartz

Geologic description:

This occurrence consists of numerous thin quartz veins and lenses in Middle to Lower Devonian chlorite and sericite schist (Dillon and others, 1986). Most are barren quartz although some also contain ankerite(?). Over an area about 200 by 300 feet in size, small amounts of tetrahedrite(?), chalcopyrite, galena, malachite, and pyrite are scattered through the quartz (Chipp, 1972; Kurtak and others, 2002). One sample of altered calcareous schist with vein quartz and unspecified sulfides contains 0.52 parts per million (ppm) gold, 31 ppm silver, 1 percent antimony, 9,700 ppm copper, 2,400 ppm lead, and 1,000 ppm zinc (Chipp, 1972; sample 128).

Alteration:

Chipp (1972) and Dillon and others (1981) describe some of the samples as altered calcareous-schist, but did not describe the alteration.

Age of mineralization:

Unclear other than the veins and lenses are probably younger than the Devonian host rocks.

Generic deposit model:

Deposit model:

Scattered, thin quartz lenses and veins with rare, scattered base and precious-metal minerals.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Briefly examined and sampled by the Alaska Division of Geological and Geophysical Surveys (Chip, 1972, Dillon and others, 1981) and the Bureau of Land Management (Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T., Jr., 1988, Maps and descriptions of lode and placer deposits, prospects, and occurrences in the Wiseman 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p., 2 plates, scale 1:250,000.

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Dillon, J.T., Cathrall, J.B., and Moorman, M.A., 1981, Geochemical reconnaissance of the southwest Wiseman quadrangle-summary of data on rock samples: Alaska Division of Geological and Geophysical Surveys Open-File Report 133B, 164 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, 2 vols., 845 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (head of Sheep Creek)

Site type: Prospect

ARDF no.: WI014

Latitude: 67.5828 **Quadrangle:** WI C-4

Longitude: 151.9188

Location description and accuracy:

This prospect is at an elevation of about 3,500 feet, about 3.0 miles south of Pet Lake near the center of section 24, T. 32 N., R. 20 W. The location is accurate.

Commodities:

Main: Ag, Cu

Other: Au, Pb?

Ore minerals: Azurite, bornite, chalcopyrite, galena?, malachite

Gangue minerals:

Geologic description:

This prospect is one of several in a northeast-trending zone with minor copper mineralization that extends for about 5 miles northeast of VABM Allen (also see WI005, 006, 012, 013, and 016). Prior to the mid-1970s, at least five companies including Bear Creek Mining Company, General Crude Oil Company, New Jersey Zinc Company, Alvenco Inc., and BP Alaska prospected and sampled along this belt (Degenhart and others, 1978). Most of these prospects consist of malachite, azurite, and chalcopyrite along a thrust-fault contact that separates Devonian, Skajit Limestone from underlying chloritic schist (Dillon and others, 1986).

At this location, a small pod of copper mineralization, no more than 5 feet in diameter, is in marble (Degenhart and others, 1978). A sample, said to represent the mineralization contained 5,700 parts per million (ppm) copper, 3.4 ppm silver, and 10 parts per billion (ppb) gold. Kurtak and others (2002) also described podiform copper mineralization in this area. A sample of schist with bornite, malachite, and possibly galena contained 11 percent copper, 17 ppb gold, and 68.9 ppm silver. A sample of a small quartz vein contained 16.5 percent copper and and 78.6 ppm silver.

Alteration:

None specified.

Age of mineralization:

Devonian or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Insufficient evidence to assign.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

This prospect is one of several in a northeast-trending zone of minor copper mineralization that extends for about 5 miles northeast of VABM Allen (also see WI005, 006, 012, 013, and 016). Prior to the mid-1970s, at least five companies including Bear Creek Mining Company, General Crude Oil Company, New Jersey Zinc Company, Alvenco Inc., and BP Alaska prospected and sampled along this belt (Degenhart, and others, 1978). It was investigated and sampled by the Bureau of Land Management in about 2000 (Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Degenhart, C.E., Griffis, R.J., McQuat, J.F., and Bigelow, C.G., 1978, Mineral studies of the western Brooks Range performed under contract to the U.S. Bureau of Mines, Contract #JO155089: U.S. Bureau of Mines Open-File Report 103-78, 529 p., 11 sheets.

Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, 2 vols., 845 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Sirr Creek; North Fork Seward Creek

Site type: Mine

ARDF no.: WI019

Latitude: 67.5345 **Quadrangle:** WI C-4

Longitude: 151.6374

Location description and accuracy:

Sirr Creek is a south-flowing tributary of Seward Creek; it is about 2 miles west of Wild Lake. As described by Reed (1938), Sirr Creek was known as the North Fork Seward Creek in the 1930's and only the eastern fork was called Sirr Creek. The location of the workings is uncertain and the mine is arbitrarily plotted on Sirr Creek at an elevation of about 1,750 feet. The mine is near the southeast corner of section 6, T. 31 N., R. 18 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Reed (1938) reported that there was extensive prospecting and a little placer mining on Sirr Creek in the early 1900s. Kurtak and others (2002) found no sign of recent mining although 19 claims were staked along Stirr Creek in 1977. The rocks in the area are Devonian phyllite and schist (Dillon and others, 1986).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Undetermined

Site Status: Probably inactive

Workings/exploration:

Some prospecting prior to 1938 and some claims were staked in 1977. But no sign of any mining in about

2000 (Kurtak and others, 2002).

Production notes:

Probably none.

Reserves:

None.

Additional comments:

References:

Chipp, E.R., 1972, Analyses of rock and stream sediment samples, Wild Lake area, Wiseman quadrangle, Arctic Alaska: Alaska Division Geological Survey Geochemical Report 25, 2 sheets.

Cobb, E.H., 1972, Metallic mineral resources map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-469, 1 sheet, scale 1:250,000.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

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Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, 2 vols., 845 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Mascot Creek

Site type: Mine

ARDF no.: WI025

Latitude: 67.5087 **Quadrangle:** WI C-2

Longitude: 150.5471

Location description and accuracy:

Mascot Creek flows south about 7 miles to the Glacier River. The coordinates are at about the midpoint of a 3-mile-long stretch of placer mining that extends down the west halves of sections 7, 18, and 19, and the middle of section 30, T. 31 N., R. 13 W. The location is accurate. Kurtak and others (2002) furnish a colored geologic map of the Mascott Creek placer as their Figure I-7.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

According to Reed (1938), the bedrock in Mascot Creek is graphitic and quartz schist. The quartz schist is reddish from iron staining. According to Schrader (1904), mica schist on bedrock contains quartz stringers and a few porphyry dikes. Bliss and others (1988) speculated that the gold might be derived from these quartz stringers. The rocks adjacent to the productive part of Mascot Creek are mainly Cambrian and Silurian siltstone and phyllite and calcareous, chloritic wacke of the Devonian Beaucoup Formation (Dillon and others, 1986).

Since the discovery of gold on Mascot Creek in 1902 (Schrader, 1904), most of the mining has been along a 3-mile stretch of the creek, beginning about 4 miles above its mouth (Maddren, 1913; Reed, 1938; Kurtak and others, 2002). Mining and prospecting above and below this section of the creek has generally proved to be unproductive. The gold occurs in the modern channel but some is along benches. The gravel is waterworn and fine with few boulders; none of the gravel is frozen. The gravel in the modern channel is generally 0.5 to 3 feet thick. The relative ease with which these thin gravels could be mined made Mascot Creek one of the more profitable placer creeks in the district.

The gold in the modern channel is just above and below the bedrock surface; it typically is coarse and well worn. Nuggets with values up to $100 (about 5 ounces) have been recovered (Maddren, 1913). In one location near the upper end of the mined area, the gold was 90% coarse and 10% fine. Fineness ranged from about 942 to 977. Reed (1938) estimated that the value of the ground being mined in the modern channel in 1938 was $1.25 to nearly $7 in gold per square foot of bedrock.

Most mining was by ground sluicing and shoveling in. Placer mining was relatively simple as the gravel over the bedrock is shallow, and there are few boulders and little black sand. Although bedrock beneath the placer gravels in the auriferous portion of the creek was relatively shallow, the thawed gravel hindered sinking shafts in the thicker sections of grave. The last extensive mining on Mascot Creek was in 1984 when Doyon Limited took ownership of the land (Kurtak and others, 2002) In 2000, mining was being done with suction dredges working small pockets left from earlier mining.

Gold also was mined from remnants of a high channel on a bench of Mascot Creek. These remnants typically are along the right limit (west side) of the creek and a few tens of feet above the modern channel. Reed (1938) described one of these remnants as about 100 feet long and 10 feet wide; another was about 30

feet above the modern stream.

The most productive periods of mining were from 1903 to 1905 and in 1954, 1955, 1976, 1977, and 1984. Maddren (1913) reported that the total gold production through 1910 was about $150,000 (approx. 7,900 ounces). Kurtak and others (2002) provide production figures from 1903 to 1984, the last year of extensive mining. The total gold production from Mascot Creek was 11,198 ounces; the most productive years were 1903, when 5,082 ounces of gold was produced, and 1984 when 2,500 ounces were produced.

Mascot Creek is essentially mined out except for perhaps a few small pockets (Kurtak and others, 2002). The conclusion of a validity examination in 1996 by the Bureau of Land Management of the claims on Mascot Creek was that the gold resources left in the creek would not support a large-scale economic placer mine and the title of the land passed to Doyon Limited in 1997 (Keill and Teseneer, 1966). However, Kurtak and others (2002) surmised that small rich pockets remained that might be amenable to small scale mining.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Probably inactive

Workings/exploration:

The Mascot Creek placer was extensively mined and prospected, mostly along a 3-4 mile section of the modern channel beginning about 4 miles above its mouth. Most mining was by ground sluicing and shoveling in. Placer mining was relatively simple as the gravel over the bedrock is shallow, and there are few boulders and black sand. Although bedrock beneath the placer gravels in the auriferous portion of the creek was relatively shallow, generally less than 29 feet deep and often less than 3 feet deep, the thawed gravel hindered sinking shafts. The last extensive mining on Mascot Creek was in 1984 (Kurtak and others, 2002). In 2000, small-scale mining was being done with a suction dredge to recover gold from small pockets left from earlier mining.

Production notes:

The most productive periods of mining were from 1903 to 1905 and in 1954, 1955, 1976, 1977, and 1984. The last extensive mining on Mascot Creek was in 1997 when Doyon Limited took ownership of the land (Kurtak and others, 2002) In 2000, mining was being done with a suction dredge that probably produced a small amount of gold from small pockets left from earlier mining. Maddren reported total gold production through 1910 as about $150,000 (approx. 7,900 oz.). Kurtak and others (2002) provide production figures from 1903 to 1984, the last year of mining. The total gold production was 11,198 ounces; the most productive years were 1903 when 5,082 ounces of gold was produced, and 1984 when 2,500 ounces were produced.

Reserves:

Mascot Creek is essentially mined out except for perhaps a few small pockets (Kurtak and others, 2002). The conclusion of a validity examination in 1996 by the Bureau of Land Management of the claims on

Mascot Creek was that the gold resources left in the creek would not support a large-scale economic placer mine and the title of the land passed to Doyon Limited in 1997 (Keill and Teseneer, 1966). However, they and Kurtak and others (2002) also indicated that small rich pockets probably still remained that might be amenable to small scale mining.

Additional comments:

References:

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T., Jr., 1988, Maps and descriptions of lode and placer deposits, prospects, and occurrences in the Wiseman 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p., 2 plates, scale 1:250,000.

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Cobb, E.H., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in the Wiseman quadrangle, Alaska; Supplement to Open-File Report 76-340; Part B, Lists of references to January 1, 1981: U.S. Geological Survey Open-File Report 81-732-B, 22 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Keill D., and Teseneer, 1966, Validity examination of twenty-one abandoned and void placer mining claims on Mascot Creek, Gates of the arctic National Park and Preserve: Fairbanks, Alaska, U.S. Bureau of Land Management, 31 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Williams, E.M., 1999, Mineral investigations in the Koyukuk mining district, northern Alaska--Progress Report: U.S. Bureau of Land Management Open-File Report 74, 158 p.

Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Schrader, F.C., 1904, A reconnaissance in northern Alaska across the Rocky Mountains, along Koyukuk,

John, Anaktuvuk, and Colville rivers and the Arctic coast to Cape Lisburne, in 1901, with notes by W.J. Peters: U.S. Geological Survey Professional Paper 20, 139 p.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (east of head of Bonanza Creek)

Site type: Occurrence

ARDF no.: WI026

Latitude: 67.558 **Quadrangle:** WI C-2

Longitude: 150.8153

Location description and accuracy:

This occurrence is about 2 miles south-southeast of the small lake at the head of Bonanza Creek. It is on the west slope of the ridge between Bonanza and Conglomerate Creeks, about 0.5 mile west-northwest of the center of section 25, T. 32 N., R. 15 W., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Pb, Zn

Other: As

Ore minerals: Galena, sphalerite

Gangue minerals: Ankerite?, quartz, siderite?

Geologic description:

Brosge and Reiser (1960) originally describe this occurrence as a galena-bearing quartz vein in Middle(?) Devonian slate, phyllite and siltstone. Kurtak and others (2002) describe a 35-foot-wide by 150-foot-long area of rusty-weathering, intensely fractured and dolomitized metamorphic rock that they tentatively interpret as a northwest-trending shear zone. The rock is cut by numerous quartz veinlets containing traces of galena, sphalerite, and possibly ankerite(?). A sample of quartz float with traces of galena and sphalerite contained 3,510 parts per million (ppm) zinc, 3,438 ppm lead, and 3,772 ppm arsenic.

Alteration:

Rusty weathering, intense fracturing, and dolomitization.

Age of mineralization:

Devonian or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Quartz vein? with minor galena and sphalerite.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only surface sampling by the U.S. Geological Survey and the Bureau of Land Management (Brosge and Reiser, 1960; Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

This occurrence is the Gates of the Arctic National Park.

References:

Brosgé, W.P., and Reiser, H.N., 1960, Progress map of the geology of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 60-19, 2 sheets, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Williams, E.M., 1999, Mineral investigations in the Koyukuk mining district, northern Alaska--Progress Report: U.S. Bureau of Land Management Open-File Report 74, 158 p.

Primary Reference: Kurtak and others, 1999

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Vermont Creek; Right Fork

Site type: Mine

ARDF no.: WI027

Latitude: 67.5146 **Quadrangle:** WI C-1

Longitude: 150.1387

Location description and accuracy:

The mouth of Vermont Creek is at an elevation of about 1,800 feet on the Hammond River. The gold placers on Vermont Creek begin at the Hammon River, continue upstream for about a mile and then turn into the Right Fork. Placer gold is not known on Vermont Creek beyond the mouth of Right Fork. The coordinates are at the junction of Vermont Creek and Right Fork about 0.5 mile west-northwest of the center of section 13, T. 31 N., R. 12 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold, pyrite

Gangue minerals:

Geologic description:

Gold was discovered on Vermont Creek in 1901 (Maddren, 1913). It quickly became apparent that the pay streaks on the first mile of Vermont Creek continued up Right Fork and the placers on the two creeks were continuous and often mined together. Especially so since little gold has been found on Vermont Creek beyond the mouth of Right Fork.

Placer gold has been mined in the modern stream channel of Right Fork and lower Vermont Creek and in deep buried channels on lower Vermont Creek (Maddren, 1913; Reed, 1938; Eden, 2000; Kurtak and others, 2002). Shallow auriferous gravels extend continuously along the lower 0.5 to 0.7 mile of Right Fork and then turn east for one or two claim lengths along Vermont Creek. The gravel is about 3 feet thick along Right Fork. and the pay streak is narrow due to the constriction of the valley. The shallow placers that continue from Right Fork into Vermont creek are covered by 6 to 8 feet of muck, and the auriferous gravel is up to 400 feet wide and 4 to 5 feet thick. The pay channel consists of coarse, poorly sorted and subangular gravel, lying on soft micaceous schist (Reed, 1938). The gold in Vermont Creek is on and in the top few inches of, the bedrock. The gold forms few small nuggets and is mostly fine. According to Reed (1938), the value of the ground in these shallow gravels was about $0.13 in gold per square foot of bedrock (gold at $35.00 per ounce). The gravel contains considerable pyrite. Much if not most of the rich shallow gravel was probably mined out by 1909 (Maddren, 1913; Reed, 1938).

On lower Vermont Creek beyond the mouth of Right Fork, the gravel deepens, and Maddren (1913) thought that its lower 0.5 mile of auriferous gravel could, at least in part, be continuous with bench deposits of the Hammond River. Reed (1938) indicated that the deep channel was about 0.2 mile long along the left limit of lower Vermont Creek. The gravels in these deposits are frozen and 30 to 90 feet deep. Reed (1938) noted that gravel on the dumps was fine and waterworn, with few boulders. The gold from the deep channels is rounded and mostly coarse; several nuggets of more than 10 ounces have been recovered. There are unconfirmed reports that the value of the ground in these deep gravels may have run as high a $5 in gold per square foot of bedrock (gold at $35,00 per ounce) (Reed, 1938).

The early mining of the shallow placers was largely by hand and hydraulic methods. In the early days, the deep ground on lower Vermont Creek was drift mined. In recent years, lower Vermont Creek has been

mined with mechanical equipment.

Eden (2000) reports that a total of 9,145 ounces of gold were produced from Vermont Creek between 1904 and 1999. Kurtak and others (2002) estimate that 11,230 ounces of gold were produced between 1901 and 1983. According to Kurtak and others (2002) gold has been mined from Vermont and Right Fork for at least 39 of the years between 1901 and 1983. The most productive period of mining was from 1902 to 1909 when the production was more than 500 ounces year; it reaching 1,451 ounces in 1902. Yearly production was much lower until 1982 and 1983 when 500 ounces was produced each of those years. Mining is reported in 1983 (Bundtzen and others, 1984) and there was some mining in 1992 (Swainbank and others, 1993).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; medium

Site Status: Active?

Workings/exploration:

Placer gold has been mined in the modern stream channel of Right Fork and lower Vermont Creek and in deep buried channels on lower Vermont Creek (Maddren, 1913; Reed, 1938; Eden, 2000; Kurtak and others, 2002). Shallow auriferous gravels extends continuously along the lower 0.5 to 0.7 mile of Right Fork and then turn east for one or two claim lengths along Vermont Creek. On lower Vermont Creek beyond the mouth of Right Fork, the gravels deepen. The early mining of the shallow placers was largely by hand and hydraulic methods. In the early days, the deep ground on lower Vermont Creek was drift mined. In recent years, lower Vermont Creek has been mined with mechanical equipment.

Production notes:

Eden (2000) reports that a total of 9,145 ounces of gold were produced from Vermont Creek between 1904 and 1999. Kurtak and others (2002) estimate that 11,230 ounces of gold were produced between 1901 and 1983. According to Kurtak and others (2002) gold has been mined from Vermont and Right Fork for at least 39 of the years between 1901 and 1983. The most productive period of mining was from 1902 to 1909 when the production was more than 500 ounces year; it reaching 1,451 ounces in 1902. Yearly production was much lower until 1982 and 1983 when 500 ounces was produced each of those years. Mining is reported in 1983 (Bundtzen and others, 1984) and there was some mining in 1992 (Swainbank and others, 1993).

Reserves:

There are apparently no published resource or reserve figures for Vermont Creek and Right Fork. Most of the shallow auriferous gravel has probably l been mined but small remnants of the shallow auriferous gravel may remain. Gold may also remain in the deep channels of lower Vermont Creek or extensions of them below the Hammond River (Kurtak and others, 2002).

Additional comments:

References:

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Swainbank, R.C., Bundtzen, T.K., Clough, A.H., Hansen, E.W., and Nelson, M.G., 1993, Alaska's mineral industry, 1992: Alaska Division of Geological and Geophysical Surveys Special Report 47, 80 p.

Wimmler, N.L., 1925, Placer mining in Alaska in 1925: Alaska Territorial Department of Mines Miscellaneous Report 195-8, 118 p.

Primary Reference: Eden, 2000; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Slisco Bench

Site type: Mine

ARDF no.: WI031

Latitude: 67.5105 **Quadrangle:** WI C-1

Longitude: 150.1114

Location description and accuracy:

The Slisco Bench placer mine is located along the west side of Hammond River about 0.2 mile southwest of the mouth of Vermont Creek. The mine is 0.3 mile east-southeast of the center of section 13, T. 31 N., R. 12 W., of the Fairbanks Meridian. It marks the north end of a buried channel on this high bench that may extend a mile to the south. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

The Slisco Bench deposit is one of a number of bench placers in the valley of the Hammond River (Bundtzen, 2008, 2009; Kurtak and others, 2002). The deposit was discovered in the late 1920s; a small amount of mining was done until 1935, and it was mined in 1983 and from 1992 to 1994.

Several companies have drilled a total of 139 holes on the bench over an area about 1,600 feet long and 500 feet wide. Drilling by Silverado Gold Mines Inc. in 1995 intersected gold-bearing gravel in a buried channel beneath 60 to 200 feet of partially frozen gravel (Bundtzen, 2008, 2009). The geology of the gravels is complicated. The gold is in multiple, stacked gold-bearing horizons that are discontinuous along and across the buried channels, and their gold content is erratic. The gravels are also partially thawed making drift mining uncertain. Bundtzen (2008) estimates that the Slisco Bench has a inferred resource of 46,670 cubic yards of gravel with an average grade of 0.045 ounce of gold per cubic yard (about 2,100 ounces of gold).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Probably inactive

Workings/exploration:

The deposit was discovered in the late 1920s; a small amount of mining was done until 1935 and it was mined in 1983 and from 1992 to 1994. As of 2008, 139 exploratory holes had been drilled on the Slisco Bench by several companies (Bundtzen, 2008, 2009).

Production notes:

Some uncertain but probably small production from the late 1920s to 1994.

Reserves:

Bundtzen (2008) estimates that the Slisco Bench has a inferred resource of 46,670 cubic yards of gravel with an average grade of 0.045 ounces of gold per cubic yard (about 2,100 ounces of gold).

Additional comments:

See also Hammond River (WI103).

References:

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Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Eden, K., 2000, Geology and gold mineralization of the Nolan area in the Brooks Range, Alaska: U.S. Bureau of Land Management Open-File Report 78, 87 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

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Primary Reference: Bundtzen, 2008

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (along Right Fork)

Site type: Occurrence

ARDF no.: WI032

Latitude: 67.5109 **Quadrangle:** WI C-1

Longitude: 150.1533

Location description and accuracy:

The best exposed mineralization at this site is just southwest of 'Friday the 13th Pup', an informal name given to the small tributary to Right Fork in the northeast corner of section 14, T. 31 N., R 12 W. The mineralization then continues down Right Fork to Vermont Creek. The location is accurate.

Commodities:

Main: Au

Other: As, Sb

Ore minerals: Arsenopyrite, galena, gold, hematite, marcasite, pyrite, pyrrhotite, sphalerite, stibnite

Gangue minerals: Ankerite, calcite, dolomite, quartz

Geologic description:

Maddren (1913) first identified quartz veins and veinlets along joint surfaces in bedrock on upper Right Fork, noted that at least one of the veins contained sulfides as well as specks and flakes of free gold. The best mineralization exposed at this site is just southwest of 'Friday the 13th Pup', a small tributary to Right Fork in the northeast quarter of section 13, T. 31 N., R 12 W. (Eden, 2000; Kurtak and others, 2002).

Numerous thin quartz veins cut interbedded phyllite and schist of the Upper Devonian Beaucoup Formation (Dillon and others, 1986). Eighteen veins spaced at about 5 foot intervals, occur in one 100-foot-wide exposure of the phyllite near Friday the 13th Pup. The veins average about 0.5 inch thick; they generally strike about N60W and dip 75SW. The veins consist of coarse, white quartz, calcite, ankerite and dolomite, 1-2 percent pyrite, and sparse arsenopyrite, galena, hematite, marcasite, pyrrhotite, sphalerite, and stibnite. Visible gold occurs in some of these veins, mostly along their margins. A sample of a vein with visible gold contained 17.8 parts per million (ppm) gold Other veins contain 415 parts per billion (ppb) to 63.56 ppm gold, 126 to 3,802 ppm arsenic, and 7 to 748 ppm antimony. Samples of phyllite with minor pyrite in the vicinity of the veins contained 13 to 38 ppb gold. The phyllite along Right Fork from Friday the 13th Pup down to Vermont Creek is cut by similar veins that contained up to 815 ppb gold, 1,137 ppm copper, and 1,065 ppm arsenic. A cobble-size boulder of quartz with gold and 1 percent stibnite, presumably from a local source, was found by local placer miners in Right Fork (Dillon, 1982).

Alteration:

The phyllite that hosts the thin quartz veins apparently is not altered.

Age of mineralization:

Devonian or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Undetermined

Workings/exploration:

The thin gold-quartz veins in the bedrock along Right Fork have been recognized since at least 1913 and have repeatedly been sampled, most recently by Kurtak and others (2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

Eden, K., 2000, Geology and gold mineralization of the Nolan area in the Brooks Range, Alaska: U.S. Bureau of Land Management Open-File Report 78, 87 p.

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Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Ann

Site type: Prospect

ARDF no.: WI034

Latitude: 67.3954 **Quadrangle:** WI B-6

Longitude: 152.8472

Location description and accuracy:

The Ann prospect is located 3.5 miles east-northeast of the east end of Ernie Lake and about 3.5 miles northwest of the junction of Pass Creek and Mettenpherg Creek. The coordinates mark the principal mineral showing; it is on an unnamed creek at an elevation of about 580 meters, near the center of section 26, T. 30 N., R. 24 W. There are other mineral showings up to 500 feet upstream and downstream from the main showing. The location is accurate.

Commodities:

Main: Ag, Cu, Pb, Zn

Other: As, Au

Ore minerals: Arsenopyrite, azurite, chalcopyrite, galena, malachite, pyrite, pyrrhotite?, sphalerite

Gangue minerals: Barite, quartz

Geologic description:

This prospect consists of vein and stratabound(?) Pb-Zn deposits of massive, stringer, and disseminated sulfides in pelitic schist interbeds in the Devonian Skajit Limestone, adjacent to the Ernie Lake granitic plutons (Nokleberg and others, 1996). The principal mineral showing at the Ann prospect is a steeply-dipping lens of massive pyrite, sphalerite, galena and minor chalcopyrite at a contact between graphitic quartz schist and sericite-talc schist (Kurtak and others, 1999). The lens is 4-5 feet thick and is exposed for only about 6 to 7 feet before pinching out in one direction and disappearing under cover in the other. A chip sample across this lens contained 3.34 percent lead, 4.31 percent zinc, 2.64 ounces of silver per ton, and 2.5 parts per million (ppm) gold (Kurtak and others, 2002). Bedded quartz-barite rock occurs a few hundred feet from the main Pb-Zn showing, but it contains no sulfides.

Several similar, but smaller, deposits are within a few hundred feet of the main showing. One of these consists of pyrite, arsenopyrite, pyrrhotite(?), galena, and chalcopyrite in layers and veins in calcareous, quartz-mica schist near the contact of granite gneiss and marble. A sample contained 37.7 ppm silver, 13 percent arsenic, 3.8 percent lead, 1.8 percent zinc, and 315 ppm antimony (Dillon and others, 1981: sample 480). Secondary copper carbonates, malachite and azurite, occur in the marble, calc-schist, and pelitic schist layers.

Claims were staked in 1975 (Grybeck, 1977). Exploration by industry included surface rock sampling, geologic mapping, geochemical soil sampling, hand trenching, and ground geophysics. There was also limited surface rock sampling by government agencies in the 1980s and 1990s (Dillon and others, 1981; Kurtak and others, 1999, 2002).

Alteration:

Oxidation of copper mineral(s).

Age of mineralization:

Devonian or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

(Metamorphosed) Polymetallic vein? (Cox and Singer, 1986; model 22c?) or metamorphosed sulfide deposit (Nokleberg and others, 1987).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

22c?

Production Status: None

Site Status: Inactive

Workings/exploration:

Claims were staked in 1975 (Grybeck, 1977). Exploration by industry included surface rock sampling, geologic mapping, geochemical soil sampling, hand trenching, and ground geophysics. There was also limited surface rock sampling by government agencies in the 1980s and the 1990s (Dillon and others, 1981; Kurtak and others, 1999, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

See also Buzz (WI047).

References:

BP Alaska Exploration Inc., 197, Annual progress report, 1978, BP General Crude Joint Venture Buzz-Ann-Dome property: unpublished report, 4 p. (held by the Bureau of Land Management, Anchorage, Alaska).

Dillon, J.T., Cathrall, J.B., and Moorman, M.A., 1981, Geochemical reconnaissance of the southwest Wiseman quadrangle-summary of data on rock samples: Alaska Division of Geological and Geophysical Surveys Open-File Report 133B, 164 p.

Grybeck, Donald, 1977, Map showing known mineral deposits of the Brooks Range, Alaska: U.S. Geological Survey Open-File Report 77-166-C, 45 p., 1 sheet, scale 1:1,000,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

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Nokleberg, W.J., Bundtzen, T.K., Berg, H.C., Brew, D.A., Grybeck, D.J., Robinson, M.S., Smith, T.E., and Yeend, W., 1987, Significant metalliferous lode deposits and placer districts of Alaska: U.S. Geological Survey Bulletin 1786, 104 p., 2 plates, scale 1:5,000,000.

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D., Khanchuck, A.I., Kovbas, L.I., Nekrasov, I.Y., and Sidorov, A.A., 1996, Significant metalliferous and selected non-metalliferous lode mineral deposits and placer districts, and for metallogenesis of the Russian Far East, Alaska, and the Canadian Cordillera: U.S. Geological Survey Open-File Report 96-513-B, 385 p.; U.S. Geological Survey Open-File Report 96-513-B, 385 p. (CD-ROM format).

WGM Inc., 1977, Annual progress report, 1976, Buzz-Ann-Dome property, WAK-2 project: Unpublished report, 21 p. (held by Bureau of Land Management, Anchorage, Alaska.)

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Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Colorado Creek

Site type: Mine

ARDF no.: WI035

Latitude: 67.3818 **Quadrangle:** WI B-6

Longitude: 152.7248

Location description and accuracy:

Colorado Creek is a west-northwest-flowing tributary of upper Mettenpherg Creek. There is considerable evidence of placer mining for about 0.3 mile above the mouth of Colorado Creek. The area is centered about 0.3 mile east of the center of section 32, T. 30 N., R. 23 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Smith, 1913 report placer mining on 'Mechlenberg' Creek (probably the modern Mettenpherg Creek) which may have been on or near the mouth of Colorado Creek. Reed (1938) reported mining on Colorado Creek in 1937. Kurtak and others found evidence of extensive mining on the lower 0.3 mile of Colorado Creek that included hand stacked rocks, old pole-riffle sluice boxes, and a suction dredge. They also report that 8 ounces of gold were produced from 1937 to 1939.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

Small-scale mining by booming and shoveling in from a small cut in 1937 (Reed, 1938). The presence of

a suction dredge reported by Kurtak and others (2002) indicates at least some modern activity.

Production notes:

Kurtak and others (2002) report that 8 ounces of gold were produced from 1937 to 1939.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

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Smith, P.S., 1913, The Noatak-Kobuk region, Alaska: U.S. Geological Survey Bulletin 536, 60 p.

Smith, P.S., and Mertie, J.B., Jr., 1930, Geology and mineral resources of northwestern Alaska: U.S. Geological Survey Bulletin 815, 315 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Zinc

Site type: Occurrence

ARDF no.: WI049

Latitude: 67.3978 **Quadrangle:** WI B-6

Longitude: 152.6955

Location description and accuracy:

This occurrence is about 3.2 miles north-northeast of the junction of Pass and Mettenpherg Creeks. The occurrence is at an elevation of about 780 meters, about 0.3 mile northeast of the center of section 28, T. 30 N., R. 23 W. The location is accurate.

Commodities:

Main: Au, Pb, Zn

Other: As

Ore minerals: Fluorite, galena, pyrite, sphalerite

Gangue minerals:

Geologic description:

The rocks in the area consist of Proterozoic(?) granite gneiss and banded schist, and Devonian Skajit Limestone (Dillon and others, 1986) This occurrence was reported to consist of sphalerite and galena in carbonate rocks (Grybeck, 1977). Kurtak and others (2002) investigated the site but only found blocks of limonite-stained schist with up to 2 percent fluorite and stringers of pyrite at a contact of Skajit Limestone and quartz-sericite schist. A select sample contained 67 parts per billion gold and 131 parts per million arsenic. Kurtak and others (2002) reported that 106 lode claims were staked over the property in 1975 but found no evidence of workings.

Alteration:

None noted.

Age of mineralization:

Devonian or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Insufficient evidence to assign.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

106 lode claims were staked in 1975.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Grybeck, Donald, 1977, Map showing known mineral deposits of the Brooks Range, Alaska: U.S. Geological Survey Open-File Report 77-166-C, 45 p., 1 sheet, scale 1:1,000,000.

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Primary Reference: Grybeck, 1977, Maas, 1987

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Midas Creek

Site type: Mine

ARDF no.: WI057

Latitude: 67.3047 **Quadrangle:** WI B-5

Longitude: 152.2285

Location description and accuracy:
Midas Creek is a north-flowing tributary to Sixtymile Creek. The exact location(s) of placer gold prospects on Midas Creek is unknown. The site is plotted near the cabin shown on the Wiseman B-5 topographic map, about 3 miles upstream from the mouth of the creek. It is about 0.5 mile northwest of the center of section 34, T. 29 W., R. 21 N. This locations approximates the location in Cobb (1972).

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:
Maddren (1913) reported that good placer gold prospects had been found on Midas Creek in 1905 although these had not been developed by 1913. A small one-man bulldozer-hydraulic mining operation was underway in 1952 (Holdsworth, 1952). Kurtak and others (2002) found the remains of a cabin (shown on the 1:63,360-scale topographic map) and placer mining equipment about 3 miles above the mouth of the creek, another cabin about 3.5 miles above the mouth, and an old airstrip about 5 miles above the mouth. They noted that there were three placer claims on the creek in 1959 and one claim at the mouth of the creek from 1979 to 1983. They did not find any significant signs of mining along the creek.

Alteration:

Age of mineralization:
Quaternary.

Generic deposit model:
Placer deposits (Garnett and Bassett, 2005)

Deposit model:
Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: Yes; small

Site Status: Probably inactive

Workings/exploration:

Maddren (1913) reported that good placer gold prospects had been found on Midas Creek in 1905, although these had not been developed by 1913. A small one-man bulldozer-hydraulic mining operation was underway in 1952. There were 3 claims in 1959 and another near the mouth of the creek from 1979 to 1983.

Production notes:

Prospecting as early as 1905, although little had been done by 1913. No record of any production but there was some mining in 1952.

Reserves:

None.

Additional comments:

References:

Brooks, A.H., 1905, Placer mining in Alaska in 1904: U.S. Geological Survey Bulletin 259, p. 18-31.

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Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Lake Creek

Site type: Mine

ARDF no.: WI061

Latitude: 67.475 **Quadrangle:** WI B-4

Longitude: 151.5518

Location description and accuracy:

Lake Creek enters the southeast end of Wild Lake about 0.5 mile north of its south end. Lake Creek has mainly been mined from about 0.5 miles to about 1.5 miles above its mouth. The center of the mined area is about 0.6 mile north-northwest of the center of section 34, T. 31 N., R. 18 W. The location is accurate.

Commodities:

Main: Au

Other: As, Bi, Cu, Pt, Sb, W

Ore minerals: Bismuth, bismuthinite, copper, galena, gold, hematite, magnetite, platinum?, pyrite, scheelite, stibnite

Gangue minerals:

Geologic description:

Gold was discovered on Lake Creek in 1903 (Maddren, 1910; 1913) and mining continued intermittently to at least 2001 (Kurtak and others, 2002, Eden, 2004; Brooks Range Exploration, 2012). Most of the gold has been produced near the head of an alluvial fan at the mouth of Lake Creek and in a narrow portion of the creek valley about 1.5 miles from its mouth. Near the head of the alluvial fan, the depth to bedrock is 60 to 95 feet; in the upper valley of the creek, the depth to bedrock is only 3 feet. Reed (1938) reported that production from the mining from 1904 to 1937 was at least $26,000 (about 1,300 ounces of gold) but he speculated that the extent of the workings indicated that the production was many thousands of dollars more. Kurtak and others (2002) report that the creek produced 2,624 ounces of gold in twelve years from 1903 to 1955. Mining before WWII was mainly by hand methods, ground sluicing, and in the upper part of the alluvial fan by drifting. In 1999, a large wash plant was built to mine ground at the upper part of the fan with mechanized equipment. The mining in the late 1990s revealed that there were two distinct bedrock channels underneath the upper portion of the fan and that they they extend upstream from the top of the fan. Incomplete records indicate that at least 1,314 ounces of gold were produced from 1995 to 2001.

The rocks in the area are predominantly Devonian muscovite-chlorite schist that contains numerous quartz lenses and veinlets (Kurtak and others, 1999). Some of the quartz is parallel to the cleavage or schistosity, and transects it. Reed (1938) describes the bedrock about 200 feet above the last of the old workings (about 2 miles from the lake) as alternating micaceous and graphitic schist cut by a 300-foot-wide, greenstone dike. This greenstone dike was not observed by Kurtak and others (1999). Reed (1938) also noted soft reddish schist containing numerous quartz stringers at the head of Lake Creek.

The gravels on Lake Creek are coarse and waterworn with numerous large schist boulders. The upper part of the gravel contains erratics of conglomerate and black chert. The gold occurs as coarse, waterworn nuggets, and also as fine flour gold. Maddren (1913) noted recovery of nuggets valued at $90 to $150 (about 4.7 to 7.9 ounces). A 22-ounce nugget was recovered in 1995 and a 24.25-ounce nugget was recovered in 1996 (Kurtak and others, 2002).

Smith and Mertie (1930) reported that the concentrates from the placers along Lake Creek had a high content of scheelite. Joesting (1943) lists several minerals in the placer concentrates from Lake Creek, including inch-long pieces of stibnite, scheelite, native bismuth, native copper, hematite, pyrite and

magnetite. Sluice concentrates collected by Kurtak and others (1999) contained up to 5,930 parts per billion (ppb) platinum, 976 parts per million (ppm) tungsten, 0.44 percent bismuth, 1,750 ppm arsenic, and 3,043 ppb gold. The sluice concentrates did not contain visible gold. Miners also showed them nuggets of bismuthinite said to come from Lake Creek. Samples of quartz from the placers thought to be from veins contained up to 8,631 ppm copper and 62 ppb gold.

Kurtak and others (2002) and Blakestad (2003) suggest that there is moderate potential for placer gold in the central basin of Lake Creek from the alluvial fan beside Wild Lake upstream to the canyon narrows. The north channel of the creek and possible bench channels to the south of the creek have not been evaluated. Based on an unpublished report by Blakestad (2000), Kurtak and others (2002) give an 'indicated resource' of 10,087 ounces of gold in Lake Creek.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active?

Workings/exploration:

Intermittent mining by hand methods, sluicing and drifting from 1904 to the the 1990s. In 1999, a large washing plant was built to mine gravels at the top of the alluvial fan above the mouth of Lake Creek with mechanized equipment (Kurtak and others, 2002). Mining continued until at least 2001.

Production notes:

Reed (1938) reported production from early mining from 1904 to 1937 to be at least $26,000 (about 1,300 ounces of gold) but he speculated that the extent of the workings indicated that the production was many thousands of dollars more. Kurtak and others (2002) tabulated the production by year from 1903 to 2001. From 1903 to 1955, the placers on Lake Creek produced 2,624 ounces of gold in 12 years. Another 1,314 ounces of gold was produced from 1955 to 2001 but the records are incomplete. The total production from 1903 to 2001 was thus at least 3,938 ounces of gold.

Reserves:

Kurtak and others (2002) and Blakestad (2003) suggest that there is moderate potential for placer gold in the central basin of Lake Creek from the alluvial fan beside Wild Lake upstream to the canyon narrows. The north channel of the creek and possible bench channels to the south of the creek have not been evaluated. Based on an unpublished report by Blakestad (2000), Kurtak and others (2002) give an 'indicated resource' of 10,087 ounces of gold in Lake Creek.

Additional comments:

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Joesting, H.R., 1943, Strategic mineral occurrences in interior Alaska, supplement to pamphlet no. 1: Alaska Territorial Department of Mines Pamphlet 2, 26 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

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Wimmler, N.L., 1925, Placer mining in Alaska in 1925: Alaska Territorial Department of Mines Miscellaneous Report 195-8, 118 p.

Primary Reference: Kurtak and others, 2002; Brooks Range Exploration II LLC, 2012

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2012-04-01

Site name(s): Crevice Creek

Site type: Mine

ARDF no.: WI064

Latitude: 67.359 **Quadrangle:** WI B-4

Longitude: 151.9028

Location description and accuracy:

Crevice Creek is a west-flowing tributary to John River. The mouth of Crevice Creek is approximately 0.5 mile south of the junction of the John and Allen Rivers. The center of the placer workings is about 3.5 miles upstream from the mouth of Crevice Creek, near the northeast corner of section 12, T. 29 N., R. 20 W. The workings extend for about two miles upstream and downstream. The location is accurate.

Commodities:

Main: Au

Other: Ag

Ore minerals: Gold, magnetite, silver

Gangue minerals:

Geologic description:

About 3.5 miles of Crevice Creek has been placer mined. The most extensive mining was from about 2.0 miles to about 2.5 miles above its mouth. Above and below that section, most of the mining has been with suction dredges working pot holes. Bedrock is exposed or shallow along much of Crevice Creek and consists mainly of Devonian Skajit Limestone (Dillon, 1982; Dillon and others, 1986). Cracks in the weathered bedrock formed numerous natural riffles and potholes up to several feet deep that trapped much of the gold along the creek and were the locus of much of the mining (Reed, 1938; Kurtak and others, 2002). The creek is named for this features.

The concentrates contained abundant magnetite. Occasionally native silver nuggets were recovered with the gold (Kurtak and others, 2002). Bliss and others (1988) speculate that the gold is derived from sulfide-bearing quartz veins in the Devonian Skajit limestone (see WI066). Analyses by Mosier and Lewis (1986) of seven gold samples from Crevice Creek gave median values of 4.2 percent silver, 0.14 percent copper, 0.008 percent lead, and 0.47 percent mercury, and a median fineness of 958. Three of these analyses showed detectable levels (but less than 2 parts per million) palladium.

As documented by Maddren (1910, 1913), Reed (1938), and Kurtak and others (2002), mining began on Crevice Creek in 1904. Production records show that at least 117 ounces of gold was produced in several episodes of mining through 1914. At least another 105 ounces of gold was produced from 1948 to 1953. Most of the production was from 1959 to 1988 by Bill Ficus who recovered at least 2,200 ounces of gold from 1980 to 1998. Suction-dredge mining of the pot holes continued until at least 2000. The total production documented in incomplete records is 2,456 ounces of gold. Kurtak and others (2002) suggest that little gold remains, although the numerous cracks, crevices, and pot holes in the bedrock along the creek probably retain some gold amenable to suction dredging.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Active?

Workings/exploration:

About 3.5 miles of Crevice Creek has been placer mined. The most extensive mining was from about 2.0 miles to about 2.5 miles above its mouth. Above and below that section, most of the mining has been with suction dredges working pot holes. As documented by Maddren (1910, 1913) Reed (1938), and Kurtak and others (2002), mining began on Crevice Creek in 1904. Production records show that at least 117 ounces of gold was produced in several episodes of mining through 1914. At least another 105 ounces of gold was produced from 1948 to 1953. Most of the production was from 1959 to 1988 by Bill Ficus who recovered at least 2,200 ounces of gold from 1980 to 1998. Suction-dredge mining of the pot holes continued until at least 2000.

Production notes:

As documented by Maddren (1910, 1913); Reed (1938), and Kurtak and others (2002), mining began on Crevice Creek in 1904. Production records show that at least 117 ounces of gold was produced in several episodes of mining through 1914. At least another 105 ounces of gold was produced from 1948 to 1953. Most of the production was from 1959 to 1988 by Bill Ficus who recovered at least 2,200 ounces of gold from 1980 to 1998. Suction-dredge mining of the pot holes continued until at least 2000. The total production documented in incomplete records is 2,456 ounces of gold.

Reserves:

Kurtak and others (2002) suggest that little gold remains, although the numerous cracks, crevices, and pot holes in the bedrock along the creek probably retain some gold amenable to suction dredging.

Additional comments:

References:

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T.Jr., 1988, Maps and descriptions of lode deposits, prospects, and occurrences in the Wiseman 1o by 3o Quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p.plus 2 plates.

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Mosier, E.L., and Lewis, J.S., 1986, Analytical results, geochemical signatures, and sample locality map of lode gold, placer gold, and heavy-mineral concentrates from the Koyukuk-Chandalar mining district, Alaska: U.S. Geological Survey Open-File Report 86-345, 172 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Moose Trail

Site type: Prospect

ARDF no.: WI074

Latitude: 67.399 **Quadrangle:** WI B-4

Longitude: 151.9942

Location description and accuracy:

This prospect is about 1 mile north of the junction of McCamant Creek and Allen River. The occurrence is at an elevation of about 1,650 feet, 0.3 mile north-northwest of the center of section 27, T. 30 N., R. 20 W. The location is accurate.

Commodities:

Main: Cu?

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Little information on this prospect is available and none of it suggests significant mineralization. The location of the prospect is given in the U. S. Bureau of Mine's MAS database and is shown by Maas (1987). Dillon and others (1981) indicates that the area contains copper mineralization but did not furnish details. Kurtak and others (2002) examined the prospect but found no indication of mineralization. They reported that BP Exploration Inc. held 28 claims in the area from 1975 to 1977 and did some drilling and trenching. The core of the holes did not show any copper mineralization. The rocks in the area are principally Devonian(?) chloritic and carbonate rocks (Dillon and others, 1986).

Alteration:

None noted.

Age of mineralization:

No mineralization identified.

Generic deposit model:

Deposit model:

No mineralization identified.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

BP Exploration Inc. held 28 claims in the area from 1975 to 1977 and did some drilling and trenching. Examined by the Bureau of Land Management in about 2000 (Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

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Primary Reference: Dillon and others, 1981 (AOF 133B)

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Birch Creek

Site type: Mine

ARDF no.: WI076

Latitude: 67.4477 **Quadrangle:** WI B-3

Longitude: 151.345

Location description and accuracy:

Birch Creek is a west-flowing tributary of Flat Creek. Their junction is about 3 miles southeast of Mathews Dome and about 6 miles east-southeast of the south end of Wild Lake. Much of the mining on Birch Creek in the early 1900s occurred along about 1 mile of the stream on either side of the mouth of a south-flowing unnamed tributary locally called Rue Creek. Rue Creek's mouth is about 1.25 miles above the mouth of Birch Creek. The center of mining is near the southeast corner of section 4, T. 30 N., R. 17 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Gold was discovered on Birch Creek in 1904 by Louis Rue (Reed, 1938). He reportedly recovered about $1,800 in gold in 1905 (gold at $20.67 per ounce). The modern channel of Birch Creek has been mined for about 1/2 mile above and below the mouth of Rue Creek (a local name not shown on modern topographic maps) that enters Birch Creek from the north about a mile above its mouth. The gravel is coarse and waterworn in Birch Creek and contains many boulders. An area along the left limit of Birch Creek below Rue Creek was drift mined. The depth of the drift workings is probably about 20 feet, similar to the depth to bedrock in the creek bed (Reed, 1938). Several shafts were also sunk in the alluvial fan where Birch Creek enters the valley of Flat Creek but the results of this work are not known.

In the early 1900s, Birch Creek was mined by shoveling-in and drifting. Reed, (1938) noted that there had been no mining since since 1933 and estimated that the total production from the early 1900s until about 1933 was about $20,000 to $30,000 (gold at $20.67 per ounce). Kurtak and others (2002) document that 1,440 ounces of gold was produced from 1905 to 1933, with the production scattered through those years.

Mining with mechanical equipment began in 1987 and continued to at least 2002 (Kurtak and others, 2002). This mining mainly took place near the mouth of Rue Creek. At least some of the activity was recreational mining. Four to twelve feet of gravel is stripped to bedrock and paying customers used metal detectors search the bedrock surface for gold. A 10.2-ounce nugget was found in 1998. The gold production for these years is not available.

A sample of quartz-mica schist from the ridge on the north side of upper Birch Creek contained 35 parts per billion gold and 1,767 parts per million arsenic (Kurtak and others, 1999).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active?

Workings/exploration:

Birch Creek was mined by shoveling-in and drifting for scattered years from 1905 to 1933 (Reed, 1938). Mining resumed in 1987 with mechanical equipment and continued to at least 2002. The recent mining included a recreational mining concession. Four to twelve feet of gravel is stripped to bedrock and paying customers using metal detectors search the top of the bedrock for gold.

Production notes:

Reed (1938) estimated that the total production from the early 1900s until about 1933 was about $20,000 to $30,000 (gold at $20.67 per ounce). Kurtak and others (2002) document that 1,440 ounces of gold was produced from 1905 to 1933, with the production intermittent through those years. No production figures are available for the mechanical mining that began in 1987 and continued to at least 2002.

Reserves:

None.

Additional comments:

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Szumigala, D.J., and Swainbank, R.C., 1999, Alaska's mineral industry, 1998: Alaska Division of Geological and Geophysical Surveys Special Report 53, 71 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (near the junction of Fall and Michigan Creeks)

Site type: Occurrence

ARDF no.: WI077

Latitude: 67.3051 **Quadrangle:** WI B-3

Longitude: 151.2404

Location description and accuracy:

This occurrence is based on several mineralized rock samples collected in an area about 0.2 mile in diameter (Dillon and others, 1981: Plate 1, samples 467 to 472 and 474 and 475). The area is about 0.2 mile northwest of the junction of Fall and Michigan Creeks. The occurrence is at an elevation of about 1,550 feet, 0.4 mile south-southwest of the center of section 25, T. 29 N., R. 17 W. The location is accurate.

Commodities:

Main: As, Au, Cu

Other: Ag, Co, Pb, Ti, Zn

Ore minerals: Arsenopyrite, cassiterite, chalcopyrite, marcasite, molybdenite?, pyrite, pyrrhotite, rutile, sphalerite

Gangue minerals: Quartz

Geologic description:

Dillon and others (1981) collected mineralized rock samples at several sites in an area about a half mile in diameter. The mineralization consists of layers and veins of massive pyrrhotite, chalcopyrite, sphalerite, arsenopyrite, cassiterite, rutile, pyrite, and possible molybdenite. The pyrrhotite is partly altered to marcasite. Eight samples collected by Dillon and others contained up to 82,000 parts per million (ppm) arsenic, 700 ppm cobalt, 1,360 ppm copper, 8.28 ppm gold, 135 ppm lead, 50 ppm tin, and 329 ppm zinc. The sulfide layers and veins are up to 30 cm. thick in actinolite-biotite felsite interlayered with marble and garnet-quartz-albite-muscovite schist. Hornfelsed calc-silicate rocks along the contact with the felsite contain disseminated pyrite(?). Dillon and others (1986) map the area as Devonian and Devonian(?) interlayered felsic and mafic intrusive and extrusive rocks, locally mixed with clastic sedimentary rocks. They indicate that the upper Devonian felsic schist is regionally associated with copper deposits.

The area was examined by Kurtak and others (2002) as part of a regional mineral assessment . The only sample they collected of a felsitic rock had only 111 ppm copper and 196 parts per billion (ppb) gold; i.e., not nearly the metal values in samples analyzed by Dillon and others (1981).

Alteration:

Alteration of pyrrhotite to marcasite; oxidation of sulfides, development of skarn.

Age of mineralization:

Devonian or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Volcanogenic massive sulfides or skarn?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Only surface sampling by government agencies (Dillon and others, 1981; Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T., Jr., 1988, Maps and descriptions of lode and placer deposits, prospects, and occurrences in the Wiseman 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p., 2 plates, scale 1:250,000.

Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

Dillon, J.T., Cathrall, J.B., and Moorman, M.A., 1981, Geochemical reconnaissance of the southwest Wiseman quadrangle-summary of data on rock samples: Alaska Division of Geological and Geophysical Surveys Open-File Report 133B, 164 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Primary Reference: Dillon and others, 1981

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Agnes Creek

Site type: Mine

ARDF no.: WI078

Latitude: 67.485 **Quadrangle:** WI B-3

Longitude: 151.3039

Location description and accuracy:

Agnes Creek is a west-flowing tributary to upper Flat Creek. It is about 6 miles east of Wild Lake and about 5 miles northeast of Mathews Dome. The extent of the placer is unknown and the occurrence is arbitrarily located about a mile upstream from the mouth of Agnes Creek, near the northeast corner of section section 27, T. 31 N., R. 17 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Reed (1938) noted that there had been extensive prospecting and some mining on Agnes Creek in the early 1900s but that records of the mining had been lost. Kurtak and others (2002) note that there were active claims on Agnes Creek from the 1970s to 2002.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Undetermined

Site Status: Inactive

Workings/exploration:

Prospecting and some mining in the early 1900s. There were active claims from the 1970s to at least 2002.

Production notes:

A small amount of gold was probably produced.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in the Wiseman quadrangle, Alaska; Supplement to Open-File Report 76-340; Part B, Lists of references to January 1, 1981: U.S. Geological Survey Open-File Report 81-732-B, 22 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (ridge east of Scofield Creek)

Site type: Occurrence

ARDF no.: WI081

Latitude: 67.3278 **Quadrangle:** WI B-3

Longitude: 151.3112

Location description and accuracy:

This occurrence is between Scofield and Michigan Creeks, about 7.5 miles west of Ipnek Mountain and 2.8 miles northeast of the junction of Scofield Creek and Wild River. The occurrence is at an elevation of about 3,550 feet, about 0.5 mile north-northeast of the center of section 22, T. 29 N., R. 17 W. The location is accurate.

Commodities:

Main: Ag, Pb, Zn

Other: As, Ba, Fe, La

Ore minerals: Sphalerite

Gangue minerals:

Geologic description:

This occurrence is a gossan zone at the contact of calc-schist and marble with granite. A sample of float from the gossan contains up to 20 parts per million (ppm) silver, 1,000 ppm arsenic, 1,500 ppm lead, 1,800 ppm zinc, 20 percent iron, and 0.5 percent barium. (Dillon and others, 1981, sample 380). No sulfides were observed in the sample.

About a mile to the west, Dillon and others (1981, no. 127) collected a sample of quartz-monzonite gneiss in contact with calc-schist and skarn This sample contained about 3 percent unspecified, partly oxidized, sulfides, apparently of replacement origin It also assayed about 200 ppm lanthanum but no other anomalous metal values. The rocks in the area are granite gneiss of the Devonian Wild River Pluton, which intrudes Proterozoic or lower Paleozoic(?) schist of varying types, accompanied by some marble. (Dillon and others, 1986).

Kurtak and others (2002) searched about a mile to the southwest for mineralization described by Bliss and others (1988) as layers or veins of sphalerite and pyrite up to 8 centimeters thick in orange dolomite. They were not successful and none of the samples they collected had significant metal values. Six claims (EPI 1-6) were located by Canevex, Inc. in 1975 (Kurtak and others, 2002).

Alteration:

Not specifically mentioned.

Age of mineralization:

Possibly associated with the emplacement of a Devonian granite and quartz monzonite.

Generic deposit model:

Deposit model:

Several types of unclassified mineralization may be present.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Six claims (EPI 1-6) were located by Canevex, Inc. in 1975 (Kurtak and others, 2002). Field examination and sampling by several government agencies (Dillon and others, 1981; Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T., Jr., 1988, Maps and descriptions of lode and placer deposits, prospects, and occurrences in the Wiseman 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p., 2 plates, scale 1:250,000.

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Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Jay Creek; Eagle Gulch

Site type: Mine

ARDF no.: WI082

Latitude: 67.4067 **Quadrangle:** WI B-3

Longitude: 151.324

Location description and accuracy:

Jay Creek is a southwest-flowing tributary of Rye Creek; it is about 6 miles southeast of Mathews Dome. Eagle Gulch, which is not named on the Wiseman B-3 topographic map, is a small, right-limit headwater tributary to Jay Creek. Although the exact location of the placer workings on Jay Creek is not known, Reed (1938) noted that the claims extended from No. 1 Below Discovery (which reached about 500 feet into Rye Creek) to No. 5 Above Discovery, and that the creek was mined from the mouth to the lower portion of No. 5 Above. The midpoint of mining is in the lower part of section 22, T. 30 N., R. 17 W. The location is accurate.

Kurtak and others (2002) and possibly others combine Jay Creek and its downstream continuation, Rye Creek (WI084), in their discussion of placer mining in this drainage.

Commodities:

Main: Au

Other: Cu, Sb

Ore minerals: Chalcopyrite, gold, pyrite, stibnite

Gangue minerals: Quartz

Geologic description:

Gold was discovered on Jay Creek in 1904 but mining did not begin until 1912 (Reed, 1938). Jay Creek was once reputed to be the richest creek in the Wild River district. It is in a canyon that averages about 50 feet wide. Brooks (1916) reported that the pay streak was 30 feet wide and 4 feet thick. Reed (1938) reported that the gravel is thawed, very coarse grained, subangular, 3 to 12 feet thick, and that it contains numerous conglomerate boulders. The gold occurs throughout the gravel and in the upper foot of the bedrock. The gold is coarse, unworn, very dark colored, and about 970 fine. Kurtak and others (2002) and possibly others combine Jay Creek and its downstream continuum, Rye Creek (WI084), in discussing placer mining in this drainage.

From 1912 through at least 1935, the creek was mined by booming and shoveling into sluice boxes. Mining took place over 5 or 6 claim lengths from the mouth of the creek to the lower part of No. 5 Above Discovery. A mechanized mining operation was active on Jay Creek in 1998. A little gold was found in Jay Creek near the mouth of Eagle Gulch, a locally named, small, right-limit tributary to Jay Creek (Reed, 1938).

Reed (1938) estimated that the total production from Jay Creek through 1935 is about $200,000 (approximately 10,000 ounces). The ground that was mined had an average value of about $0.505 per square foot of bedrock (gold at $35 per ounce). There is no specific information available about mining specifically on Jay Creek in the 1990s as the same company mined both on Rye Creek (WI084) and Jay Creek (Kurtak and others, 2002). This early 10,000-ounce production figure conflicts with the Kurtak and others (2002) estimate that the combined total production of both the more productive(?) Rye Creek and Jay Creek 'could be as much as 3,537 ounces'.

Dillon (1982) reports a stibnite-quartz vein upstream from the placer, and Bliss and others (1988) speculate that the source of the gold is stibnite(?)-quartz veins in the drainage. The rocks in the vicinity

consist of alternating bands of graphitic schist, micaceous schist, and greenstone schist (Reed, 1938).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Probably inactive

Workings/exploration:

From 1912 through at least 1935, the creek was mined by booming and shoveling into sluice boxes. Mining took place over 5 or 6 claim lengths from the mouth of the creek to the lower part of No. 5 Above Discovery. A mechanized mining operation was active on Jay Creek in 1998 and probably a few years before.

Production notes:

Reed (1938) estimated that the total production from Jay Creek through 1935 is about $200,000 (approximately 10,000 ounces). The ground that was mined had an average value of about $0.505 per square foot of bedrock (gold at $35 per ounce). There is no specific information available about mining specifically on Jay Creek in the 1990s as the same company mined both on Rye Creek (WI084) and Jay Creek (Kurtak and others, 2002). This early 10,000-ounce production figure conflicts with the Kurtak and others (2002) estimate that the combined total production of both the more productive(?) Rye Creek and Jay Creek 'could be as much as 3,537 ounces.'

Reserves:

None.

Additional comments:

References:

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T., Jr., 1988, Maps and descriptions of lode and placer deposits, prospects, and occurrences in the Wiseman 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p., 2 plates, scale 1:250,000.

Brooks, A.H., 1916, The Alaskan mining industry in 1915: U.S. Geological Survey Bulletin 642, p.16-71.

Brooks, A.H., 1918, The Alaskan mining industry in 1916: U.S. Geological Survey Bulletin 662-A, p. 11-62.

Brooks, A.H., 1922, The Alaska mining industry in 1920: U.S. Geological Survey Bulletin 722-A, p. 1-74.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Williams, E.M., 1999, Mineral investigations in the Koyukuk mining district, northern Alaska--Progress Report: U.S. Bureau of Land Management Open-File Report 74, 158 p.

Mosier, E.L., and Lewis, J.S., 1986, Analytical results, geochemical signatures, and sample locality map of lode gold, placer gold, and heavy-mineral concentrates from the Koyukuk-Chandalar mining district, Alaska: U.S. Geological Survey Open-File Report 86-345, 172 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Smith, S.S., 1917, The mining industry in the Territory of Alaska during the calendar year 1915: U.S. Bureau of Mines Bulletin 142, 65 p.

Smith, P.S., and Mertie, J.B., Jr., 1930, Geology and mineral resources of northwestern Alaska: U.S. Geological Survey Bulletin 815, 315 p.

Primary Reference: Reed, 1938

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Silver King

Site type: Prospect

ARDF no.: WI083

Latitude: 67.2891 **Quadrangle:** WI B-3

Longitude: 151.3251

Location description and accuracy:

The Silver King prospect is along the north side of Michigan Creek about 2 miles east of Wild River at an elevation of about 1,100 feet. It is about 0.3 mile west of the top of hill 1370, near the northwest corner of section 34, T. 29 N., R. 17 W. Kurtak and others (2002: fig. I-5 and I-6) provide several excellent maps of the prospect. See figures I-5 and I-6 of Kurtak and others (2002) for a map of the prospect. The location is accurate.

Commodities:

Main: Ag, Au, Cu, Pb, Zn

Other: As, Sb

Ore minerals: Argentiferous galena, chalcopyrite, pyrite

Gangue minerals: Ankerite, quartz, siderite?

Geologic description:

Dillon and others (1986) describe the rocks in the area as Middle Devonian calcareous and chlorite-quartz schist interbedded with quartz-mica schist and marble. This schist unit is overlain by metabasites and felsic volcanic rocks of the Devonian and Mississippian Ambler metavolcanic sequence. The schist is locally deformed into broad, open folds.

Early descriptions of the Silver King prospect, beginning with Schrader (1904) describe it as argentiferous galena-bearing quartz veins in phyllite. Reed (1938) described several poorly exposed outcrops and float of galena-bearing quartz veins about 5 to 6 feet thick. A small adit noted by Reed that apparently did not cut mineralization is now caved. A 20-foot-long trench is about 100 feet north of the adit.

Nokleberg and others (1987 and 1996) characterize the occurrence as a Kuroko massive sulfide deposit. They describe the mineralization as 3- to 4-inch-thick zones of disseminated to massive chalcopyrite and argentiferous galena in felsic schist, with crosscutting pyrite veins. The country rocks are felsic schist, marble and phyllite of the Ambler sequence. Grab samples of the mineralized material contained up to 8.2 percent arsenic, 8.3 grams of gold per tonne, 3.9 grams of silver per tonne, 0.14 percent copper, 0.03 percent zinc, and 0.014 percent lead.

Kurtak and others (2002) mapped and sampled the mineralization . They interpret the deposit as quartz and quartz-carbonate veins 0.5 to 7.0 feet thick that trend northwest to northeast and can be traced for up to 80 feet along strike. The veins contain isolated clots and stringers of galena with minor pyrrhotite and chalcopyrite. A picked sample of galena-bearing quartz contained 121.9 parts per million (ppm) silver and 5.78 percent lead. Another sample from a 7-foot-thick quartz vein contained 64.5 ppm silver, 5.34 percent lead, and 2,000 ppm antimony. Locally, large pieces galena with minor pyrrhotite and chalcopyrite can be found in float; one assayed 583 ppm silver and 168 parts per billion gold.

About a thousand feet upstream from the main prospect in the gorge of Michigan Creek, at least 5 quartz veins 0.5 to 10-feet thick are exposed in the canyon walls. The veins strike about N10W and cut across the schistosity of the wall rocks. A chip sample across a 0.5-foot-wide vein contained 650 ppm silver.

Alteration:

Not specifically noted.

Age of mineralization:

Interpreted as different workers as either epigenetic galena-quartz veins that cut Devonian schist or as a Kuroko massive-sulfide deposit related to the felsic rocks of the Devonian and Mississippian Ambler sequence.

Generic deposit model:

Deposit model:

Galena-quartz veins or Kuroko massive sulfide? (Cox and Singer, 1986; model 28a?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a?

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Before 1938, a 7x7 foot adit, 75 feet long, was driven into the north wall of the canyon of Michigan Creek, probably to undercut a vein exposed in a surface trench about 150 feet north and 100 feet higher than the portal of the adit. This adit was caved in 1999 (Kurtak and others, 2002). Mapped and sampled by several government agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brooks, A.H., 1923, The Alaska mining industry in 1921: U.S. Geological Survey Bulletin 739-A, p. 1-50.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

Dillon, J.T., Cathrall, J.B., and Moorman, M.A., 1981, Geochemical reconnaissance of the southwest Wiseman quadrangle-summary of data on rock samples: Alaska Division of Geological and Geophysical Surveys Open-File Report 133B, 164 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Nokleberg, W.J., Bundtzen, T.K., Berg, H.C., Brew, D.A., Grybeck, D.J., Robinson, M.S., Smith, T.E., and Yeend, W., 1987, Significant metalliferous lode deposits and placer districts of Alaska: U.S. Geological

Survey Bulletin 1786, 104 p., 2 plates, scale 1:5,000,000.

Nokleberg, W.J., Bundtzen, T.K., Dawson, K.M., Eremin, R.A., Goryachev, N.A., Koch, R.D., Ratkin, V.V, Rozenblum, I.S., Shpikerman, V.I., Frolov, Y.F., Gorodinsky, M.E., Melnikov, V.D., Diggles, M.F., Ognyanov, N.V., Petrachenko, E.D., Petrochenko, R.I., Pozdeev, A.I., Ross, K.V., Wood, D.H., Grybeck, D., Khanchuck, A.I., Kovbas, L.I., Nekrasov, I.Y., and Sidorov, A.A., 1996, Significant metalliferous and selected non-metalliferous lode mineral deposits and placer districts, and metallogenesis of the Russian Far East, Alaska, and the Canadian Cordillera: U.S. Geological Survey Open-File Report 96-513-B, 385 p.; U.S. Geological Survey Open-File Report 96-513-B, 385 p. (CD-ROM format).

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Schrader, F.C., 1904, A reconnaissance in northern Alaska across the Rocky Mountains, along Koyukuk, John, Anaktuvuk, and Colville rivers and the Arctic coast to Cape Lisburne, in 1901, with notes by W.J. Peters: U.S. Geological Survey Professional Paper 20, 139 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Rye Creek

Site type: Mine

ARDF no.: WI084

Latitude: 67.4092 **Quadrangle:** WI B-3

Longitude: 151.3745

Location description and accuracy:

Rye Creek is a west-flowing tributary to Flat Creek that joins it about 4 miles south-southwest of Mathews Dome. More than a mile of Rye Creek from where it emerges onto the flat valley of Flat Creek to the mouth of Jay Creek (WI082) has been placer mined. The coordinates are at about the midpoint of the mining in the 1980s and 1990s. This location is about 0.2 mile southwest of the center of section 21, T. 30 N., R. 17 W. The location is accurate.

Commodities:

Main: Au

Other: Cu, Pb, REE, W

Ore minerals: Chalcopyrite, galena, gold, ilmenite, monazite, pyrite, scheelite

Gangue minerals:

Geologic description:

Placer gold was found at Rye Creek in 1915 (Brooks, 1916). As described by Reed (1938), gold was found in three environments; along the present channel, along a high channel, and along a deep channel. Beginning in the early history of mining on Rye Creek, the present channel was mined from the mouth of Jay Creek for a short distance out into the alluvial fan where Rye Creek enters the valley of Flat Creek. Most of the mining was by open cut methods but there was some drift mining on the lower part of the creek. A high channel on the north side of the lower valley of Rye Creek was explored by shafts and in the 1990s by mechanical mining with heavy equipment. A deep channel occurs along the right limit of Rye Creek. A shaft was sunk 85 feet to bedrock beside lower Rye Creek and the deep channel was drift mined for a short distance. There was additional drift mining along the deep channel about 0.2 mile below Jay Creek, where the depth to bedrock is about 20 feet. Several deep shafts and drill holes were sunk in the valley of Flat Creek above the lower part of Rye Creek, but a 350-foot drill hole bottomed in muck and ice. Kurtak and others (2002) also found signs of old mining in the upper portion of Rye Creek, locally known as Lucky Creek, above the mouth of Jay Creek (WI082).

Rye Creek was first mined in 1904, then for several years between 1912 and 1916, from 1933 to 1937, and in the late 1960s. There was extensive mining from 1983 to at least 1999 by the Northern Lights Mining Company (Kurtak and others (2002). Reed (1938) reported that total gold production from Rye Creek to 1938 was $55,000 (approximately 1,600 ounces). Nearly half of that was recovered from a short section just below Jay Creek (WI082), where the gold values were about $3.35 per square foot of bedrock (gold at $35 per ounce). The only other documented gold production is 101 ounces in 1938 and 1939. However, Kurtak and others (2002) indicate that the total gold production 'could be as much as 3,537 ounces'.

The gravel in Rye Creek is angular, coarse, and contains numerous small boulders. Miners report that the gold occurs in pockets and that some of it is coarse. Much of the early mining may have concentrated on these pockets. During the mining in the late 1990s, mechanical equipment stripped the gravel over the bedrock and a metal detector was used to check the bedrock for large nuggets. A 7.5 ounce nugget was found this way.

Reed (1938) reports that the bedrock on lower Rye Creek to about 0.5 mile below the mouth of Jay Creek

is blue crystalline limestone; upstream, the bedrock is schist. He suspects a fault contact between these two units. Dillon and others (1986) mapped most of lower Rye Creek as Skajit Limestone; the uppermost part of the creek flows across Devonian chloritic and carbonate rocks. White (1952) reported various accessory minerals in panned samples from Rye Creek; these include ilmenite, andalusite, kyanite, pyrite, zircon, chalcopyrite, monazite, galena, and scheelite.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Probably inactive

Workings/exploration:

Rye Creek was first mined in 1904, then or several years between 1912 and 1916, from 1933 to 1937, and in the late 1960s. There was extensive mining from 1983 to at least 1999 by the Northern Lights Mining Company (Kurtak and others, 2002).

Production notes:

Reed (1938) reported that total gold production from Rye Creek to 1938 was $55,000 (approximately 1,600 ounces). Nearly half of that was recovered from a short section just below Jay Creek (WI082), where the gold values were about $3.35 per square foot of bedrock (gold at $35 per ounce). The only other documented gold production is 101 ounces in 1938 and 1939. However, Kurtak and others (2002) indicate that the total gold production could be as much as 3,537 ounces'.

Reserves:

Unknown but it is likely that at least some gold remains despite several episodes of mining over more than 100 years.

Additional comments:

References:

Brooks, A.H., 1916, The Alaskan mining industry in 1915: U.S. Geological Survey Bulletin 642, p.16-71.

Brooks, A.H., 1918, The Alaskan mining industry in 1916: U.S. Geological Survey Bulletin 662-A, p. 11-62.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral

occurrences in the Wiseman quadrangle, Alaska; Supplement to Open-File Report 76-340; Part B, Lists of references to January 1, 1981: U.S. Geological Survey Open-File Report 81-732-B, 22 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

White, M.G., 1952, Radioactivity of selected rock and placer concentrates from northeastern Alaska: U.S. Geological Survey Circular 195, 12 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (near Mathews Dome)

Site type: Occurrence

ARDF no.: WI086

Latitude: 67.4693 **Quadrangle:** WI B-3

Longitude: 151.4826

Location description and accuracy:

This occurrence consists of rock samples collected by two government parties over a distance of about 2,000 feet immediately north of the summit of Mathews Dome. The occurrence is centered at an elevation of about 4,100 feet on the ridge about 0.2 mile north-northwest of the 4,618-foot peak of Mathews Dome, about 0.3 mile west of the center of section 36, T. 31 N., R. 17 W. The location is accurate.

Commodities:

Main: Ag, Au, Cu

Other:

Ore minerals: Bornite, malachite, tetrahedrite?

Gangue minerals: Calcite, quartz

Geologic description:

This occurrence consists of bornite, malachite, and possibly tetrahedrite in quartz veins in altered schist (Chipp, 1972). The rocks in the area consist of Devonian phyllite, schist, and subordinate limestone/dolomite (Chipp, 1972). Seven samples contained up to 0.1 part per million (ppm) gold, 14 ppm silver, and 2.1 percent copper. Kurtak and others (2002) reexamined the site and collected several samples. A 3-foot continuous chip sample of calcareous schist collected immediately north of Mathews Dome contained 8,630 ppm copper and a cross-cutting quartz vein at the same locality contained 4,003 ppm copper. Both the quartz veins and calcareous schist are overlain by green chlorite schist with sparse tetrahedrite, bornite(?), and malachite. The copper mineralization along the ridge is limited and discontinuous, extending for a quarter of a mile or less.

Alteration:

Oxidation of copper mineral(s). One sample of calc-schist is described as altered, but there is no description of the alteration.

Age of mineralization:

Devonian or younger based on the age of the host rock.

Generic deposit model:

Deposit model:

Unclear whether epigenetic, syngenetic, remobilized, or a combination of these.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Examination and sampling by the Alaska Division of Geological and Geophysical Surveys and the Bureau of Land Management. (Chipp, 1972; Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Chipp, E.R., 1972, Analyses of rock and stream sediment samples, Wild Lake area, Wiseman quadrangle, Arctic Alaska: Alaska Division Geological Survey Geochemical Report 25, 2 sheets.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in the Wiseman quadrangle, Alaska; Supplement to Open-File Report 76-340; Part B, Lists of references to January 1, 1981: U.S. Geological Survey Open-File Report 81-732-B, 22 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Primary Reference: Chipp, 1972

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (north of Mathews Dome)

Site type: Occurrence

ARDF no.: WI087

Latitude: 67.4766 **Quadrangle:** WI B-3

Longitude: 151.4908

Location description and accuracy:

This occurrence is about 0.6 mile north of the summit of Mathews Dome. It is at an elevation of about 4,000 feet near the southwest corner of section 25, T. 31 N., R. 18 W., of the Fairbanks Meridian. The location is accurate.

Commodities:

Main: Ag, Cu

Other:

Ore minerals: Malachite

Gangue minerals: Quartz

Geologic description:

This occurrence consists of traces of malachite in quartz veins and schist (Chipp, 1972). Selected grab sample of schist contain 2.1% copper and 14.0 ppm silver. A sample of vein quartz contained no anomalous values. (Samples 501 and 502 of Dillon and others (1981 [AOF 133B]) are the same as samples 136 and 137 of Chipp (1972) that are cited above.). The rocks in the area are Devonian phyllite, schist, and subordinate limestone or dolomite (Chipp, 1972).

Alteration:

Oxidation of copper mineral.

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only surface sampling.

Production notes:

None.

Reserves:

None.

Additional comments:

See also Mathews Dome (WI086).

References:

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T., Jr., 1988, Maps and descriptions of lode and placer deposits, prospects, and occurrences in the Wiseman 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p., 2 plates, scale 1:250,000.

Chipp, E.R., 1972, Analyses of rock and stream sediment samples, Wild Lake area, Wiseman quadrangle, Arctic Alaska: Alaska Division Geological Survey Geochemical Report 25, 2 sheets.

Dillon, J.T., Cathrall, J.B., and Moorman, M.A., 1981, Geochemical reconnaissance of the southwest Wiseman quadrangle-summary of data on rock samples: Alaska Division of Geological and Geophysical Surveys Open-File Report 133B, 164 p.

Primary Reference: Chipp, 1972

Reporter(s): J.M. Britton (Anchorage)

Last report date: 2010-05-14

Site name(s): Fall Creek

Site type: Prospects

ARDF no.: WI089

Latitude: 67.2969 **Quadrangle:** WI B-3

Longitude: 151.2138

Location description and accuracy:

Fall Creek is a west-flowing tributary to Michigan Creek; its mouth is about 6 miles southwest of Ipnek Mountain. The exact locations of placer prospects on Fall Creek are unknown and the site is arbitrarily placed approximately 1 mile upstream from its mouth, near the center of section 31, T. 29 N., R. 16 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Reed (1938) did not visit visit Fall Creek but was told that it flowed entirely over schist and that very good prospects had been found on it in the early 1900s. The area was investigated by Kurtak and others (2002); they found no evidence of mining or prospecting.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Inactive

Workings/exploration:

Probably only prospected and no record of that since the early 1900s.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Bourbon Creek

Site type: Mine

ARDF no.: WI090

Latitude: 67.2725 **Quadrangle:** WI B-3

Longitude: 151.1664

Location description and accuracy:

Bourbon Creek is not named on the Wiseman B-3 topographic map. Reed (1938) describes Bourbon Creek as a left-limit tributary of Fall Creek. Later publications (Cobb (1972 [MF469]); Maas, 1987; Bliss and others, 1988) placed the mouth of Bourbon Creek about 2.5 miles upstream from the mouth of Fall Creek although at least two other tributaries farther upstream could correspond to Reed's description. This mine is somewhat arbitrarily located near the mouth of the tributary in the NW1/4 section 6, T. 28 N., R. 16 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Reed (1938) indicated that Bourbon Creek was extensively mined in the early 1900s and was thought to have been mined out by 1937. Kurtak and others (2002 located placer workings that included stacked rocks, a small trench, and the remnants of a small dam on the right limit of the west tributary of the creek about a mile above its mouth. There was no indication of recent workings.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Probably inactive

Workings/exploration:

Reed (1938) indicated that Bourbon Creek was extensively mined in the early 1900s and was thought to have been mined out by 1937. Kurtak and others (2002 located placer workings that included stacked rocks, a small trench, and the remnants of a small dam on the right limit of the west tributary of the creek about a mile above its mouth. There is no other indication of mining nor any record of claims in recent years.

Production notes:

Reed (1938) indicated that Bourbon Creek was extensively mined in the early 1900s and was thought to have been mined out by 1937. There is no record of more recent mining. Production was probably small.

Reserves:

None.

Additional comments:

References:

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T.Jr., 1988, Maps and descriptions of lode deposits, prospects, and occurrences in the Wiseman 1o by 3o Quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p.plus 2 plates.

Cobb, E.H., 1972, Metallic mineral resources map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-469, 1 sheet, scale 1:250,000

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Maas, K.M., 1987, Maps summarizing land availability for mineral exploration and development in northern Alaska, 1986: U.S. Bureau of Mines Open-File Report 10-87, 33 quadrangle overlays.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Oregon Creek

Site type: Prospects

ARDF no.: WI093

Latitude: 67.4692 **Quadrangle:** WI B-3

Longitude: 151.3986

Location description and accuracy:

Oregon Creek is not named on the Wiseman B-3 topographic map. It is a small right-limit tributary to Flat Creek. The mouth of Oregon Creek is about 1.5 miles north of the junction of Birch and Flat Creeks. The location of the placer prospects on Oregon Creek is not known and the site is plotted just upstream from the mouth of the creek in about the center of section 32, T. 31 N., R. 17 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Reed (1938) reported that good placer prospects had been found on Oregon Creek but that there had been no mining. Kurtak and others (2002) noted that claims were intermittently active from the 1970s to 2002. Reed described the bedrock on Oregon Creek as schist; Dillon and others (1986) map the area as Upper Devonian(?), Hunt Fork Shale and Middle Devonian(?) siliceous clastic rocks.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Undetermined

Workings/exploration:

There was prospecting on Oregon Creek but apparently no mining. There were active claims on the creek

from the 1970s to at least 2002.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in the Wiseman quadrangle, Alaska; Supplement to Open-File Report 76-340; Part B, Lists of references to January 1, 1981: U.S. Geological Survey Open-File Report 81-732-B, 22 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Minnie Creek

Site type: Mine

ARDF no.: WI096

Latitude: 67.4207 **Quadrangle:** WI B-1

Longitude: 150.0675

Location description and accuracy:

Minnie Creek is a west-flowing tributary to the Middle Fork, Koyukuk River; it joins the Middle Fork about 0.8 mile north of Wiseman. Only the lower three miles of Minnie Creek are in the Wiseman quadrangle; the upper 6 miles is in the Chandalar quadrangle. Although most indications of placer activity are in the Chandalar quadrangle, the exact location of prospecting and/or mining is uncertain. This mine is arbitrarily placed approximately 1 mile upstream from the mouth of Minnie Creek near the southwest corner of section 17, T. 30 N.., R. 11 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Minnie Creek reportedly was heavily prospected and locally drift mined in the early 1900s, but it is unclear where this activity occurred (Reed, 1938). Water problems hindered excavation to bedrock and the early mining efforts were not very successful (Reed, 1938). A shaft to bedrock in 1904 reportedly produced $500 of 'shot' gold from a short drift before it flooded. Drift mining was concentrated in a deep channel. Apparently no gold was produced from the modern channel or from benches, although benches are present. Limited evidence suggests that most mining on Minnie Creek has been on the middle and upper parts of the creek in the Chandalar quadrangle, although it is likely that at least some prospecting has occurred along the lower portion of the creek in the Wiseman quadrangle. Based on incomplete records, Kurtak and others (2002) report that Minnie Creek produced 132 ounces of gold from 1904 to 1916. Claims were active intermittently from the 1970s to the 1990s, but there is no record of production from 1916 to 2000.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

Considerable prospecting and some drifting was reported in the early 1900s, but underground water impeded mining. Claims were active intermittently from the 1970s to the 1990s, but there is no record of production from 1916 to 2000.

Production notes:

Based on incomplete records, Kurtak and others (2002) report that Minnie Creek produced 132 ounces of gold from 1904 to 1916. Claims were active intermittently from the 1970s to the 1990s, but there is no record of production from 1916 to 2000.

Reserves:

None.

Additional comments:

References:

Brooks, A.H., 1913, The mining industry in 1912: U.S. Geological Survey Bulletin 542-A, p. 18-51.

Brooks, A.H., 1918, The Alaskan mining industry in 1916: U.S. Geological Survey Bulletin 662-A, p. 11-62.

Brosgé, W.P., and Reiser, H.N., 1972, Geochemical reconnaissance in the Wiseman and Chandalar districts and adjacent region, southern Brooks Range, Alaska: U.S. Geological Survey Professional Paper 709, 21 p.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

Dillon, J.T., 1987, Upper Koyukuk district land and mining claim status current to 1985: Alaska Division of Geological and Geophysical Surveys Public-Data File 87-11, 1 sheet, scale 1:125,000.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Lofty Gulch

Site type: Mine

ARDF no.: WI097

Latitude: 67.4863 **Quadrangle:** WI B-1

Longitude: 150.0898

Location description and accuracy:

Lofty Gulch is a short, steep, south tributary to the lower Hammond River, between Swift Creek and Gold Bottom Gulch. Placer mining has occurred from near the mouth of Lofty Gulch to about 1,500 feet upstream. The mine is plotted near the mouth of the gulch, about 0.5 mile south of the center of section 30, T., 31 N., R. 12 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Lofty Gulch was mined near its mouth in the early 1900s (Reed, 1938). There has been no mining on the upper part of the creek where it is narrow, steep, and contains only limited amounts of gravel. According to Reed (1938), the creek was mined out. Kurtak and others (2002) examined the creek in about 2000; there was no sign of mining. There is no record of production, but it probably was small.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

There was limited mining near the mouth of Lofty Gulch prior to 1938.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

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Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Union Gulch; Union Creek

Site type: Mine

ARDF no.: WI098

Latitude: 67.4536 **Quadrangle:** WI B-1

Longitude: 150.1039

Location description and accuracy:

Union Gulch flows southeast from Midnight Dome into the Middle Fork Koyukuk River. It is about 3 miles north of Wiseman and about 0.5 mile west of the center of section 6, T. 30 N., R. 11 W. Eden (2000) indicates that the placer gold was mined about 0.8 mile upstream from the mouth of Union Gulch at an elevation of about 1,300 feet.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

The placer gold that was mined on Union Gulch came from the modern stream channel (Reed, 1938). The gravel is less than 3 feet thick over bedrock for most of the creek. Gold was discovered in 1901 when a 32-ounce nugget was recovered. Maddren (1913) reported that $35,000 of gold (about 1,850 ounces) was produced from 1900 through 1909, with $30,000 of that in 1902. Kurtak and others (2002) give slightly different figures. They report a total production of 1,633 ounces from 1901 to 1935, with 1,451 ounces of that in 1902. Mining was reported in 1934 and 1937, but Mulligan (1974) indicated that the property was inactive as of 1974. Bliss and others (1986) reported some mining from 1980 to 1982. Kurtak and others (2002) reported that mining was being done with a trommel, sluice box, and suction dredge from the 1990s to the at least 2002. The production since 1935 is not known.

Kurtak and others (2002) examined and sampled the property. They also conducted a ground-penetrating-radar survey along the benches on lower Union Creek to locate buried channels; the results were inconclusive.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active?

Workings/exploration:

Maddren (1913) reported that $35,000 of gold (about 1,850 ounces) was produced from 1900 through 1909, with $30,000 of that produced in 1902. Mining was reported in 1934 and 1937, but Mulligan (1974) indicated that the property was inactive as of 1974. Bliss and others (1986) reported some mining activity from 1980 to 1982. Kurtak and others (2002) reported that mining was being done with a trommel, sluice box, and suction dredge from the 1990s to at least 2002. Kurtak and others (2002) examined and sampled the property. They also conducted a ground-penetrating-radar survey along the benches on lower Union Creek to locate buried channels; the results were inconclusive.

Production notes:

Maddren (1913) reported $35,000 of gold (about 1,850 ounces) was produced from 1900 through 1909, with $30,000 of that in 1902. Kurtak and others (2002) give slightly different figures. They report a total production of 1,633 ounces from 1901 to 1935, with 1,451 ounces of that in 1902. Mining was reported in 1934 and 1937, but Mulligan (1974) indicated that the property was inactive as of 1974. Bliss and others (1986) reported some mining activity from 1980 to 1982. Kurtak and others (2002) reported that mining was being done with a trommel, sluice box, and suction dredge from the 1990s to at least 2002. The production since 1935 is not known.

Reserves:

None.

Additional comments:

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Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T., Jr., 1988, Maps and descriptions of lode and placer deposits, prospects, and occurrences in the Wiseman 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p., 2 plates, scale 1:250,000.

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Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Confederate Gulch

Site type: Mine?

ARDF no.: WI099

Latitude: 67.4631 **Quadrangle:** WI B-1

Longitude: 150.0913

Location description and accuracy:

Confederate Gulch is a small creek that drains into the west of the Middle Fork Koyukuk River. It is about 3.5 miles north-northeast of Wiseman and about 0.4 mile south of the center of section 31, T. 31 N., R. 11 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Confederate Gulch was prospected extensively in the early 1900s and some coarse gold was recovered during prospecting (Maddren, 1913; Reed, 1938). The amount of gold, however, was insufficient to justify intensive mining. Kurtak and others (2002) examined and sampled the creek. They found no evidence of mining and none of their samples showed visible gold.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Undetermined

Workings/exploration:

Prospected and some mining in the early 1900s; examined by the Bureau of Land Management in about 2000.

Production notes:

There is no record of production but a small amount of gold was recovered in the early 1900s.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

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Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Maddren, 1913

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Buckeye Gulch; Buckeye Creek

Site type: Mine

ARDF no.: WI100

Latitude: 67.4981 **Quadrangle:** WI B-1

Longitude: 150.1155

Location description and accuracy:

Buckeye Gulch is a short, east-flowing tributary to the lower Hammond River. It is approximately 2 miles northeast of Smith Creek Dome and extends through the middle of section 24, T. 31 N., R. 12 W. Buckeye Gulch has been placer mined for about 2,000 feet above its mouth. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Gold was first mined on Buckeye Gulch in 1904 (Maddren, 1913). To 1913, the mine produced 0.32 to 0.54 ounce of gold per man day of work. Reed (1938) indicated that the early mining extended for about 2,000 feet above the mouth of the gulch. Reed (1938) noted that a high channel of the Hammond River, which was exposed in Buckeye Gulch just above its mouth, was being explored in 1937. The only evidence of mining found by Kurtak and others (2002) was stacked rocks along the gulch. Buckeye Gulch produced 685 ounces of gold from 1904 to 1935; 612 ounces of that was in 1907 (Kurtak and others, 2002). Dillon (1982) suggested that the gold near the mouth of the gulch probably was derived from bench gravels of the Hammond River.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

About 2,000 feet of Buckeye Gulch above its mouth was mined from 1904 to 1935; most of the production was in 1907. A high channel of the Hammond River which was exposed in Buckeye Gulch just above its mouth was being explored in 1937 (Reed, 1938).

Production notes:

Buckeye Gulch produced 685 ounces of gold from 1904 to 1935; 612 ounces of that was in 1907 (Kurtak and others, 2002).

Reserves:

None.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

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Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Nolan Creek

Site type: Mine

ARDF no.: WI101

Latitude: 67.4745 **Quadrangle:** WI B-1

Longitude: 150.2324

Location description and accuracy:

Nolan Creek is a south-southwesterly-flowing tributary of Wiseman Creek; its mouth is about 5 miles northwest of Wiseman. The coordinates are at the old town of Nolan just above the mouth of Smith Creek. The placer deposits extend for about 1 mile below and 1.75 miles above the town. The productive portion of Nolan Creek crosses sections 27, 28, and 33, T. 31 N., R. 12 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

There are three types of gold placers on Nolan Creek: 1) placers in shallow gravel just below the mouth of Fay Creek along the present channel of Nolan Creek; 2) a deep channel roughly under the present course of Nolan Creek from downstream of the mouth of Fay Creek to just below Smith Creek, and 3) bench deposits along the east side of the Nolan Creek valley from just north of Archibald Creek to 0.5 mile south of Smith Creek. The deep channel has been by far the most productive.

The present channel in Nolan Creek was mined just below the mouth of Fay Creek (near the Discovery claim) from 1903 to 1905. This placer and placers in shallow gravels on Smith and Fay Creeks produced a considerable amount of gold. The shallow gravels on Nolan Creek were about 3.5 feet thick and lay on false bedrock in the valley fill. Reed (1938) suggested that the gold in this placer was derived from erosion of gold-bearing gravels in Fay Creek. The auriferous gravel was 20 to 75 feet wide. The deposits were small and mined out in a short time (Reed, 1938).

The most productive of the Nolan Creek placers has been along the deep channel that roughly coincides with the present course of Nolan Creek from near the mouth of Fay Creek to about three-quarters of a mile below the mouth of Smith Creek, i.e., for about 2 miles. At its upper end, bedrock is about 20 feet deep; it gradually deepens to over 200 feet at its lower end. The average gradient of the deep channel is about 2 percent but there are sections with steeper gradients and 'dropoffs' as the deep channel goes down valley. The gravel and overlying fill in Nolan Creek is frozen. It is waterworn and generally fairly fine but large boulders commonly are scattered throughout the gravel. The gold in the deep channel lies directly on bedrock. It is rounded and waterworn and generally coarse grained; nuggets up to 40 ounces have been found. Values, according to Reed (1938), vary from $1.15 to as much as $15 per square foot of bedrock (gold at $35 per ounce). In addition to the principal deep channel, there are sections of other deep channels that have been preserved at levels above the main deep channel. Reed (1938) speculated that these remnants may have been bench deposits formed either when the deep-channel stream was active, or when an aggrading Nolan Creek deposited gold in channels cut in the valley walls as it meandered across the valley floor.

The deep channel was drift mined from before 1913 (Maddren, 1913) to 1938 when it was considered to be mined out (Reed, 1938). In 1989, Silverado Gold Mines Ltd. attempted to reach the deep channel near

the mouth of Acme Creek (WI120) with a decline but was unsuccessful. However, in 1996, Silverado Gold Mines Ltd. began mining the deep channel from a decline and continued drift mining on it in 1998 and 1999 (Bundtzen, 2008).

The bench deposits on Nolan Creek are its east side from just north of Archibald Creek to about a half mile south of Smith Creek. The tops of the bench deposits are 50 to 200 feet above the modern stream channel and bedrock is covered by 40 to 100 feet of overburden. The auriferous gravel varies from 50 to 200 feet wide and extend 300 to 1,000 feet. From north to south, the bench deposits along the east side of Nolan Creek are: the Wooll Bench, the Swede Channel, Mary's Bench, Pingel Bench, and Workman Bench. The gravel in these bench deposits is frozen and coarse but contains few boulders. The gold is coarse; it includes small nuggets and a few large nuggets. The gold fineness varies from 885 to 962. According to Reed (1938) these deposits varied in value from $0.25 to $4.20 per square foot of bedrock (gold at $35 per ounce).

The bench deposits were drift mined in early years with water brought in by ditches but mining was difficult due to the lack of a reliable water supply. In 1991 and 1992, Inside Out Mining drift mined the Nolan Bench. In 1993, Silverado purchased the bench claims (and claims covering many of the streams in the area) and began mining them. In 1988, Silverado mined the Swede Channel and Mary's Bench, and in 1999, the Workman Bench.

Most years between 1979 and 2007, Silverado mined along Nolan Creek and its tributaries Fay Creek (WI112), Archibald Creek (WI113), and Smith Creek (WI116). During that period, the placers produced 23,150 ounces of gold from 271,771 cubic yards of gravel with an average grade of 0.085 ounce of gold per cubic yard. More than two-thirds of the production was by underground drift mining in the winter; the rest was by open-cut mining with heavy equipment in the summer. Some of the mining was to test the gravels east of Nolan Creek or in its tributaries. Most of the gold, probably about 20,000 ounces was produced from the bench deposits east of Nolan Creek. Most of the production took place between 1993 and 1995 but continued at various places along benches on the east side of the creek until 2007.

Nolan Creek has produced gold for at least 63 of the years between 1904 and 2000; the most productive period was 1908 and 1909, when it produced more than 93,000 ounces of gold. Eden (2000) reports that a total of 135,437.70 ounces of gold was produced from it between 1904 and 1999. Kurtak and others (2002) provide (incomplete) production figures year by year from 1904 to 2000 that total 147,045 ounces of gold. Bundtzen (2008) estimates that Nolan Creek and its tributaries, Smith Creek (WI116), Archibald Creek (WI113), and Fay Creek (WI112), have produced about 185,000 ounces of gold from 1901 to 2007.

Bundtzen (2008) estimated that Nolan Creek and its tributaries still had: 1) an 'indicated resource' of 66,800 cubic yards of gravel with an average grade of 0.095 ounce of gold per cubic yard (or 6,250 ounces of gold); and 2) an 'inferred resource' of 103, 500 cubic yards of gravel that contain 3,012 ounces of gold. This gold is in several locations along the Nolan Deep Channel between the mouth of Fay Creek and the mouth of Archibald Creek; in two bench deposits east of Nolan Creek between Fay Creek and Smith Creek; and in shallow gravel along Smith Creek (WI116).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Nolan Creek has been extensively mined and prospected beginning in 1903 and continuing until until at least 2007, with production in at least 63 of those years (Kurtak and others, 2002; Bundtzen, 2008, 2009). Most mining into the 1960s was by underground drifting. Mining since 1979 has been by a combination of open-pit operation in the summer and underground drift mining in frozen gravel in the winter.

Production notes:

Nolan Creek has produced gold for at least 63 of the years between 1904 and 2000; the most productive period was 1908 and 1909 when it produced more than 93,000 ounces of gold. Eden (2000) reports that a total of 135,437.70 ounces of gold was produced from Nolan Creek between 1904 and 1999. Kurtak and others (2002) provides (incomplete) production figures year by year from 1904 to 2000 that total 147,045 ounces of gold. Bundtzen (2008) estimates that Nolan Creek and its tributaries--Smith Creek (WI116), Archibald Creek (WI113), and Fay Creek (WI112)-- have produced about 185,000 ounces of gold from 1901 to 2007.

Reserves:

Bundtzen (2008) estimated that Nolan Creek and its tributaries still had: 1) an 'indicated resource' of 66,800 cubic yards of gravel with an average grade of 0.095 ounce of gold per cubic yard (or 6,250 ounces of gold); and 2) an 'inferred resource' of 103, 500 cubic yards of gravel that contain 3,012 ounces of gold. This gold is in several locations along the Nolan Deep Channel between the mouth of Fay Creek and the mouth of Archibald Creek; in two bench deposits east of Nolan Creek between Fay Creek and Smith Creek; and in shallow gravel along Smith Creek (WI116).

Additional comments:

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Primary Reference: Reed, 1938; Bundtzen, 2008

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Swift Creek; Swift Gulch

Site type: Mine

ARDF no.: WI102

Latitude: 67.4914

Quadrangle: WI B-1

Longitude: 150.1052

Location description and accuracy:

Swift Creek is a northeast-flowing tributary of the Hammond River that begins on the northeast flank of Smith Creek Dome. The placer deposits extend from the mouth of Swift Creek about a mile upstream and then continue a short distance up a small, left-limit gully. The mine is near the southwest corner of section 19, T. 31 N., R. 11 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Gold was produced from Swift Creek as early as 1901 (Schrader, 1904). The richest placer deposits were near the mouth, although the mines produced only wages and small amounts of coarse gold (Maddren, 1913). The modern stream bed has been mined as was a high channel that coalesced with an eroded high channel of the Hammond River (Reed, 1938). Some of the gold had a white coating similar to that on the gold from Smith Creek (WI116). Mosier and Lewis (1986) report that the gold from the high channel was 880 fine from the high channel and 924 fine from the modern channel. Kurtak and others (2002) report the production by year from 1902 to 1941; gold was recovered in 22 of those years. The total production was 1,396 ounces of gold; the best year was 1916 when 212 ounces were recovered. Claims were active at various times from 1979 to 1996. The rocks in the area are mainly Devonian chlorite-mica schist, quartz-mica schist, and phyllite (Eden, 2000).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Inactive

Workings/exploration:

Swift Creek was mined by hand methods during 20 of the years from 1902 to 1941.

Production notes:

Kurtak and others (2002) report the production by year from 1902 to 1941; gold was recovered in 22 of those years. The total production was 1,396 ounces of gold; the best year was 1916 when 212 ounces were recovered.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

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Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

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Mosier, E.L., and Lewis, J.S., 1986, Analytical results, geochemical signatures, and sample locality map of lode gold, placer gold, and heavy-mineral concentrates from the Koyukuk-Chandalar mining district, Alaska: U.S. Geological Survey Open-File Report 86-345, 172 p.

Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

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Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Hammond River; Hammond Creek

Site type: Mine

ARDF no.: WI103

Latitude: 67.4904 **Quadrangle:** WI B-1

Longitude: 150.0927

Location description and accuracy:

The Hammond River is a large, northern tributary of the Middle Fork, Koyukuk River. The mouth of the Hammond River is about 4 miles northeast of Wiseman and 3 miles east of Midnight Dome. The productive part of the river begins about 1.5 miles above its mouth near the mouth of Jennie Creek (WI169) and extends upriver for about 3 miles to the mouth of Vermont Creek (WI027). For this record, the coordinates are about 0.5 mile south of the center of section 19, T. 31 N., R. 11 W., near the midpoint of the productive section.

Commodities:

Main: Au

Other:

Ore minerals: Galena, gold, pyrite

Gangue minerals:

Geologic description:

The Hammond River is one of the largest gold producers in the Koyukuk District. Most of the production has come from a three-mile section of the river that extends from the mouth of Jennie Creek (WI169) to the mouth of Vermont Creek (WI027).

Gold was discovered on the Hammond River about 1900 about 2 miles above its mouth (Maddren, 1913). Early work concentrated on mining the shallow gravel along the modern stream channel, notably near the discovery claim about 0.4 mile upstream from the mouth of Jennie Creek and along river meanders as far upstream as Buckeye Gulch (WI100). According to Maddren (1913), mining in the modern channel produced about $8,000 to $10,000 in gold (gold at $20.67 per ounce) by 1913. Most of these deposits were soon mined out although some shallow ground was mined as recently as from 1985 to 1987 near the mouth of Swift Creek and probably elsewhere over the years.

In 1911, drift mining began on the deep channel below the Hammond River and it is the major source of the gold. The deep channel has been mined from near the mouth of Buckeye Gulch to about a mile and a half above the mouth of the river. The lower end of the deep channel extends into the valley of the Middle Fork, Koyukuk River, but is truncated there, presumably by glacial scouring. The deep channel was about 114 feet deep about 0.2 mile above the mouth of Jennie Creek and was thought to be too deep and wet to mine downstream. The deep channel, except for a few areas overlooked by the early miners, was thought to be mined out by 1937 (Reed, 1938). Workings in one of these overlooked areas in 1936 and 1937 found a section 8-10 thick of paying gravel. The channel was 35 feet wide and the depth to bedrock was 115 feet. The gravel consisted of small boulders and large cobbles, separated by sand and fine gravel. The gravel was frozen to bedrock (although this was not always the case at other locations along the deep channel) and the bedrock was described as hard schist (Reed, 1938). The gravel of the deep channel was said to become richer downstream. The gold in the deep channel is on bedrock; it is coarse, rounded, and waterworn. Galena and pyrite locally accompany the gold. Much coarse gold has been produced from the Hammond River. Several 40- and 50-ounce nuggets were found, and one weighed 137 ounces (Maddren, 1913; Dillon, 1982). Mosier and Lewis (1986) reported that gold in 14 samples from Hammond River varied from

from 845 to 929 fine with a median fineness of 900. According to Reed (1938), the ground was valued at about $1.46 per square foot of bedrock (gold at $35 per ounce). At that time, little gold had been found in the deep channel above the mouth of Buckeye Gulch. However, from 1991 to 1995, there was an attempt to mine the deep channel between Buckeye Gulch and Vermont Creek with earth moving equipment. That attempt was unsuccessful due to flooding and silting of the workings.

Gold also occurs in sections of a high channel preserved along the lower Hammond River. These sections appear to be 40-50 feet above the modern river bed and were first encountered where the high channel is cut by tributary streams such as at Buckeye Gulch (WI100). (There are also much higher bench placers that are described separately, notably the Slisco Bench (WI031) southwest of the mouth of Vermont Creek.). In the late 1990s several mines worked these benches between Gold Bottom Gulch and Jennie Creek, but getting water to them was difficult.

An examination in 2011 (by D.J. Grybeck) of the satellite imagery available widely on the internet shows evidence of extensive modern surface placer mining with earth moving equipment at several sites along the Hammond River: 1) opposite the mouth of Jennie Creek; 2) about 2,000 to 3,000 feet upstream; 3) on the opposite side of the river and just upstream from the mouth of Steep Creek; 4) near the mouth of Swift Creek (WI102) , and 5) near the mouth of Buckeye Gulch (WI100).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active?

Workings/exploration:

From 1900 to at least 2001, there have been numerous mines in operation along the Hammond River from the mouth of Jennie Creek to the mouth of Vermont Creek (Kurtak and others, 2002). Early mining concentrated on shallow ground along the modern stream channel but this ground was soon exhausted. In 1911, drift mining began on a deep channel that extended from the mouth of Buckeye Gulch to the mouth of Jennie Creek and most of the gold mined from the Hammond River has come from this deep channel. The deep channel was thought to be mined out by 1938 but various mining operations have continued to mine into the 21st century on remnants of shallow ground and benches along the river, using earth moving equipment and suction dredges. An examination in 2011 (by D.J. Grybeck) of the satellite imagery available widely on the internet shows evidence of extensive modern surface placer mining with earth moving equipment at several sites along the Hammond River: 1) opposite the mouth of Jennie Creek; 2) about 2,000 to 3,000 feet upstream; 3) on the opposite side of the river and just upstream from the mouth of Steep Creek; 4) near the mouth of Swift Creek (WI102); and 5) near the mouth of Buckeye Gulch (WI100).

Production notes:

The total placer gold production from the Hammond River is uncertain, but it has been large. Bliss and others (1988) indicate that total production may be more than 31,746 ounces and as much as 47,620 ounces (but this includes the substantial production from the tributary streams to the Hammond River). Eden (2000) reported that 17,256 ounces of gold was produced from the Hammond River between 1904 and

1999. Kurtak and others (2002) give yearly production figures from 1900 to 1943 that total 19,128 ounces of gold, but they note that the production records are incomplete. The peak of the production was from 1913 to 1916 when 15,705 ounces of gold was mined and most of that probably came from drift mining on the deep channel.

Reserves:

Probably no substantial reserves remain but there may be remnant pockets of unmined auriferous gravel.

Additional comments:

References:

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T., Jr., 1988, Maps and descriptions of lode and placer deposits, prospects, and occurrences in the Wiseman 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p., 2 plates, scale 1:250,000.

Brosgé, W.P., and Reiser, H.N., 1960, Progress map of the geology of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 60-19, 2 sheets, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

Eden, K., 2000, Geology and gold mineralization of the Nolan area in the Brooks Range, Alaska: U.S. Bureau of Land Management Open-File Report 78, 87 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Williams, E.M., 1999, Mineral investigations in the Koyukuk mining district, northern Alaska--Progress Report: U.S. Bureau of Land Management Open-File Report 74, 158 p.

Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Mosier, E.L., and Lewis, J.S., 1986, Analytical results, geochemical signatures, and sample locality map of lode gold, placer gold, and heavy-mineral concentrates from the Koyukuk-Chandalar mining district, Alaska: U.S. Geological Survey Open-File Report 86-345, 172 p.

Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Schrader, F.C., 1904, A reconnaissance in northern Alaska across the Rocky Mountains, along Koyukuk, John, Anaktuvuk, and Colville rivers and the Arctic coast to Cape Lisburne, in 1901, with notes by W.J. Peters: U.S. Geological Survey Professional Paper 20, 139 p.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Clara Creek

Site type: Mine

ARDF no.: WI105

Latitude: 67.279 **Quadrangle:** WI B-1

Longitude: 150.1094

Location description and accuracy:

Clara Creek is a westward-flowing tributary to the Middle Fork, Koyukuk River; its mouth is about 1 mile north of Coldfoot. The exact location of mining is not known but probably took place in the upper part of the creek between about 1,400 and 1,600 feet in elevation. The site is about 0.5 mile east of the center of section 2, 28 N., R. 12 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Gold was discovered on Clara Creek in 1900 (Schrader, 1904). Mining in 1900 and 1901 produced $3,000 in gold (about 150 ounces), including an 18 ounce nugget (Maddren, 1913). Reed (1938) noted that there was no report of mining on the creek since the early 1900s. From 1953 to 1999, there were several periods of prospecting, trenching, and shaft sinking by several operators and gold was produced at times from 1984 to 1992. Production records are not available after 1901. Kurtak and others (2002) examined the creek and found piles of stacked rocks up to 10 feet high between 1,400 and 1,600 feet in elevation. They also found the remains of shafts at 1,550 feet and 2,000 feet in elevation.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Active?

Workings/exploration:

Gold was discovered on Clara Creek in 1900 and it produced about 150 ounces of gold in 1900 and 1901 (Maddren, 1913). There were several periods of prospecting and development from 1953 to 1999. Some gold was produced at times from 1984 to 1992 and perhaps in other years. Kurtak and others (2002) examined the creek and found piles of stacked rocks up to 10 feet high from about 1,400 feet to 1,600 feet in elevation. They also found the remains of shafts at 1,550 feet and 2,000 feet.

Production notes:

Mining in 1900 and 1901 produced $3,000 worth of gold (about 150 ounces), including an 18 ounce nugget. There is no record of the gold production during several periods of prospecting and mining from 1953 to 1999 (Kurtak and others, 2002).

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Schrader, F.C., 1900, Preliminary report on a reconnaissance along the Chandalar and Koyukuk Rivers, Alaska, in 1899: U.S. Geological Survey Twenty-first Annual Report, Part 2, p. 441-486.

Schrader, F.C., 1904, A reconnaissance in northern Alaska across the Rocky Mountains, along Koyukuk, John, Anaktuvuk, and Colville rivers and the Arctic coast to Cape Lisburne, in 1901, with notes by W.J. Peters: U.S. Geological Survey Professional Paper 20, 139 p.

Primary Reference: Maddren, 1913

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Ferguson

Site type: Prospect

ARDF no.: WI106

Latitude: 67.4623 **Quadrangle:** WI B-1

Longitude: 150.1473

Location description and accuracy:

This prospect is located just east of the ridge line of Midnight Dome at the head of Union Gulch. It is at an elevation of about 3,500 feet, about 0.7 mile southeast of the center of section 35, T. 31 N., R. 12 W. The location is accurate.

Commodities:

Main: Au, Sb

Other: Ag

Ore minerals: Gold, stibnite

Gangue minerals: Quartz

Geologic description:

This deposit was described by Ebbley and Wright (1948) as prospect pits that expose a 6-inch quartz vein containing 'kernels' of stibnite in an earthy yellow matrix of antimony oxides. Samples of vein material contained 0.03 to 0.04 parts per million (ppm) gold, up to 0.15 ppm silver, and more than 1 percent antimony. A sample of bedrock contained 0.05 ppm gold, 0.1 ppm silver, and 0.03 percent antimony (Brosge and Reiser, 1970). Samples of a quartz-stibnite vein collected by Dillon (1982) contain up to 14 ppm gold. A sample of fine- to coarse-grained, crystalline stibnite from dump material assayed 62 percent antimony (Mulligan, 1974). The prospect was examined and sampled by Kurtak and others (2002). They found two trenches about 12 feet long. They analyzed a select sample that contained 33.13 percent antimony and 14 parts per billion gold. About a quarter of a mile south of this prospect, they collected two samples of quartz veins that cut chlorite schist. They averaged 321 ppb gold, 373 ppm lead, 365 ppm arsenic, and 317 ppm antimony. (This occurrence to the south is not the occurrence just west of hill 3860 (WI132) that they describe separately.) The rocks in the area are Middle or Upper Devonian(?) calcareous, chloritic wacke (Dillon and others, 1986).

Alteration:

Oxidation of stibnite to yellow antimony oxides.

Age of mineralization:

Devonian or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Simple stibnite deposit (Cox and Singer, 1986; model 27d).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

27d

Production Status: None

Site Status: Inactive

Workings/exploration:

There are at least two prospect pits and the prospect has been sampled repeatedly by government agencies.

Production notes:

None.

Reserves:

None.

Additional comments:

See also: Jones and Boyle (WI114), and Wannemaker and Wortman (WI115).

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

Ebbley, Norman, Jr., and Wright, W.S., 1948, Antimony deposits in Alaska: U.S. Bureau of Mines Report of Investigations 4173, 41 p.

Eden, K., 2000, Geology and gold mineralization of the Nolan area in the Brooks Range, Alaska: U.S. Bureau of Land Management Open-File Report 78, 87 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Williams, E.M., 1999, Mineral investigations in the Koyukuk mining district, northern Alaska--Progress Report: U.S. Bureau of Land Management Open-File Report 74, 158 p.

Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Primary Reference: Ebbley and Wright, 1948; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Wiseman Creek

Site type: Prospects

ARDF no.: WI108

Latitude: 67.4523 **Quadrangle:** WI B-1

Longitude: 150.2203

Location description and accuracy:

The mouth of Wiseman Creek is at the town of Wiseman on the Middle Fork, Koyukuk River. There have been several attempts to find and mine placer gold along Wiseman Creek but the only two records of prospecting refer to deep shafts 1 mile and 2 miles below the mouth of Nolan Creek. The coordinates are arbitrarily placed between these two shafts, about 0.5 mile east of the center of section 4, T. 30 N., R. 12 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Schrader (1900) first reported gold on Wiseman Creek but in view of the subsequent mining in the area and the absence of any gold placers that have been found since on Wiseman Creek, he probably was referring to its then-unnamed tributary Nolan Creek (WI101) and its many tributaries. There have been several attempts to find gold on Wiseman Creek below the mouth of Nolan Creek (Maddren, 1910; Kurtak and others, 2002). In 1908, a 260-foot shaft was sunk to bedrock about a mile below the mouth of Nolan Creek. The bottom 30 feet was in washed gravel with only colors of gold, not enough to warrant drift mining. In 1909, another shaft was sunk about 2 miles below the mouth of Nolan Creek but did not reach bedrock at 365 feet. The USGS B-1 topographic map shows a prospect in the Wiseman Creek valley about 3 miles below the mouth of Nolan Creek but there is no record of prospects in this area. In 1928, a company cut two trenches, one 800 feet long and the other 400 feet long, about 1.5 miles north of the town of Wiseman. (The location is shown on figure 1.8 of Kurtak and others, 2002). Only fine flour gold was found in the trenches and the ground contained only 6 to 10 cents per cubic yard (at $20.67 per ounce of gold) (Reed, 1938).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Inactive

Workings/exploration:

In 1908, a 260-foot shaft was sunk to bedrock about a mile below the mouth of Nolan Creek. The bottom 30 feet was in washed gravel but not enough gold was found to warrant drift mining. In 1909, another shaft was sunk about 2 miles below the mouth of Nolan Creek but did not reach bedrock at 365 feet. The USGS B-1 topographic map shows a prospect in the Wiseman Creek valley about 3 miles below the mouth of Nolan Creek but there is record of prospects in this area. In 1928, a company cut two trenches, one 800 feet long and the other 400 feet long, about 1.5 miles north of the town of Wiseman. (The location is shown on figure 1.8 of Kurtak and others, 2002). Over the years, placer claims have been staked along the length and width of Wiseman Creek valley but as yet there is no record of workable gold placers anywhere on the creek.

Production notes:

Despite more than 100 years of prospecting along Wiseman Creek and much mining along its tributaries to the north, e.g., Nolan Creek (WI101), there is no record of production on Wiseman Creek.

Reserves:

None.

Additional comments:

References:

Brooks, A.H., 1905, Placer mining in Alaska in 1904: U.S. Geological Survey Bulletin 259, p. 18-31.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

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Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Schrader, F.C., 1900, Preliminary report on a reconnaissance along the Chandalar and Koyukuk Rivers,

Alaska, in 1899: U.S. Geological Survey Twenty-first Annual Report, Part 2, p. 441-486.

Primary Reference: Reed, 1938

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Roches Moutonnees

Site type: Occurrence

ARDF no.: WI109

Latitude: 67.3808 **Quadrangle:** WI B-1

Longitude: 150.162

Location description and accuracy:

This occurrence is on the west side of the Middle Fork, Koyukuk River about 0.5 mile northwest of the mouth of Moose Creek. It is at an elevation of about 1,530 feet, 0.1 mile south of the center of section 35, T. 30 N., R. 12 W., of the Fairbanks Meridian. The name, Roches Moutonnees, is derived from the rounded hummock outcrops in the area, which are said to form a distinctive local feature. The location is accurate within one-half mile.

Commodities:

Main: Cu

Other: Zn

Ore minerals: Bornite

Gangue minerals: Quartz

Geologic description:

This occurrence consists of quartz veinlets in dolomite and limestone (Mulligan, 1974). Analysis of the veinlets show trace amounts of copper and zinc, but the only visible sulfide in freshly broken quartz was a small bleb of bornite. The rocks in the area are Proterozoic or lower Paleozoic(?), calcareous schist, and local marble (Dillon and others, 1986).

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only surface sampling.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T., Jr., 1988, Maps and descriptions of lode and placer deposits, prospects, and occurrences in the Wiseman 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p., 2 plates, scale 1:250,000.

Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Primary Reference: Mulligan, 1974

Reporter(s): J.M. Britton (Anchorage)

Last report date: 2010-05-14

Site name(s): Sawyer Creek; Sawyer Gulch

Site type: Mine

ARDF no.: WI111

Latitude: 67.3492 **Quadrangle:** WI B-1

Longitude: 150.2021

Location description and accuracy:

Sawyer Creek is a east-flowing tributary to the Middle Fork, Koyukuk River; it joins the Middle Fork about 4.6 miles south-southwest of Wiseman. The location of the mining is unclear and the site is plotted about a mile above the mouth of the creek, about 0.3 mile south of the center of section 10, T. 29 N., R. 12 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Sawyer Creek was reputed to have been prospected for gold in about 1909 (Maddren, 1913); was prospected in 1936 (Reed, 1938; and was prospected again in 1995 with a backhoe (Kurtak and others, 2002). There are numerous stacked rocks, suction-dredge holes, and backhoe pits along the creek. From 1981 to 1983, the creek was mined and produced about 25 ounces of gold (Kurtak and others, 2002). The gold was coarse and one nugget weighed 1.5 ounces. The creek has a steep gradient and has many large boulders.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Undetermined

Workings/exploration:

Sawyer Creek was reputed to have been prospected for gold in about 1909 (Maddren, 1913); was prospected in 1936 (Reed, 1938; and again was prospected with a backhoe in 1995 (Kurtak and others, 2002). There are numerous stacked rocks, suction-dredge holes, and backhoe pits along the creek. From 1981 to 1983, the creek was mined and produced about 25 ounces of gold (Kurtak and others, 2002).

Production notes:

From 1981 to 1983, the creek was mined and produced about 25 ounces of gold (Kurtak and others, 2002).

Reserves:

None.

Additional comments:

Also see Emma Creek (WI118).

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Mosier, E.L., and Lewis, J.S., 1986, Analytical results, geochemical signatures, and sample locality map of lode gold, placer gold, and heavy-mineral concentrates from the Koyukuk-Chandalar mining district, Alaska: U.S. Geological Survey Open-File Report 86-345, 172 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Maddren, 1913

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Fay Creek; Fay Gulch; Faye Creek

Site type: Mine

ARDF no.: WI112

Latitude: 67.4889 **Quadrangle:** WI B-1

Longitude: 150.1997

Location description and accuracy:

The mouth of Fay Creek is about 1.4 miles north-northeast of the old town of Nolan on Nolan Creek. Placer mining extended from near the mouth of Fay Creek to more than 4,000 feet upstream. The coordinates are just upstream from its mouth, about 0.5 mile north of the center of section 27, T. 31 N., R. 12 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Arsenopyrite, boulangerite?, gold, jamesonite?, pyrite, pyrrhotite, stibnite

Gangue minerals: Quartz

Geologic description:

Placer gold in Fay Creek occurs in the modern channel, in a deep channel, and in a high channel. The discovery in 1901 of gold in the shallow gravels near the mouth of the modern channel of Fay Creek sparked the initial interest in the Nolan Creek valley. These shallow gravels were first mined in 1903 but were exhausted within a few years.

Gold in portions of a high channel along the north side of Fay Creek was mined prior to 1930. These high-channel placers begin about 1,000 feet upstream from the mouth of the creek and are about 275 higher in elevation than the modern steam valley (Reed, 1938). A gold-bearing deep channel near the mouth of the creek, which probably was a deep channel of Nolan Creek, was mined out in the early 1900s. This deep channel was about 20 feet below the surface. The high channel was being prospected in 1929 (Reed, 1938) but the modern stream channel and the deep channel were considered to have been mined out by 1937. Brosge and Reiser (1960) noted probable post-World War II mining activity and Dillon (1982) noted reports of recent mining activity.

Maddren (1913) noted that the placer gold in Fay Creek appeared not to have moved very far from its bedrock source inasmuch as it generally occurred in rough and angular grains attached to quartz. There are reports of lode gold occurrences nearby on Smith Creek Dome (WI110 and WI127) near the head of Fay Creek, as well as on on Thompson Pup (WI128), a tributary of Fay Creek. A sample of gold from Fay Creek was 842 fine, and contained 16 percent silver, 94 parts per million (ppm) copper, 16 ppm lead, and 0.625 percent mercury (Mosier and Lewis, 1986).

Most years between 1979 and 2007, Silverado Gold Mining Inc. mined along Nolan Creek (WI101) and its tributaries Fay Creek, Archibald Creek (WI113), and Smith Creek (WI116) (Bundtzen, 2008, 2009). Silverado mined on Fay Creek in 1979 and produced 12 ounces of gold. They continued to mine on Fay Creek and Archibald Creek in 1981, 1984, and 1987, and produced 2,372 ounces of gold from the two creeks. The mining on Fay Creek took place from its mouth to the mouth of Thompson Pup (WI124), probably in open cuts. Silverado did no further work on either Fay Creek or Archibald Creek during their considerable mining in the area until 2007, although they mined on Thompson Pup (WI124), a tributary of Fay Creek, in 1993. In his 2008 estimates of the gold resources of Nolan Creek and its tributaries, Bundtzen (2009) did not include any on Fay Creek.

According to Maddren (1913), Fay Creek produced about $30,000 of gold (about 1,500 ounces) between 1900 and 1909. Eden (2000) reports that a total of about 1,865 ounces of gold were produced from Fay Creek between 1904 and 1999.

Kurtak and others (2002) sampled several quartz veins that cut bedrock on lower Fay Creek. The veins trend northwest and contain sparse pyrite, pyrrhotite, arsenopyrite, chalcopyrite, stibnite, and either boulangerite or jamesonite. Samples contained up to 167 parts per billion gold.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Active

Workings/exploration:

The modern and deep channels of Fay Creek were mined in the early 1900s, but there is no record of the mining methods. Sections of the high channel were mined in the early 1900s and the high channel was being prospected in 1929 (Reed, 1938). Brosge and Reiser (1960) noted probable post-World War II mining activity and Dillon (1982) noted reports of recent mining activity. Silverado Gold Mining Ltd. mined on Fay Creek in 1979 and produced 12 ounces of gold (Bundtzen, 2008, 2009). They continued to mine on Fay Creek and Archibald Creek in 1981, 1984, and 1987, and produced 2,372 ounces of gold from the two creeks. The mining on Fay Creek took place from its mouth to the mouth of Thompson Pup (WI124), probably in open cuts. Silverado did no further work on either Fay creek or Archibald Creek during their considerable mining in the area until 2007, although they mined on Thompson Pup (WI124), a tributary of Fay Creek, in 1993.

Production notes:

According to Maddren (1913), Fay Creek produced about $30,000 of gold (about 1,500 ounces) between 1900 and 1909. Eden (2000) reports that a total of about 1,865 ounces of gold were produced from Fay Creek between 1904 and 1999. Kurtak and others (2002) indicated that the production was considerably greater, a total of 3,295 ounces from 1903 to 1987, with mining in 14 of the years from 1903 to 1923, and then in 1987.

Reserves:

In his 2008 estimates of the gold resources of Nolan Creek and its tributaries, Bundtzen (2009) did not include any on Fay Creek.

Additional comments:

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Wimmler, N.L., 1925, Placer mining in Alaska in 1925: Alaska Territorial Department of Mines Miscellaneous Report 195-8, 118 p.

Primary Reference: Reed, 1938; Bundtzen, 2008

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Archibald Creek; Archibald Gulch

Site type: Mine

ARDF no.: WI113

Latitude: 67.4823 **Quadrangle:** WI B-1

Longitude: 150.2124

Location description and accuracy:

Archibald Creek is a west-flowing tributary to Nolan Creek. Its mouth is about 1.75 miles above the mouth of Nolan Creek on Wiseman Creek. Most of the mining activity on Archibald Creek has been along the lower 0.5 mile of the creek. The coordinates are about at the midpoint of mining about 0.4 mile west of the center of section 27, T. 31 N., R. 12 W. The location is accurate.

Commodities:

Main: Au

Other: Sb

Ore minerals: Gold, stibnite

Gangue minerals:

Geologic description:

Placer gold has been mined both from the modern channel and a deep channel on Archibald Creek. The modern channel was mined near the mouth of the creek in the early 1900s and was being mined about 3/8ths of a mile upstream in 1937. The gravel in the modern channel is coarse and subangular; it contains many boulders. Five to twelve feet of frozen gravel, covered by 3 feet of muck and a foot of moss, overlie soft, schist bedrock. The gold is distributed throughout the gravel and occurs both as fine particles worn flat and smooth, and as coarse particles that are rough and porous. The gold averages 905 fine and the value of the ground was about $0.44 per square foot of bedrock (gold at $35 per ounce) (Reed, 1938).

The deep channel, which is 5 to to 14 feet wide, is on the north side of the creek. It is about 25 feet deep near the mouth of the creek; it rises upstream to coalesce with the modern channel. Seven to nine feet of frozen, coarse, subangular gravel overlies bedrock, which is described as alternating bands of black graphitic and yellow schist (Reed, 1938). The gravel is overlain by 16 to 18 feet of muck and a foot of moss. Unlike the modern channel, the deep channel is free of large boulders. The gold in the deep channel occurs both as coarse, worn, and rounded particles, and as coarse, porous, and unworn particles. Reed (1938) reports values of approximately $2.11 in gold per square foot of bedrock (gold at $35 per ounce). A stibnite vein was reported during drift mining on Archibald Creek (Ebbley and Wright, 1948). The creek and bench placers have been mined by hand and hydraulic methods, and the deep channel by drifting. Mulligan (1974) reported hand mining in 1974.

Most years between 1979 and 2007, Silverado Gold Mining Inc. mined along Nolan Creek (WI101) and its tributaries Fay Creek (WI112), Archibald Creek, and Smith Creek (WI116) (Bundtzen, 2008 and 2009). More than two-thirds of the production was by underground drift mining; the rest was by open-cut mining with heavy equipment. Silverado mined on Fay Creek (WI112) and Archibald Creek in 1981, 1984, and 1987, and produced 2,372 ounces of gold from the two creeks. The mining on Archibald Creek took place from near its mouth upstream for about 1,200 feet. Silverado did no further work on Archibald Creek during their considerable mining in the area from 1988 to 2007. In his 2008 estimates of the gold resources of Nolan Creek and its tributaries, Bundtzen (2009) did not cite any resources on Archibald Creek.

Maddren (1913) reported that $6,000 of gold (about 300 ounces) was produced from 1900 to 1909. Eden (2000) reported that about 5,430 ounces of gold were produced from Archibald Creek between 1904 and

1999. Kurtak and others (2002) give a slightly greater production of 6,577 ounces from 1904 to 1998. A notable year was 1927 when 1,462 ounces of gold was produced, and 1,923 ounces was produced in four years from 1981 to 1998.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

The creek and bench placers have been mined by hand and hydraulic methods and the deep channel by drifting. Mulligan (1974) reported hand mining in 1974. Silverado Gold Mining Ltd. mined on Fay Creek (WI112) and Archibald Creek in 1981, 984, and 1987, and produced 2,372 ounces of gold from the two creeks. The mining on Archibald Creek took place from near its mouth upstream for about 1,200 feet.

Production notes:

Maddren (1913) reported that $6,000 of gold (about 300 ounces) was produced from 1900 to 1909. Eden (2000) reported that about 5,430 ounces of gold were produced from Archibald Creek between 1904 and 1999. Kurtak and others (2002) give a slightly greater production of 6,577 ounces from 1904 to 1998. A notable year was 1927 when 1,462 ounces of gold was produced, and 1,923 ounces was produced in four years from 1981 to 1998.

Reserves:

None.

Additional comments:

References:

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Wimmler, N.L., 1925, Placer mining in Alaska in 1925: Alaska Territorial Department of Mines Miscellaneous Report 195-8, 118 p.

Primary Reference: Reed, 1938; Bundtzen, 2008

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Pringle Bench; Jones & Boyle

Site type: Mine

ARDF no.: WI114

Latitude: 67.4746 **Quadrangle:** WI B-1

Longitude: 150.2204

Location description and accuracy:

This mine is on the north side of lower Smith Creek, about 0.5 mile east of Nolan; it is near the northeast corner of section 33, T. 31 N., R. 12 W. The location is accurate. Kurtak and others (2002) include a detailed map of the mine as their figure I-10.

Commodities:

Main: Ag, Au, Sb

Other:

Ore minerals:

Gangue minerals: Quartz

Geologic description:

As the Jones and Boyle, this mine was described prior to 1988 as a series of quartz-stibnite veins that were exposed during placer mining sometime prior to 1943 (Ebbley and Wright, 1948). The veins apparently were still exposed in the old placer cuts as late as 1974. Ebbley and Wright describe six, parallel quartz-stibnite veins, 3-4 inches wide; the stibnite is concentrated in the central 1.5 to 2 inches of the veins. W. W. Patton Jr.'s, U. S. Geological Survey field notes in 1953 indicate that the veins are as wide as 1 foot and that their stibnite core is as wide as 4 inches (Bliss and others, 1988). The veins are in joints and locally are offset by cross faults (Bliss and others, 1988). Six samples of vein material contained 0.02 to 0.06 part per million (ppm) gold and from less than 0.1 ppm to 0.2 ppm silver (Bliss and others, 1988). Two samples of bedrock near the veins contained 0.03 ppm gold. Samples across the veins contained 33.8 to 44.5 percent antimony (Mulligan, 1974).

The host rocks at the Pringle Bench (Jones & Boyle) Mine are Devonian phyllite, schist, and metasiltstone (Dillon and Reifenstuhl, 1990). The gold-stibnite mineralization occurs as distinct veins parallel to and along a structural zone 120 to 350 feet wide that strikes northeast and dips 50 to 85 degrees southeast (Bundtzen, 2008, 2009). Both stibnite (only) and quartz-stibnite veins are present; minor arsenopyrite occurs in them. On the nearby Workman's Bench prospect, there are veins of massive stibnite up 15 inches thick that assayed up to 2.86 ounces of gold per ton. Four major, parallel veins across a width of about 100 feet and a strike length of about 1,100 feet were cut in the 41 drill holes and the underground workings of Workman's Bench (WI115); there were numerous gold-stibnite(-quartz) veinlets between the major veins. When Silverado was working on the Workman's Bench prospects, they drilled 8 holes on Pringle Bench. At the Pringle Bench Mine, two major stibnite-gold(-quartz) veins were intersected that extended for about 600 feet along strike. The mineralization at the Workman's Bench and Pringle Bench only could be followed in the drill holes but the orientation and characteristics of the mineralization at the two sites demonstrate that it is probably continuous over a distance of at least 1,600 feet through the two sites. Soil geochemistry and geophysical data suggest that the mineralization continue further northeast.

Bundtzen (2009) estimated that Pringle Bench has an 'inferred resource' of 6,308 tons with an average grade of 12.78 percent antimony and 0.088 ounce of gold per ton.

Five tons of stibnite ore were recovered from sluice operations somewhere on upper Smith Creek and shipped during World War II (Joesting, 1943). Joesting attributed at least some of this production to this

property, then known as the Jones & Boyle prospect. However, his description of its source on upper Smith Creek contradicts the location of the Jones & Boyle prospect described by Ebbley & Wright (1948). More likely, the source of the stibnite was the unnamed prospect at the head of Smith Creek on Midnight Dome (WI130). The information is so vague however, that the ore may have come ore or more of the stibnite prospects near Smith Creek (WI114, WI115, or WI130). Based on a personal communication from E. Armstrong, about 35 drums of stibnite ore was hand-cobbed from the Pringle Bench Mine in the 1980s and possibly shipped to Texas (Kurtak and others, 2002).

Alteration:

No alteration is mentioned.

Age of mineralization:

Devonian or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Sb-Au vein (Nokleberg and others, 1987).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: Yes

Site Status: Active

Workings/exploration:

Before 1999, the Pringle Bench Mine apparently was only sampled by government and industry. In 1999, the U.S. Bureau of Land Management began work in the area that included soil sampling and an airborne geophysical survey (Kurtak and others, 2002). Their data encouraged Silverado Gold Mines, Ltd., who was placer mining along Nolan Creek, to more aggressively search for the lode source of the placer gold. They concentrated their work on Pringle Bench and Workman's Bench (WI115), about 1,500 feet to the southwest where auriferous stibnite was also known to occur. Silverado drilled 8 core holes on the Pringle Bench Mine that intersected several auriferous stibnite veins.

Production notes:

Five tons of stibnite ore were recovered from sluice operations somewhere on upper Smith Creek and shipped during World War II (Joesting, 1943). Joesting attributed at least some of this production to this property, then known as the Jones & Boyle prospect. However, his description of its source on upper Smith Creek contradicts the location of the Jones & Boyle prospect described by Ebbley & Wright (1948). More likely, the source of the stibnite was the unnamed prospect at the head of Smith Creek on Midnight Dome (WI130). The information is so vague however, that the ore may have come ore or more of the stibnite prospects near Smith Creek (WI114, WI115, or WI130). Based on a personal communication from E. Armstrong, about 35 drums of stibnite ore was hand-cobbed from the Pringle Bench Mine in the 1980s and possibly shipped to Texas (Kurtak and others, 2002).

Reserves:

Bundtzen (2009) estimated that Pringle Bench Mine has an 'inferred resource' of 6,308 tons with an average grade of 12.78 percent antimony and 0.088 ounce of gold per ton.

Additional comments:

References:

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Primary Reference: Bundtzen, 2009

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Workman's Bench; Wannemaker and Wortman

Site type: Prospect

ARDF no.: WI115

Latitude: 67.4689 **Quadrangle:** WI B-1

Longitude: 150.2241

Location description and accuracy:

This center of the Workman's Bench prospect is about 0.2 mile east of the junction of Smith Creek and Nolan Creek at the mine symbol on the Wiseman B-1 topographic map. The prospect is about 0.3 mile north of the center of section 33, T. 31 N., R. 12 W. The location is accurate.

Commodities:

Main: Au, Sb

Other: As, Hg?, Pb?

Ore minerals: Arsenopyrite, gold, stibnite

Gangue minerals: Ankerite?, calcite?, dolomite?, quartz

Geologic description:

Before 1999, the Workman's Bench prospect was described as a 3-to-4-inch-wide quartz-stibnite vein exposed in a trench on the south side of Smith Creek. The stibnite fills open spaces between quartz crystals with euhedral terminations deposited along the margins of the vein (Ebbley and Wright, 1948). Mulligan (1974) noted that the vein occupies a vertical fissure that cuts flat-lying, blue-gray phyllite. Selected samples from this prospect contain as much as 12.2 parts per million gold, are anomalous in arsenic (Eden, 2000) and contain up to 58.3 percent antimony (Mulligan, 1974; Eden, 2000). Eden describes auriferous quartz veins containing stibnite and arsenopyrite elsewhere in the general area. Calcite, ankerite and minor dolomite accompany the quartz at the margins of these veins, which strike N44E and dip nearly vertically. The gold is mostly near the margins of the veins and rarely in the stibnite (Eden, 2000).

In 1999, the U.S. Bureau of Land Management began work in the area that included soil sampling and an airborne geophysical survey (Kurtak and others, 2002). Their data encouraged Silverado Gold Mines, Ltd., who was placer mining along Nolan Creek, to more aggressively search for the lode source of the placer gold (Bundtzen, 2008, 2009). They concentrated on Workman's Bench and on Pringle Bench (WI114), about 1500 feet to the northeast where auriferous stibnite also known occurs. From 1994 to 2008 in these two areas, Silverado drilled 15 reverse-circulation holes that totaled 3,230 feet and 58 shallow core holes that totaled 16,152 feet, dug numerous trenches, and drove 570 feet of underground workings on the Workman's Bench prospect that intersected the four stibnite or quartz-stibnite veins in two places along a northeast-trending structure.

The host rocks are Devonian phyllite, schist, and metasiltstone (Dillon and Reifenstuhl, 1990). The gold-stibnite mineralization occurs as distinct veins, four are recognized, parallel to and along a structural zone 120 to 350 feet wide that strikes northeast and dips 50 to 85 degrees southeast (Bundtzen, 2008 and 2009). Both stibnite (only) and quartz-stibnite veins are present; minor arsenopyrite occurs in them. At the Workman's Bench prospect, there are veins of massive stibnite up 15 inches thick that contain up to 2.86 ounces of gold per ton. Four, parallel veins across a distance of about 100 feet and a strike length of about 1,100 feet were cut in the 41 drill holes and in the underground workings of Workman's Bench; there are also numerous gold-stibnite(-quartz) veinlets between the major veins. Coincident with the work on Workman's Bench, Silverado was also working on similar mineralization at the Pringle Bench (WI114). The mineralization between Workman's Bench and Pringle Bench could not be visually followed other than in

the drill core and cuttings but the attitudes and characteristics of the mineralization at the two sites demonstrate that the mineralization is continuous over a distance of at least 1,600 feet between the two prospects. Soil geochemistry and geophysical data suggests that the mineralization continues even further northeast.

Bundtzen, (2009) estimated that Workman's Bench has: 1) a 'probable reserve' of 42,412 tons with an average grade of 28 percent antimony and 0.408 ounce of gold per ton (at a cut-off grade of 4.0 percent antimony); and 2) an 'inferred resource' of 21,389 tons with an average grade of 12.11 percent antimony and 0.272 ounce of gold per ton (at a cut-off grade of 4.0 percent antimony.

Alteration:

Age of mineralization:

The only constraint is the Devonian age of the host rocks.

Generic deposit model:

Deposit model:

Sb-Au vein (Nokleberg and others, 1987).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Active

Workings/exploration:

Before 1999, the Workman's Bench prospect was apparently only sampled by government and industry. In 1999, the U.S. Bureau of Land Management began work in the area that included soil sampling and an airborne geophysical survey (Kurtak and others, 2002). Their data encouraged Silverado Gold Mines, Ltd., who was placer mining along Nolan Creek, to more aggressively search for the lode source of the placer gold (Bundtzen, 2008, 2009). They concentrated on Workman's Bench and on Pringle Bench (WI114), about 1500 feet to the northeast where auriferous stibnite also known occurs. From 1994 to 2008 in these two areas, Silverado drilled 15 reverse-circulation holes that totaled 3,230 feet and 58 shallow core holes that totaled 16,152 feet, dug numerous trenches, and drove 570 feet of underground workings on the Workman's Bench prospect that intersected the four stibnite or quartz-stibnite veins in two places along a northeast-trending structure.

Production notes:

Probably none but see the nearby Pringle Bench (WI114).

Reserves:

Bundtzen, (2009) estimated that Workman's Bench has: 1) a 'probable reserve' of 42,412 tons with an average grade of 28 percent antimony and 0.408 ounce of gold per ton (at a cut-off grade of 4.0 percent antimony); and 2) an 'inferred resource' of 21,389 tons with an average grade of 12.11 percent antimony and 0.272 ounce of gold per ton (at a cut-off grade of 4.0 percent antimony.

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Primary Reference: Bundtzen, 2009

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-02

Site name(s): Smith Creek; Smith Gulch

Site type: Mine

ARDF no.: WI116

Latitude: 67.4712 **Quadrangle:** WI B-1

Longitude: 150.2126

Location description and accuracy:

Smith Creek is a west-flowing tributary to Nolan Creek; its mouth is near the old town of Nolan on Nolan Creek. The workings extend for approximately 1.5 miles along the creek above its mouth and the coordinates are at about the center of the workings. Smith Creek flows across the northern half of sections 33 and 34, T. 31 N., R. 12 W. The location is accurate.

Commodities:

Main: Au

Other: Sb

Ore minerals: Gold, stibnite

Gangue minerals:

Geologic description:

According to Maddren (1913), the placer deposits in the Nolan Creek basin occur in the shallow gravels of the modern channel, as bench deposits, and in deep, frozen gravels. Mining of the shallow gravels began in 1903, two years after their discovery. Maddren (1913) described the gold from upper Smith Creek as mostly rough, angular grains; the gold becomes progressively more rounded and coarser downstream. Some of the gold near the head of Smith Creek is coated by a white substance that Maddren did not identify although he suspected that it might be 'lime' (calcite?). Based on analysis of six gold samples, Eden (2000) concluded that the gold occurs in two different populations, defined by either high or low silver content. The gold in the six samples ranged from 925 to 986 fine. Eden also suggested that the gold in the Nolan-Hammond area has been derived from two gold-bearing vein systems in the area. The rocks in the valley of Smith Creek are micaceous schist, phyllite, and slate (Eden, 2000).

The gravel along the lower 2 miles of the modern channel of Smith Creek was selectively mined in richer spots during the early mining activity in the 1900s, but there is little information about this mining. Gravel in the modern channel that was mined in the 1920s and 1930s was 6 to 20 feet thick (Bundtzen, 2008, 2009). The gravel was frozen, coarse and subangular, and contained a few boulders. The gold was both coarse, rough and pitted, and smooth, rounded and waterworn. The value of the ground was about $0.30 per square foot of bedrock (gold at $20.67 per ounce).

The deep channel on Smith Creek rose from a depth of 135 feet near its mouth to merge upstream with the modern channel. By 1937, this deep channel was considered to be mined out by the methods available at that time. Reed (1938) reported that remnants of the bench channel on Smith Creek had been mined at several locations along the creek. The gravel was frozen and generally coarse and subangular. The gold from one of these locations was mostly coarse, unworn and pitted, but some was smooth, rounded and worn. This gold occurred throughout the gravel but most was in the lower few feet; there were no large nuggets. The gold was about 950 fine.

Most years between 1979 and 2007, Silverado Gold Mining Inc. mined along Nolan Creek (WI101) and its tributaries Fay Creek (WI112) and Archibald Creek (Bundtzen, 2008,2009). Apparently however, Silverado did not mine on Smith Creek. Bundtzen (2008, 2009) estimated an 'inferred resource' of 35,500 cubic yards of gravel about 1,500 feet above the mouth of Smith Creek, with an average grade of 0.030

ounce of gold per cubic yard (or about 1,065 ounces of gold).

Maddren (1913) reported that $208,000 (about 10,400 oz.) in gold was produced from Smith Creek from 1903 to 1909. Eden (2000) reported that a total of about 15,141 ounces of gold were produced from Smith Creek between 1904 and 1999. Kurtak and others (2002) document somewhat different production numbers year by year from 1903 to 1948. Their data indicate that the total production during that period was 17,811 ounces. The most productive period was from 1902 to 1907, when 8,689 ounces of gold was mined.

Cobb (1973) notes that 5 tons of placer and lode stibnite was recovered from somewhere on Smith Creek and shipped during World War II, perhaps from stibnite prospects on Workman's Bench (WI115) or Pringle Bench (WI 114) on the hillsides above lower Smith Creek.

Alteration:

Not specified.

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Active

Workings/exploration:

Smith Creek was worked by hand-mining and hydraulic methods from about 1903 until the early 1960s.

Production notes:

Maddren (1913) reported that $208,000 (about 10,400 oz.) in gold was produced from Smith Creek from 1903 to 1909. Eden (2000) reported that a total of about 15,141 ounces of gold were produced from Smith Creek between 1904 and 1999. Kurtak and others (2002) document somewhat different production year by year from 1903 to 1948. Their data indicate that the total production during that period was 17,811 ounces. The most productive period was from 1902 to 1907, when 8,689 ounces of gold was mined. Cobb (1973) notes that 5 tons of placer and lode stibnite was recovered from somewhere on Smith Creek and shipped during World War II, perhaps from stibnite prospects on Workman's Bench (WI115) or Pringle Bench (WI 114) on the hillsides above lower Smith Creek.

Reserves:

Bundtzen (2008 and 2009) estimated an 'inferred resource' of 35,500 cubic yards of gravel, centered about 1,500 feet above the mouth of Smith Creek, with an average grade of 0.030 ounce of gold per cubic yard (or about 1,065 ounces of gold).

Additional comments:

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Miscellaneous Report 195-8, 118 p.

Primary Reference: Reed, 1938; Bundtzen, 2008

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Kelly Gulch; Kelly's Gulch; Kelly's Mistake

Site type: Mine

ARDF no.: WI117

Latitude: 67.2972 **Quadrangle:** WI B-1

Longitude: 150.2027

Location description and accuracy:

Kelly Gulch is a short, east-flowing tributary to the Middle Fork Koyukuk River; its mouth is about 3 miles north of Coldfoot. The exact location of placer workings on this creek is unknown but there are stacked tailings near the mouth of the creek, near the center of section 34, T. 29 N., R. 12 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Maddren (1913) indicates that some mining was done on Kelly Gulch in 1901 and that it produced about $500 in gold (about 25 ounces). Reed (1938) notes that attempt to mine in 1937 was abandoned before any significant results were obtained. Kurtak and others (2002) visited the site; the only indication they found of mining was stacked rocks near the mouth of the creek.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Inactive

Workings/exploration:

Some mining in 1901, probably by hand methods, that produced about 25 ounces of gold.

Production notes:

The mine produced $500 (about 25 ounces) in gold in 1901 (Maddren, 1913).

Reserves:

None.

Additional comments:

References:

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Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Emma Creek

Site type: Mine

ARDF no.: WI118

Latitude: 67.3219 **Quadrangle:** WI B-1

Longitude: 150.2024

Location description and accuracy:

The mouth of Emma Creek is on the Middle Fork, Koyukuk River, about 4.5 miles north of Coldfoot. The coordinates are about 0.8 mile upstream from its mouth, the site of recent mining near the center of section 22, T. 29 N., R. 12 W.

Commodities:

Main: Au

Other: Cu, Pb, Sb

Ore minerals: Galena, gold, stibnite

Gangue minerals:

Geologic description:

Gold was discovered on Emma Creek in 1900 (Maddren, 1913; Kurtak and others, 2002). The gold occurs in the modern channel and in high bench channels. The productive portion of the modern channel is centered in a steep canyon cut through crystalline limestone. The canyon begins about a mile above the mouth of Emma Creek and extends upstream 1/2 mile or more. Most of the placer gold in Emma Creek was concentrated at the upper end of the canyon and in a gravel fan at its lower end. The richest ground was at the lower end of the canyon.

The high bench channels are on the south side of Emma Creek about a half mile from the mouth. These channels are about 30 feet above the modern creek bed. Recent work indicates that there are at least 4 separate channels on the right limit (Kurtak and others, 2002). The bench gravel is fine-grained and water worn and contains numerous granite and limestone boulders (Reed, 1938). The depth to bedrock varies from 5 to 91 feet. From the top, the section consists of a foot of moss, 0-50 feet of sand and clay, and 4-40 feet of gravel. All of the gravel, except the lower 4-5 feet is frozen. The gold is coarse and angular and commonly attached to quartz (Bliss and others, 1988). The gold on bedrock was in small nuggets valued at $0.25 to $1 (gold at $20.67 per ounce). Bliss and others (1988) suggest that the source of the gold may be quartz veins in the drainage area. Three samples of gold from Emma Creek have a median fineness of 905 and median trace elements contents of 0.047 percent copper, 50 parts per million (ppm) lead, 80 ppm antimony, and 0.31 percent mercury (Mosier and Lewis, 1986). Kurtak and others (2002) note that the gold is in 4 forms: 1) rounded and well-worn 'slugs'; 2) ragged masses with attached calcite and quartz; 3) in sheets; and 4) in rectangular crystalline shapes. The placer concentrates contained abundant galena and stibnite.

Early mining of the modern channel was by sluicing; the high channels were drift mined and open cut. Mining in the modern channel was complicated by numerous large boulders, 3 to 10 feet in diameter, above and below the canyon. From 1957 to at least 2001, Emma Creek was mined using a variety of equipment including heavy mechanized equipment and suction dredges (Kurtak and others, 2002). Some drift mining was done in the high channels of the canyon on both sides of the creek.

The gold production from Emma Creek is uncertain but is substantial. Based on incomplete records, Kurtak and others (2002) report that the production from 1900 to 1928 was 7,861 ounces of gold. Cobb (1976) indicates that the production could have been as much as 9,000 ounces. Production records are not available after 1928 but nuggets weighing up to 8 ounces have been recovered (Kurtak and others, 2002).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active?

Workings/exploration:

Mining occurred on Emma Creek each year from 1900 to 1915, and then in three years to 1928. Mining resumed in 1957 and continued until at least 2001. Early mining of the modern channel was by sluicing; the high channels were drift mined and open cut. Mining in the modern channel was complicated by numerous large boulders, 3 to 10 feet in diameter, above and below the canyon. From 1957 to at least 2001, Emma Creek was mined using a variety of equipment including heavy mechanized equipment and suction dredges (Kurtak and others, 2002). In recent years, some drift mining was done in the high channels of the canyon on both sides of the creek.

Production notes:

The gold production from Emma Creek is uncertain but is substantial. Based on incomplete records, Kurtak and others (2002) report that the production from 1900 to 1928 was 7,861 ounces of gold. Cobb (1976) indicates that the production could have been as much as 9,000 ounces. Production records are not available after 1928, but nuggets weighing up to 8 ounces have been recovered (Kurtak and others, 2002).

Reserves:

None.

Additional comments:

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Primary Reference: Reed, 1938

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Emma Dome

Site type: Occurrence

ARDF no.: WI119

Latitude: 67.3213 **Quadrangle:** WI B-1

Longitude: 150.4104

Location description and accuracy:
This occurrence is at an elevation of about 3,900 feet, in the SE1/4 section 22, T. 29 N., R. 13 W., of the Fairbanks Meridian. It is 0.2 mile south of hill 4465. The location is accurate.

Commodities:

Main: Ag, Au, Cu

Other:

Ore minerals: Malachite, unspecified copper sulfides

Gangue minerals: Quartz

Geologic description:
This occurrence is a quartz vein in Devonian schist and marble (Brosge and Reiser, 1972). A sample contains 0.04 to 0.079 ppm gold and 6.0 to 19 ppm silver. Brosge and Reiser (1960) earlier reported copper sulfides and malachite along the contact between the schist and marble.

Alteration:
Oxidation of copper mineral(s).

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:
Only surface sampling.

Production notes:
None.

Reserves:

None.

Additional comments:

This occurrence is in Gates of the Arctic National Park and Preserve.

References:

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T., Jr., 1988, Maps and descriptions of lode and placer deposits, prospects, and occurrences in the Wiseman 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p., 2 plates, scale 1:250,000.

Brosgé, W.P., and Reiser, H.N., 1960, Progress map of the geology of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 60-19, 2 sheets, scale 1:250,000.

Brosgé, W.P., and Reiser, H.N., 1970, Chemical analysis of rock and soil samples from the Chandalar and eastern Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 70-39, 8 p.

Brosgé, W.P., and Reiser, H.N., 1972, Geochemical reconnaissance in the Wiseman and Chandalar districts and adjacent region, southern Brooks Range, Alaska: U.S. Geological Survey Professional Paper 709, 21 p.

Cobb, E.H., 1972, Metallic mineral resources map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-469, 1 sheet, scale 1:250,000

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Grybeck, Donald, 1977, Map showing known mineral deposits of the Brooks Range, Alaska: U.S. Geological Survey Open-File Report 77-166-C, 45 p., 1 sheet, scale 1:1,000,000.

Maas, K.M., 1987, Maps summarizing land availability for mineral exploration and development in northern Alaska, 1986: U.S. Bureau of Mines Open-File Report 10-87, 33 quadrangle overlays.

Primary Reference: Brosge and Reiser, 1972

Reporter(s): J.M. Britton (Anchorage)

Last report date: 2010-05-14

Site name(s): Acme Creek

Site type: Mine

ARDF no.: WI120

Latitude: 67.4839 **Quadrangle:** WI B-1

Longitude: 150.2293

Location description and accuracy:

Acme Creek is a southeast-flowing tributary to lower Nolan Creek. Its mouth is about 0.5 upstream from the old town of Nolan. The site is near the mouth of the creek, about 0.5 mile north of the center of section 33, T. 31 N., R. 12 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Reed (1938) reported that a small amount of fine gold was mined a few hundred feet above the mouth of Acme Creek from a deep channel 70 to 110 feet deep. The deep channel was thought to be related to the deep channel on Nolan Creek (WI101). Reed (1938) noted that gold had not been found in the modern shallow channel of Acme Creek or in high channels along it. In 1989, a decline was started to access the deep channel near the mouth of Acme Creek but was abandoned short of bedrock. (See the record for Nolan Creek (WI101) for the significance and productivity of the deep channel along it.)

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Undetermined

Site Status: Probably inactive

Workings/exploration:

Some mining on a deep channel just above the mouth of Acme Creek.

Production notes:

Probably some gold production.

Reserves:

None.

Additional comments:

References:

Bundtzen, T.K., Swainbank, R.C., Wood, J.E., Clough, A.H., 1991 (1992), Alaska's Mineral Industry 1991: Alaska Division of Geological & Geophysical Surveys, Special Report 46, 89 p.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Cow Creek

Site type: Occurrence

ARDF no.: WI121

Latitude: 67.3921 **Quadrangle:** WI B-1

Longitude: 150.1515

Location description and accuracy:

Cow Creek is a small, east-flowing tributary to the Middle Fork, Koyukuk River. Its mouth is about 1.8 miles southwest of Wiseman. The occurrence, as plotted by Brosge and Reiser (1960), is at an elevation of about 1,500 feet, in the SE1/4 section 26, T. 30 N., R. 12 W., of the Fairbanks Meridian. It is just north of Cow Creek, on a small unnamed, north tributary. The location is accurate within one-half mile.

Commodities:

Main: Cu

Other:

Ore minerals: Copper sulfides, malachite

Gangue minerals:

Geologic description:

Brosge and Reiser (1960) noted copper sulfides and malachite staining in Devonian(?) schist and marble.

Alteration:

Alteration of copper minerals.

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Only surface sampling.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T., Jr., 1988, Maps and descriptions of lode and placer deposits, prospects, and occurrences in the Wiseman 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p., 2 plates, scale 1:250,000.

Brosgé, W.P., and Reiser, H.N., 1960, Progress map of the geology of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 60-19, 2 sheets, scale 1:250,000.

Cobb, E.H., 1972, Metallic mineral resources map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-469, 1 sheet, scale 1:250,000

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Grybeck, Donald, 1977, Map showing known mineral deposits of the Brooks Range, Alaska: U.S. Geological Survey Open-File Report 77-166-C, 45 p., 1 sheet, scale 1:1,000,000.

Maas, K.M., 1987, Maps summarizing land availability for mineral exploration and development in northern Alaska, 1986: U.S. Bureau of Mines Open-File Report 10-87, 33 quadrangle overlays.

Primary Reference: Brosge and Reiser, 1960

Reporter(s): J.M. Britton (Anchorage)

Last report date: 2010-05-14

Site name(s): Moose Creek; Moose Gulch

Site type: Occurrence

ARDF no.: WI122

Latitude: 67.3763 **Quadrangle:** WI B-1

Longitude: 150.1716

Location description and accuracy:
Moose Creek is a west tributary to the Middle Fork, Koyukuk River; its mouth is about 3 miles south-southwest of Wiseman. The exact location of this occurrence is unknown and the location is arbitrarily placed about 0.5 mile upstream from the mouth of Moose Creek.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:
Maddren (1913) described Moose Creek as a small gulch containing gold prospects, but numerous large boulders prevented any work from being done. No other information is available on this occurrence.

Alteration:

Age of mineralization:
Quaternary.

Generic deposit model:
Placer deposits (Garnett and Bassett, 2005)

Deposit model:
Placer Au (Cox and Singer, 1986; model 39a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: None

Site Status: Inactive

Workings/exploration:
Surface prospecting.

Production notes:
None.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Heiner, L.E., and Wolff, E.N., eds., 1968, Mineral resources of northern Alaska, Final report, submitted to the NORTH Commission: University of Alaska, Mineral Industry Research Laboratory Report No. 16, 306 p.

Maas, K.M., 1987, Maps summarizing land availability for mineral exploration and development in northern Alaska, 1986: U.S. Bureau of Mines Open-File Report 10-87, 33 quadrangle overlays.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Maddren, 1913

Reporter(s): J.M. Britton (Anchorage)

Last report date: 2010-05-14

Site name(s): Thompson Pup; Thompson Gulch

Site type: Mine

ARDF no.: WI124

Latitude: 67.4892 **Quadrangle:** WI B-1

Longitude: 150.1879

Location description and accuracy:

Thompson Pup is a 0.8-mile-long tributary to Fay Creek. The junction of Fay Creek and and Thompson Pup is about 1 mile northwest of the summit of Smith Creek Dome. Placer gold has been mined along most of Thompson Pup. The coordinates are at the mine symbol on the 1:63,360-scale topographic map, which is a short distance above the mouth of Thompson Pup and about 0.5 mile north of the center of section 27, T. 31 N., R. 12 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Thompson Pup is a tributary of Fay Creek (WI112) and in recent years they may have been mined together. The first record of mining on Thompson Pup was in 1929, when a high channel was mined about 1,000 feet upstream from its mouth on Fay Creek (Reed, 1938). Work on Thompson Pup was noted by Holdsworth (1957) and Williams (1950) who describe a hydraulic and ground sluicing operation on Thompson Gulch. Silverado Gold Mining Inc. mined on Fay Creek in 1993 (Bundtzen, 2008, 2009).

Williams (1950) reported that there were several channels on Thompson Pup and that the fineness of the gold being recovered was unusually high; averaging about 940 fine with nuggets up to 982 fine. Mosier and Lewis (1986), however, indicate that the fineness is generally lower, in the range of 777 to 926. Eden (2000) reports that the gold placer deposits extend up Thompson Pup for approximately a half mile above Fay Creek, and that the gold from Thompson Pup is crystalline. The crystalline nature of the gold distinguishes it from other placer gold in the Nolan Creek area and suggests that it has not traveled far from its source. Kurtak and others (1999) analyzed arsenopyrite crystals from placer concentrates from Thompson Pup; they contained as much as 1,964 parts per billion gold, but they may have been contaminated.

Eden (2000) estimated that a total of 3,100 ounces of gold were produced from Thompson Pup between 1904 and 1999. Based on a personal communication in 2001, Kurtak and others (2002) reported that Thompson Pup had a 'measured reserve' of 1,000 ounces of gold in its upper portion.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Active?

Workings/exploration:

From 1929 into the 1960s, Thompson Pup was mined by hand methods, including ground sluicing, and by hydraulic methods. Mechanical mining was reported in 1993 (Bundtzen, 2008 and 2009).

Production notes:

Eden (2000) reports that a total of 3,100 ounces of gold were produced from Thompson Pup between 1904 and 1999.

Reserves:

Based on a personal communication in 2001, Kurtak and others (2002) reported that Thompson Pup had a 'measured reserve' of 1,000 ounces of gold in its upper portion.

Additional comments:

References:

Armstrong, E., 1985, The placer geology of the Wiseman area, in Walsh, D.E.,and Wray, M.S., eds., 1985, Sixth Annual Conference on Alaskan Placer Mining: March 28-29, 1984, Fairbanks, Alaska: Mineral Industry Research Laboratory Report 69, 77 p.

Bundtzen, T.K., 2008, Estimation of lode and placer mineral resources, Nolan Creek, Wiseman B-1 quadrangle, Koyukuk Mining District, northern Alaska, July 28, 2008: NI43-101 Technical Report for Silverado Gold Mines Ltd., 128 p. (posted on www.sedar.com, July 31, 2008).

Bundtzen, T.K., 2009, Updates of mineral resource and reserve estimates and preliminary feasibility study, Workman's bench antimony-gold lode deposit, Nolan Creek, Wiseman B-1 quadrangle, Koyukuk Mining District, Northern Alaska, Jan 1, 2009: NI 43-101 Technical Report for Silverado Gold Mines Ltd., 165 p. (posed on www.sedar.com, June 1, 2009).

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Eden, K., 2000, Geology and gold mineralization of the Nolan area in the Brooks Range, Alaska: U.S. Bureau of Land Management Open-File Report 78, 87 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Holdsworth, P.R., 1957, Report of the commissioner of mines for the biennium ended December 31, 1956: Alaska Territorial Department of Mines Annual Report 1956, 103 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Williams, E.M., 1999, Mineral investigations in the Koyukuk mining district, northern Alaska--Progress Report: U.S. Bureau of Land Management Open-File Report 74, 158 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Williams, J.A., 1950, Mining operations in the Fairbanks district and Innoko and Koyukuk precincts: Alaska Territorial Department of Mines Miscellaneous Report 194-13, 20 p.

Primary Reference: Eden, 2000, Bundtzen, 2008

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Pasco Creek

Site type: Occurrence

ARDF no.: WI125

Latitude: 67.4659 **Quadrangle:** WI B-1

Longitude: 150.3126

Location description and accuracy:

Pasco Creek is a short, west tributary to Wiseman Creek. It heads in Pasco Pass and flows into Wiseman Creek about 1 mile west of Nolan Creek Lake. The location of placer occurrences on Pasco creek is uncertain and the coordinates are arbitrarily placed near its mouth, near the center of section 31, T. 31 N., R. 12 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Schrader (1900) reported placer gold on Pasco Creek but there is no other reference to it in the literature until 2002. Kurtak and others (2002) visited and sampled the site but found no indication of mining. One panned concentrate showed a small amount of fine gold although an analysis showed only 9 parts per billion gold.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Inactive

Workings/exploration:

Schrader (1900) reported placer gold on Pasco Creek. Kurtak and others (2002) visited and sampled the

site. They found no indication of mining or prospecting.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in the Wiseman quadrangle, Alaska; Supplement to Open-File Report 76-340; Part B, Lists of references to January 1, 1981: U.S. Geological Survey Open-File Report 81-732-B, 22 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Schrader, F.C., 1900, Preliminary report on a reconnaissance along the Chandalar and Koyukuk Rivers, Alaska, in 1899: U.S. Geological Survey Twenty-first Annual Report, Part 2, p. 441-486.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Quartz Creek

Site type: Mine

ARDF no.: WI126

Latitude: 67.2507 **Quadrangle:** WI B-1

Longitude: 150.3084

Location description and accuracy:

Quartz Creek is a southeast-flowing tributary to Porcupine Creek. It's mouth is about 3 miles west of Coldfoot. A little gold was mined on Quartz Creek at some unknown location and the site is arbitrarily located just upstream from its mouth on Porcupine Creek (WI152) near the center of section 13, T. 28 N., R. 13 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Although Porcupine Creek (WI152) produced substantial gold from 1900 to 2000, Quartz Creek that flows into it has produced only a small amount (Kurtak and others, 2002). Reed (1938) indicated that Quartz Creek produced about 80 ounces of gold by hand mining sometime before 1938. No ground rich enough to mine was subsequently found (Saunders, 1954).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Active?

Workings/exploration:

Quartz creek was hand mined some time before 1938 but only about 80 ounces of gold was recovered

(Reed, 1938).

Production notes:

About 80 ounces of gold was produce by hand mining sometime before 1938 (Reed, 1938).

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., 1982, Source of lode and placer gold deposits of the Chandalar and upper Koyukuk Districts: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-158, 25 p., 1 sheet, scale 1:250,000.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Saunders, R.H., 1954, Koyukuk district operations (Wiseman, Chandalar): Alaska Territorial Department of Mines Miscellaneous Report MR-194-16, 8 p.

Primary Reference: Reed, 1938; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (near summit of Smith Creek Dome)

Site type: Occurrences

ARDF no.: WI127

Latitude: 67.4765 **Quadrangle:** WI B-1

Longitude: 150.1722

Location description and accuracy:

This site consists of several occurrences near the top of Smith Creek Dome. The coordinates are the top of the Dome which is about 0.6 mile south-southwest of the center of section 26, T. 31 N., R. 12 W. The location is accurate.

Commodities:

Main: Ag, As, Au, Pb, Sb

Other:

Ore minerals: Gold, stibnite

Gangue minerals: Quartz

Geologic description:

The rocks at the top of Smith Creek Dome are Upper Devonian quartzite interbedded with chloritic quartzite and quartz-mica schist . They are thrust faulted over Devonian schist and phyllite (Eden, 2000; Kurtak and others, 2002).

Several parties have described mineralization near the top of Smith Creek Dome. Ebbley and Wright (1948) described a 6-inch-thick quartz-stibnite vein at a caved prospect. Brosge and Reiser (1972) collected several samples in the same area, possibly at the same prospect. Two samples of a quartz-stibnite vein assayed up to 9.2 parts per million (ppm) gold, 5,000 ppm arsenic, and more than 1 percent antimony. Elen (2000) also collected several samples in this vicinity. One was of a quartz vein that cut quartz-mica schist and contained 46 parts per billion (ppb) gold. A sample of schist with pyrite cubes contained 2,234 ppb gold, 7.2 ppm silver and 3,500 ppm lead.

Kurtak and others (2002) located 2 trenches, half a mile north of Smith Creek Dome, perhaps the same prospect described by Ebbley and Wright. The larger is 6 feet long, 3 feet wide and 3.5 feet deep. A select sample of quartz-stibnite vein in this trench contained 436 ppb gold, 297 ppm arsenic, and 28.1 percent antimony. They also collected 8 samples of quartz veins and wallrock just south of the top of Smith Creek Dome. Seven of of the 8 samples contained 9 to 5,095 ppb gold. The quartz veinlets are about 1/8th to 1 inch wide, strike about N55W, and dip 83S. The veins are exposed for no more than 10 feet along strike. They average 3,665 ppb gold, 5.1 ppm silver, 2,931 ppm lead, 103 ppm arsenic, and 126 ppm antimony.

Alteration:

No mention of alteration.

Age of mineralization:

Devonian or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Quartz -stibnite vein and low-sulfide gold-quartz vein (Cox and Singer, 1986; models 27d and 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
27d, 36a

Production Status: None

Site Status: Inactive

Workings/exploration:
Four episodes of examination and sampling by government agencies from 1948 to about 2000.

Production notes:
None.

Reserves:
None.

Additional comments:

References:

Brosgé, W.P., and Reiser, H.N., 1972, Geochemical reconnaissance in the Wiseman and Chandalar districts and adjacent region, southern Brooks Range, Alaska: U.S. Geological Survey Professional Paper 709, 21 p.

Eden, K., 2000, Geology and gold mineralization of the Nolan area in the Brooks Range, Alaska: U.S. Bureau of Land Management Open-File Report 78, 87 p.

Ebbley, Norman, Jr., and Wright, W.S., 1948, Antimony deposits in Alaska: U.S. Bureau of Mines Report of Investigations 4173, 41 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Williams, E.M., 1999, Mineral investigations in the Koyukuk mining district, northern Alaska--Progress Report: U.S. Bureau of Land Management Open-File Report 74, 158 p.

Primary Reference: Eden, 2000

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (along and at head of Thompson Pup)

Site type: Occurrences

ARDF no.: WI128

Latitude: 67.4956 **Quadrangle:** WI B-1

Longitude: 150.1669

Location description and accuracy:
These occurrences are along and at the head of Thompson Pup, a tributary of Fay Creek (WI112). They are in the southwest quarter of section 23, T. 31 N, R. 12W. The location is accurate. (See WI124 for placer gold in Thompson Pup.)

Commodities:

Main: Au

Other: Ag, As, Cu, Sb

Ore minerals: Arsenopyrite, chalcopyrite, gold, pyrite, stibnite

Gangue minerals: Limonite, quartz, siderite

Geologic description:
Quartz veins with gold have been identified at several locations along and at the head of Thompson Pup. Brosge and Reiser (1972) found a quartz vein at the head of Thompson Pup that averaged 3.4 parts per million (ppm) gold. Kurtak and others (2002) collected a series of 8 samples (presumably along Thompson Pup) from veins 0.5 inch to 2 feet thick that averaged 56 parts per billion (ppb) gold; the highest value was 182 ppb gold. The veins trend N70W and contain sparse pyrite, chalcopyrite, arsenopyrite, and stibnite. Sluice concentrates from placer mining include many arsenopyrite crystals up to 1 centimeter in size. A sample of these crystals contained 1,964 ppb gold. The rocks in the area are mostly Devonian micaceous schist, phyllite, and metasiltstone (Eden, 2000).

Alteration:
None mentioned.

Age of mineralization:
Devonian or younger based on the age of the host rock.

Generic deposit model:

Deposit model:
Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
36a

Production Status: None

Site Status: Undetermined

Workings/exploration:

Limited surface sampling by government agencies (Brosge and Reiser, 1972; Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brosgé, W.P., and Reiser, H.N., 1972, Geochemical reconnaissance in the Wiseman and Chandalar districts and adjacent region, southern Brooks Range, Alaska: U.S. Geological Survey Professional Paper 709, 21 p.

Eden, K., 2000, Geology and gold mineralization of the Nolan area in the Brooks Range, Alaska: U.S. Bureau of Land Management Open-File Report 78, 87 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Williams, E.M., 1999, Mineral investigations in the Koyukuk mining district, northern Alaska--Progress Report: U.S. Bureau of Land Management Open-File Report 74, 158 p.

Primary Reference: Kurtak and others, 1999

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (on lower Wiseman Creek)

Site type: Occurrence

ARDF no.: WI129

Latitude: 67.4144 **Quadrangle:** WI B-1

Longitude: 150.1332

Location description and accuracy:

This occurrence is at the lower end of the Wiseman Creek canyon about 0.5 mile west-northwest of Wiseman. The location is accurate.

Commodities:

Main: Cu

Other:

Ore minerals: Chalcopyrite, chrysocolla

Gangue minerals: Gypsum, quartz

Geologic description:

Brosge and Reiser (1960) reported unspecified copper sulfides and malachite stains in Devonian(?) schist and marble. At the same location, Mulligan (1974) described narrow veins of quartz and dogtooth-spar gypsum in mica schist. Grab samples of quartz and gypsum float contained traces of chalcopyrite and chrysocolla (Mulligan, 1974). Dillon and Reifenstuhl (1990) mapped the rocks in the area as lower Paleozoic(?) or Proterozoic(?) marble and calcareous schist.

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Brosgé, W.P., and Reiser, H.N., 1960, Progress map of the geology of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 60-19, 2 sheets, scale 1:250,000.

Cobb, E.H., 1972, Metallic mineral resources map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-469, 1 sheet, scale 1:250,000

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Dillon, J.T., and Reifenstuhl, R.R., 1990, Geologic map of the Wiseman B-1 quadrangle, southcentral Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 101, 1 sheet, scale 1:63,360.

Maas, K.M., 1987, Maps summarizing land availability for mineral exploration and development in northern Alaska, 1986: U.S. Bureau of Mines Open-File Report 10-87, 33 quadrangle overlays.

Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Primary Reference: Mulligan, 1974

Reporter(s): J.M. Britton (Anchorage)

Last report date: 2010-05-14

Site name(s): Unnamed (in Smith Creek)

Site type: Prospect

ARDF no.: WI130

Latitude: 67.4688 **Quadrangle:** WI B-1

Longitude: 150.1991

Location description and accuracy:

This prospect is at an elevation of about 1,950 feet in Smith Creek, about 1 mile east of Nolan Creek. The location is accurate.

Commodities:

Main: Au, Sb

Other:

Ore minerals: Arsenopyrite, gold, stibnite

Gangue minerals: Ankerite, dolomite, quartz

Geologic description:

Eden (2000) describes quartz-stibnite-gold veins at three locations in the vicinity of Smith Creek. Two of the three locations described by Eden (2000, locations 266 & 359) appear to correspond to the Wanemaker & Wortman (WI115) and the Jones & Boyle (WI114) prospects described by Ebbley and Wright (1948). The location described in this record is about a mile further upstream and was not described by Ebbley & Wright (1948). Reports of production of antimony from placer operations on Smith Creek may have covered one or more of these three locations.

The veins here consist of coarse-grained, white quartz with stibnite and arsenopyrite. The gold is mostly in the margins of the quartz veins but rare in the stibnite. Calcite, ankerite and minor dolomite also occur along the margins of the veins. The veins do not exhibit alteration envelopes. Thin quartz-carbonate veins, which represent a later stage of the mineralizing event, cut the quartz-stibnite-gold veins. The mineralized veins are 0.5 to 1.5 centimeters thick, strike N 55 E, and dip steeply (Eden, 2000). Two samples of sulfide-bearing quartz veins contain 1,532 and 1,958 ppb gold, 5,772 ppm and 3,933 ppm arsenic and more than 2,000 ppm antimony (Eden, 2000, samples 11165 and 11166). The veins are near a fault contact between Devonian chloritic schist and a unit of Devonian gray-black phyllite, black slate, and black metasiltstone.

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Sb-Au vein deposit (Nokleberg and others, 1987); or simple stibnite vein (Cox and Singer, 1986; model 27d)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

27d

Production Status: Yes

Site Status: Inactive

Workings/exploration:

The veins were exposed by during placer mining. Apparently there is no other work on the veins beyond sampling.

Production notes:

Five tons of stibnite was recovered from sluice operations in the vicinity of the veins and shipped during World War II (Joesting, 1943).

Reserves:

None.

Additional comments:

References:

Ebbley, Norman, Jr., and Wright, W.S., 1948, Antimony deposits in Alaska: U.S. Bureau of Mines Report of Investigations 4173, 41 p.

Eden, K., 2000, Geology and gold mineralization of the Nolan area in the Brooks Range, Alaska: U.S. Bureau of Land Management Open-File Report 78, 87 p.

Joesting, H.R., 1943, Strategic mineral occurrences in interior Alaska, supplement to pamphlet no. 1: Alaska Territorial Department of Mines Pamphlet 2, 26 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Williams, E.M., 1999, Mineral investigations in the Koyukuk mining district, northern Alaska--Progress Report: U.S. Bureau of Land Management Open-File Report 74, 158 p.

Saunders, R.H., 1954, Koyukuk district operations (Wiseman, Chandalar): Alaska Territorial Department of Mines Miscellaneous Report MR-194-16, 8 p.

Primary Reference: Eden, 2000

Reporter(s): J.M. Britton (Anchorage)

Last report date: 2010-05-14

Site name(s): Unnamed (near southwest end of Midnight Dome)

Site type: Occurrence

ARDF no.: WI132

Latitude: 67.4597 **Quadrangle:** WI B-1

Longitude: 150.1562

Location description and accuracy:

This occurrence is at an elevation of 3,700 feet, 0.2 mile west of hill 3860 on the south end of Midnight Dome. The location is accurate.

Commodities:

Main: Au

Other: Cu

Ore minerals: Gold?, malachite, pyrite

Gangue minerals: Quartz

Geologic description:

This occurrence consists of sulfide-bearing quartz veins in schist or quartzite (Eden, 2000). A sample of vein quartz found in float contains pyrite, malachite, and limonite, 179 ppb gold and 1,469 ppm copper. A sample of quartz vein collected in place contains pyrite and limonite, and 532 ppb gold. Eden (2000) interprets this occurrence as an extension of the system of auriferous quartz veins in the Nolan area. The rocks in the area are Upper Devonian chloritic schist and chloritic quartzite (Eden, 2000).

Alteration:

Iron-oxide alteration.

Age of mineralization:

Generic deposit model:

Deposit model:

Low-sulfide Au-quartz vein (Cox and Singer, 1986; model 36a)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

36a

Production Status: None

Site Status: Inactive

Workings/exploration:

Only limited surface sampling and geologic mapping.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Eden, K., 2000, Geology and gold mineralization of the Nolan area in the Brooks Range, Alaska: U.S. Bureau of Land Management Open-File Report 78, 87 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Williams, E.M., 1999, Mineral investigations in the Koyukuk mining district, northern Alaska--Progress Report: U.S. Bureau of Land Management Open-File Report 74, 158 p.

Primary Reference: Eden, 2000

Reporter(s): J.M. Britton (Anchorage)

Last report date: 2010-05-14

Site name(s): Roosevelt Creek; RO; Skroo

Site type: Prospect

ARDF no.: WI134

Latitude: 67.1386 **Quadrangle:** WI A-6

Longitude: 152.9018

Location description and accuracy:

This prospect is near Roosevelt Creek about two miles north of the Malamute Fork, Alatna River. A large claim group which extends about 10 miles east-west and 1 to 1.5 miles north-south, is shown by Dillon and others (1981, Plate 1); the claims are presumed to cover this this prospect. For this record, the site is about 0.5 mile east-northeast of the center of section 30, T. 27 N., R. 25 W. The location is accurate within 1 mile.

Commodities:

Main: Cu, Pb, Zn

Other: Ag?, Au?

Ore minerals: Chalcopyrite, galena, pyrite, sphalerite

Gangue minerals:

Geologic description:

Sparse published information about the Roosevelt Creek prospect principally cites oral communications and reports of unpublished industry data. The most recent of the published reports (Nokleberg and others, 1996) describes the Roosevelt Creek prospect as massive and disseminated(?) sulfides in metavolcanics, pelitic schists and marbles of the Devonian and Mississippian, Ambler sequence. The sulfides are described as probably chalcopyrite, sphalerite, and galena. Dillon and others (1986) map the general area of the prospect as Devonian, metavolcanic rocks and Proterozoic(?) or lower Paleozoic schists of various types, along with local marble. Grybeck (1977) indicates that the geology and geochemistry of the area is similar to that to the west in the Ambler district.

Kurtak and others (2002) examined the area during their study of the Koyukuk mining district. They report that the canyon on Roosevelt Creek exposes Devonian(?) muscovite schist, graphitic schist and metarhyolite in a sequence that trends generally east-west and dips 55o south. Drilling by Anaconda Alaska intersected narrow, discontinuous zones of massive to semi-massive pyrite, sphalerite, galena, and chalcopyrite in schist and metarhyolite.

Several rock samples collected along Roosevelt Creek in the vicinity of the presumed location of the prospect are described in Dillon and others (1981) as felsic schists or felsites, most of which contain 1-2 percent disseminated pyrite. One sample may contain as much as 3 percent disseminated chalcopyrite and another may contain galena. Chemical analysis of these samples showed that only one contained any base metals: it was weakly anomalous in Pb.

Following up a geochemical soil anomaly, industry staked claims over the prospect in 1975 (Kurtak and others, 2002.) The prospect was explored by geophysics in 1976 and 1977. Grybeck (1977, loc. 1) reported that 77 lode claims were staked in 1975, and Dillon and others (1981) show a large claim block over the property that extended at least 10 miles east and 1 to 1.5 miles north. One of two core holes drilled in 1978 by Anaconda Alaska intersected massive-sulfide mineralization. Four more holes drilled in 1979 also intersected mineralization.

Alteration:

Not specifically mentioned.

Age of mineralization:

Correlative with the massive-sulfide deposits in the Devonian and Mississippian Ambler Sequence.

Generic deposit model:

Deposit model:

Kuroko massive sulfide (Cox and Singer, 1986; model 28a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a

Production Status: None

Site Status: Inactive

Workings/exploration:

Based on a geochemical soil anomaly, Anaconda Alaska first staked over the prospect in 1975 (Grybeck, 1977, Kurtak and others, 2002) The prospect was explored by geophysics in 1976 and 1977. Dillon and others (1981) show a large claim block over the property that extended at least 10 miles east-west and 1 to 1.5 miles north-south. One of two core holes drilled in 1978 by Anaconda Alaska intersected massive-sulfide mineralization. Four more holes drilled in 1979 also intersected mineralization.

Production notes:

None.

Reserves:

None.

Additional comments:

Core samples from three drill holes from the Roosevelt Creek and/or RO prospects are stored at the Alaska Geologic Materials Center in Eagle River, Alaska.

References:

Dillon, J.T., Cathrall, J.B., and Moorman, M.A., 1981, Geochemical reconnaissance of the southwest Wiseman quadrangle-summary of data on rock samples: Alaska Division of Geological and Geophysical Surveys Open-File Report 133B, 164 p.

Grybeck, Donald, 1977, Map showing known mineral deposits of the Brooks Range, Alaska: U.S. Geological Survey Open-File Report 77-166-C, 45 p., 1 sheet, scale 1:1,000,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Nokleberg, W.J., Bundtzen, T.K., Berg, H.C., Brew, D.A., Grybeck, D.J., Robinson, M.S., Smith, T.E., and Yeend, W., 1987, Significant metalliferous lode deposits and placer districts of Alaska: U.S. Geological Survey Bulletin 1786, 104 p., 2 plates, scale 1:5,000,000.

Nokleberg, W.J., Bundtzen, T.K., Dawson, K.M., Eremin, R.A., Goryachev, N.A., Koch, R.D., Ratkin, V.V, Rozenblum, I.S., Shpikerman, V.I., Frolov, Y.F., Gorodinsky, M.E., Melnikov, V.D., Diggles, M.F., Ognyanov, N.V., Petrachenko, E.D., Petrochenko, R.I., Pozdeev, A.I., Ross, K.V., Wood, D.H., Grybeck, D., Khanchuck, A.I., Kovbas, L.I., Nekrasov, I.Y., and Sidorov, A.A., 1996, Significant metalliferous and

selected non-metalliferous lode mineral deposits and placer districts, and for metallogenesis of the Russian Far East, Alaska, and the Canadian Cordillera: U.S. Geological Survey Open-File Report 96-513-B, 385 p.; U.S. Geological Survey Open-File Report 96-513-B, 385 p. (CD-ROM format).

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Red

Site type: Occurrence

ARDF no.: WI136

Latitude: 67.1964 **Quadrangle:** WI A-6

Longitude: 152.7628

Location description and accuracy:

The Red occurrence is west of lower Mettenpherg Creek, about 5 to 6 miles north of the junction of Mettenpherg Creek and the Malamute Fork, Alatna River. Two small claim groups, approximately 1 to 1.5 miles apart in a north-south direction are shown by Dillon and others (1981, Plate 1 [AOF 133B]); the most northerly of these claim groups is inferred (from very scant data) to correspond to the Red property. The occurrence is near the center of the claim block at an elevation of about 2,150 feet, in the NE1/4 section 2, T. 27 N., R. 24 W.

Commodities:

Main: Cu, Zn

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Almost no information is available on this property. It reportedly is a stratiform Cu-Zn occurrence in an area whose geology and geochemistry is similar to that in the Ambler District to the west (Grybeck, 1977, loc. 2). The area is underlain by Middle(?) Devonian, calcareous schist interbedded with quartz mica schist and marble (Brosge and Reiser, 1971). The Bureau of Land Management made an aerial reconnaissance of the area in the 1990s, but saw nothing to suggest the presence of mineralization (Kurtak and others, 2002). Bureau of Land Management data indicate that 8 claims were located in 1975 and abandoned by 1980 (Kurtak and others, 2002).

Alteration:

Age of mineralization:

If any, Middle Devonian or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Kuroko massive sulfide? (Cox and Singer, 1986; model 28a?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a?

Production Status: None

Site Status: Inactive

Workings/exploration:

Twenty-one lode claims were staked in 1975 (Grybeck, 1977). Bureau of Land Management data indicate that 8 claims were located in 1975 and abandoned in 1978 (Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

See also Roosevelt Creek (WI134).

References:

Brosgé, W.P., and Reiser, H.N., 1971, Preliminary bedrock geologic map, Wiseman and eastern Survey Pass quadrangles, Alaska: U.S. Geological Survey Open-File Report 71-0056, 2 sheets, scale 1:250,000.

Grybeck, Donald, 1977, Map showing known mineral deposits of the Brooks Range, Alaska: U.S. Geological Survey Open-File Report 77-166-C, 45 p., 1 sheet, scale 1:1,000,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Maas, K.M., 1987, Maps summarizing land availability for mineral exploration and development in northern Alaska, 1986: U.S. Bureau of Mines Open-File Report 10-87, 33 quadrangle overlays.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (near Jones Creek)

Site type: Prospect

ARDF no.: WI137

Latitude: 67.1496 **Quadrangle:** WI A-6

Longitude: 152.5951

Location description and accuracy:

The exact location of this prospect is uncertain. It is probably at an elevation of about 1,100 feet on a north tributary to Jones Creek in the SW1/4 section 22, T. 27 N., R. 23 W., of the Fairbanks Meridian.

Commodities:

Main: Cu, Zn

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Almost no information is available on this property except that reportedly it is a stratiform Cu-Zn occurrence in an area whose geology and geochemistry is similar to that in the Ambler District to the west (Grybeck, 1977). Regional geologic mapping indicates that the rocks in the vicinity of this occurrence are Devonian, Ambler metavolcanic rocks (Dillon and others, 1986). Thirty-six lode claims were staked in 1975 (Grybeck, 1977) and 3 holes were drilled on the prospect in the 1970s by Anaconda Minerals (Kurtak and others, 2002).

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Kuroko massive sulfide? (Cox and Singer, 1986; model 28a?).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

28a?

Production Status: None

Site Status: Inactive

Workings/exploration:

Thirty-six lode claims were staked in 1975 (Grybeck, 1977) and 3 holes were drilled on the prospect in the

1970s by Anaconda Minerals (Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

Core samples from three drill holes from the Jones Creek prospect are stored at the Alaska Geologic Materials Center in Eagle River, Alaska.

See also: Roosevelt Creek (WI134).

References:

Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

Grybeck, Donald, 1977, Map showing known mineral deposits of the Brooks Range, Alaska: U.S. Geological Survey Open-File Report 77-166-C, 45 p., 1 sheet, scale 1:1,000,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Maas, K.M., 1987, Maps summarizing land availability for mineral exploration and development in northern Alaska, 1986: U.S. Bureau of Mines Open-File Report 10-87, 33 quadrangle overlays.

Primary Reference: Grybeck, 1977

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Suckik Creek; Sickik Creek

Site type: Mine

ARDF no.: WI145

Latitude: 67.2266 **Quadrangle:** WI A-4

Longitude: 151.6962

Location description and accuracy:

Suckik Creek is south-flowing tributary to Timber Creek. The creek is named Sickik Creek on the modern (1970) A-4, 1-63,360-scale topographic map and Suckik Creek on the 1:250,000-scale map. The mouth of Suckik Creek is directly across Timber Creek from Button Mountain. There is little information on the exact location of placer mining on the creek. For this record, the site is placed about 3.5 miles upstream from the mouth of the creek where there was some suction dredging before 2000. The mine is in the northeast quarter of section 27, T. 28 N., R. 19 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Stewart (1949) described a 2-man, placer mining operation in 1948 that included shoveling-in and prospecting. Kurtak and others (2002) examined the creek but found no evidence of mining other than signs of suction dredging about 3.5 miles above the mouth of the creek and the remains of an old cabin and an airstrip near its mouth. Claims were active in 1948 and from 1979 to 1986. Suckik Creek is underlain mainly by Proterozoic or lower Paleozoic(?) schist and local marble, and by smaller areas of Devonian, metavolcanic rocks (Dillon and others, 1986).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Probably inactive

Workings/exploration:

There are reports of mining and prospecting in 1948 (Stewart, 1949) and suction dredging before 2002 (Kurtak and others, 2002).

Production notes:

Probably a small amount of undocumented gold production.

Reserves:

None.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Stewart, B.D., 1949, Report of the Commissioner of Mines for the biennium ended December 31, 1948: Alaska Territorial Department of Mines Annual Report 1948, 50 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Smalley Creek

Site type: Mine

ARDF no.: WI146

Latitude: 67.0306 **Quadrangle:** WI A-2

Longitude: 150.5125

Location description and accuracy:

The Smalley Creek that has been mined and is described by Reed (1938) is not named on the USGS 1:360,360-scale topographic map. It is about a mile northeast of the Smally Creek named on the map. Both are tributaries to the John River. The midpoint of the creek that has been mined is near the southwest corner of section 31, T. 26 N., R. 13 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Smalley Creek was first prospected in the 1900s (Reed, 1938). The placer gold occurs in the modern stream bed, in alluvium about 17 feet thick. The upper 4 to 7 feet consists of muck, and the remainder is coarse and waterworn gravel with numerous boulders. The gold is principally on bedrock, but also in the lower 6 feet of the gravel. The gold is in very fine, flat flakes; there are infrequent coarse pieces. Reed (1938) noted that the average fineness of the gold was 907. The fineness of five samples of gold collected in about 1985 varies from 853 to 933 (Mosier and Lewis, 1986). The bedrock is black shale and quartz conglomerate; Reed (1938) suspects that the conglomerate was the source of the fine gold in the placer. Reed (1938) reports mining by ground sluicing and shoveling in in 1937. Kurtak and others (2002) visited the site and found several trailers, cabins, and tailings, along about a quarter mile of the creek. They reported suction dredging from 1998 to 2001. Kurtak and others (2002) reported that 75 ounces of gold were produced from 1936 to 1941 and that there were active claims on the creek in several periods from 1956 to 2001.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Undetermined

Workings/exploration:

Smalley Creek was first prospected in the 1900s (Reed, 1938). Reed reported ground sluicing and shoveling in in 1937. Kurtak and others (2002) visited the site and found several trailers, cabins, and tailings along about a quarter of a mile of the creek. They noted active claims on the creek in several periods from 1956 to 2001 and suction dredging from 1998 to 2001.

Production notes:

Kurtak and others (2002) reported that 75 ounces of gold were produced from 1936 to 1941, but production from earlier mining was not known. There were also active claims during several periods from 1956 to 2001 and suction dredge mining from 1998 to 2001.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in the Wiseman quadrangle, Alaska; Supplement to Open-File Report 76-340; Part B, Lists of references to January 1, 1981: U.S. Geological Survey Open-File Report 81-732-B, 22 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Mosier, E.L., and Lewis, J.S., 1986, Analytical results, geochemical signatures, and sample locality map of lode gold, placer gold, and heavy-mineral concentrates from the Koyukuk-Chandalar mining district, Alaska: U.S. Geological Survey Open-File Report 86-345, 172 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Twelvemile Creek; Upper Fork; Lower Fork; Potato Creek

Site type: Mine

ARDF no.: WI147

Latitude: 67.1896 **Quadrangle:** WI A-1

Longitude: 150.4453

Location description and accuracy:

Twelvemile Creek is a large western tributary to the Middle Fork, Koyukuk River. The junction of Twelvemile Creek and the Middle Fork is about 6.5 miles southwest of Coldfoot. Probably the most extensive mining was from about 2.2 to 3.0 miles above the mouth of the creek. The coordinates are at about the middle of the mined area, about 0.6 mile southeast of the center of section 5, T. 27 N., R. 13 W. There has also been prospecting and some mining on the Lower and Upper Forks of Twelvemile Creek and probably on some of its ther tributaries.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Mining began on Twelvemile Creek in 1900 and continued along it and its tributaries during 8 of the years before 1942 (Schrader, 1900; Reed, 1938; Kurtak and others, 2002). From about 1900 to 1910, the modern creek bed was mined by hand methods. Later mining included shafts, open cuts, and drifting (Reed, 1938) There was exploration drilling in 1934 and hydraulic mining in 1937 (Reed, 1938). There was activity from 1953 to 1997 but the chronology and amount of mining during that period is unclear. It probably was done with mechanical earth moving equipment. Kurtak and others (2002) visited and sampled Twelvemile Creek. They found considerable evidence of past mining including remains of sluice boxes and wash plants, trailers, and other equipment along the creek from about 2.2 to 3.0miles above its mouth. The equipment probably postdates WWII, but they found no sign of recent mining.

Reed (1938) reported that the gold on Twelvemile Creek was in three environments: 1) along the modern channel, 2) in a deep channel, and 3) in channels on benches. Mining has mainly been in the modern channel and on the benches. The gold apparently is sporadically distributed. The depth to bedrock in the upstream modern channel is about 5 feet. The gold-bearing gravel on the downstream parts of the modern channel is relatively fine grained with few boulders. The gravel on the upper part of the creek contains more boulders.

There are two high-bench channels: an upper one, called 'primary', and a lower one, called 'secondary'. The secondary bench is about 60 feet wide and 20 feet above the modern stream; it occurs only along the left limit of the Upper Fork (Reed, 1938). The primary bench is about 125 feet above the secondary bench. The primary bench It is 600 feet wide, and lies along the left limit of lower Upper Fork and along Twelvemile Creek downstream as far as the Lower Fork. Below Lower Fork, high channels occur along the right limit of Twelvemile Creek at about the same level as the primary bench. An adit into the primary channel on the lower Upper Fork explored gravels containing gold values of $0.75 per cubic yard (gold at $35 per ounce). There apparently is a deep channel along Twelvemile Creek but it isn't clear whether it contains any gold.

Reed (1938) reported only one active mining operation in 1937, along lower Upper Fork (Reed's 'Middle

Fork'). The depth to bedrock there was 8 to 21 feet, and very fine, flat pieces of gold were distributed throughout the gravel. The values were about $0.35 per square foot of bedrock and the average fineness was 914. According to Reed (1938), several other tributaries of Twelvemile Creek that are not named on the modern USGS 1:63,360-scale topographic maps were explored and/or mined with varying degrees of success.

Kurtak and others (2002) report that 281 ounces of gold were produced from Twelvemile Creek and its tributaries from 1900 to 1942, most of it from 1900 to 1925. Production records after 1942 are not available but Orris and Bliss (1985) indicate that Twelvemile Creek probably produced from 1,002 to 7,500 ounces ounces of gold, but possibly as much as 1,500 ounces.

The bedrock in the Twelvemile Creek area is mainly graphitic and quartz schist (Reed, 1938) . Dillon and others (1986) mapped the rocks as Mississippian to Triassic metagraywacke and phyllite, and Upper Devonian, Hunt Fork schist.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Inactive

Workings/exploration:

Mining began on Twelvemile Creek in 1900 and continued on it and tributaries during 8 of the years between 1900 and 1942 (Reed, 1938; Kurtak and others, 2002). Later mining included shafts, open cuts, and drifting (Reed, 1938) There was exploration drilling in 1934 and hydraulic mining in 1937 (Reed, 1938). There was activity from 1953 to 1997 but the chronology and amount of mining during that period is unclear. It probably was done with mechanical earth moving equipment. Kurtak and others (2002) visited and sampled Twelvemile Creek. They found considerable evidence of past mining including remains of sluice boxes and wash plants, trailers, and other equipment along the creek from about 2.2 to 3.0 miles above its mouth. The equipment probably postdates WWII but they found no sign of recent mining.

Production notes:

Kurtak and others (2002) report that 281 ounces of gold were produced from Twelvemile Creek and its tributaries from 1900 to 1942, most of it from 1900 to 1925. Production records after 1942 are not available but Orris and Bliss (1985) indicate that Twelvemile Creek probably produced from 1,002 to 7,500 ounces ounces of gold, but possibly as much as 1,500 ounces.

Reserves:

None.

Additional comments:

References:

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T., Jr., 1988, Maps and descriptions of lode and placer deposits, prospects, and occurrences in the Wiseman 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p., 2 plates, scale 1:250,000.

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Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

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Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Schrader, F.C., 1900, Preliminary report on a reconnaissance along the Chandalar and Koyukuk Rivers, Alaska, in 1899: U.S. Geological Survey Twenty-first Annual Report, Part 2, p. 441-486.

Schrader, F.C., 1904, A reconnaissance in northern Alaska across the Rocky Mountains, along Koyukuk, John, Anaktuvuk, and Colville rivers and the Arctic coast to Cape Lisburne, in 1901, with notes by W.J. Peters: U.S. Geological Survey Professional Paper 20, 139 p.

Primary Reference: Reed, 1938

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Slate Creek

Site type:

ARDF no.: WI149

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

This is a case where a placered creek crosses a quadrangle boundary. There was was also considerable ambiguity if not contradictions in the original records in the two quadrangles and many of the early reports don't make any distinction. The majority of the production was in the Chandalar quadrangle and that is now the site of the only record for Slate Creek (CH007).

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Myrtle Creek

Site type:

ARDF no.: WI150

Latitude: **Quadrangle:**

Longitude:

Location description and accuracy:

This is a case where a placered creek crosses a quadrangle boundary. Most of the placer is in the Chandalar quadrangle and the information about this site can be found in the CH008 (Myrtle Creek) record.

Commodities:

Main:

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Alteration:

Age of mineralization:

Generic deposit model:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status:

Site Status:

Workings/exploration:

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Primary Reference:

Reporter(s): J.M. Britton (Anchorage, Alaska); D.J. Grybeck (Contractor, U.S. Geological Survey)

Last report date: 2010-04-18

Site name(s): Rosie Creek; Rose Creek; Lake Creek

Site type: Prospects

ARDF no.: WI151

Latitude: 67.1945

Quadrangle: WI A-1

Longitude: 150.1923

Location description and accuracy:

Rosie Creek is 4 miles south of Coldfoot. The site is at the junction of Rosie Creek and a small creek informally named Lake Creek that extends to a small lake about a mile north. The site is about 0.3 mile east of the center of section 3, T. 27 N., R. 12 W. Six shafts were sunk near this junction.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

In about 1900, fine gold was discovered about 2 miles above the mouth of Rosie Creek (Maddren, 1913). Six shafts were sunk in the early 1900s on Rosie Creek and its tributary Lake Creek (Reed, 1938; Kurtak and others, 2002). The depth to bedrock varied from just over 100 feet to as much as 275 feet in one shaft near the head of Lake Creek. A 113-foot shaft near the junction of Rose Creek and Lake Creek worked a thin layer of gravel on bedrock that produced numerous fine flakes of gold. Reed (1938) described several additional shafts at locations from near the head of Lake Creek to about 0.2 mile below the junction of Rosie and Lake Creeks. Only the shafts on Lake Creek found gold as fine flakes throughout the gravel from a depth of 20 feet to the top of the bedrock. Reed (1938) reported that the bedrock on Rosie Creek is greenstone and the bedrock on Lake Creek is schist. According to Dillon and others (1986), Rosie Creek is underlain by metagraywacke and phyllite, and upper Lake Creek is underlain by schist of the Devonian Hunt Fork Formation. Kurtak and others (2002) visited the site but found little indication of prospecting or mining.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Inactive

Workings/exploration:

In about 1900, fine gold was discovered about 2 miles above the mouth of Rosie Creek (Maddren, 1913). Six shafts were sunk in the early 1900s on Rosie Creek and its tributary Lake Creek (Reed, 1938). Kurtak and others (2002) visited the site but found little indication of prospecting or mining.

Production notes:

Only a small amount of flour gold was recovered during prospecting.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1973, Placer deposits of Alaska: U.S. Geological Survey Bulletin 1374, 213 p.

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Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

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Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Porcupine Creek

Site type: Mine

ARDF no.: WI152

Latitude: 67.2441 **Quadrangle:** WI A-1

Longitude: 150.2956

Location description and accuracy:

Porcupine Creek is a south-flowing tributary to the Middle Fork, Koyukuk River; its mouth is about 3 miles southwest of Coldfoot. It has been mined for about a mile below the mouth of Quartz creek. This site is at about the midpoint of the mining, near the northeast corner of section 24, T. 28. N., R. 13 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Except for a break in the 1940s and 1950s, Porcupine Creek produced gold consistently from 1900 to 2000 over a length of about a mile below the mouth of Quartz Creek (Kurtak and others, 2002). About 600 feet downstream from the mouth of Quartz Creek, the gravel was about 6 feet deep ; the depth increased gradually to more than 80 feet at the downstream end of mining where the creek flows out on the valley of the Middle Fork, Koyukuk River. No high channels on benches were found A test above the mouth of Quartz Creek with a backhoe was unproductive.

Placer gold mining on Porcupine Creek began in 1901 when four men were producing $8 per man per day (Maddren, 1913). Through the 1930s, mining in the modern stream channel in the upper part of the creek was done by shoveling in and hydraulic methods. In the early years, a section at least 450 feet long in gravel about 30 feet deep was drift mined in the upper part of the creek along a deep channel. Since the 1960s mining has mainly been in the deep channel in the lower potions of Porcupine Creek using dozers, backhoes, and trucks to carry the auriferous gravel to a sluice-box washing plant.

Except for parts of the deep channel, the auriferous gravel is frozen and consists of small worn pieces of schist mixed with coarse sand and many large boulders. The gold is in the lower 3 to 6 feet of the gravel; only a little is on bedrock. The gold is generally fairly fine with an occasional nugget, and is about 854 fine. At the end of the season in 2000, the operator considered that further mining would not be economical in the deep gravel at the mouth of Porcupine Creek (Kurtak and others, 2002).

The most authoritative production figures are those given year by year in Kurtak and others (2002). They indicate that Porcupine Creek produced a total of 7,774 ounces of gold, of which 6,574 ounces was produced from 1909 to 1911. No production records are available from 1964 to 2000, but a substantial amount of gold was probably recovered.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Active

Workings/exploration:

Except for a break in the 1940s and 1950s, Porcupine Creek produced gold consistently from 1900 to 2000 over a length of about a mile below the mouth of Quartz Creek (Kurtak and others, 2002). Placer gold mining on Porcupine Creek began in 1901 when four men were producing $8 per man per day (Maddren, 1913). Through the 1930s, mining in the modern stream channel in the upper part of the creek was done by shoveling in and hydraulic methods. In the early years, a section at least 450 feet long in gravel about 30 feet deep was drift mined in the upper part of the creek along a deep channel. Since the 1960s mining has mainly been in the deep channel in the lower potions of Porcupine Creek using dozers, backhoes, and trucks to carry the auriferous gravel to a sluice-box washing plant. At the end of the season in 2000, the operator considered that further mining would not be economical in the deep gravel at the mouth of Porcupine Creek (Kurtak and others, 2002).

Production notes:

The most authoritative production figures are those given year by year from 1900 to 1963 by Kurtak and others (2002). They indicate that Porcupine Creek produced a total of 7,774 ounces of gold, of which 6,574 ounces was produced from 1909 to 1911. No production records are available from 1964 to 2000 but a substantial amount of gold was probably recovered.

Reserves:

None.

Additional comments:

See also Quartz Creek (WI126).

References:

Carnes, D.R., 1976, Active Alaskan placer operations, 1975: U.S. Bureau of Mines Open-File Report 98-76, 90 p., 40 plates, scale 1:250,000.

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Maddren, A.G., 1910, The Koyukuk-Chandalar gold region: U.S. Geological Survey Bulletin 442-G, p. 284-315.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Mosier, E.L., and Lewis, J.S., 1986, Analytical results, geochemical signatures, and sample locality map of lode gold, placer gold, and heavy-mineral concentrates from the Koyukuk-Chandalar mining district, Alaska: U.S. Geological Survey Open-File Report 86-345, 172 p.

Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Saunders, R.H., 1954, Koyukuk district operations (Wiseman, Chandalar): Alaska Territorial Department of Mines Miscellaneous Report MR-194-16, 8 p.

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Schrader, F.C., 1904, A reconnaissance in northern Alaska across the Rocky Mountains, along Koyukuk, John, Anaktuvuk, and Colville rivers and the Arctic coast to Cape Lisburne, in 1901, with notes by W.J. Peters: U.S. Geological Survey Professional Paper 20, 139 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Grubstake Bar

Site type: Mine

ARDF no.: WI153

Latitude: 67.0097 **Quadrangle:** WI A-1

Longitude: 150.4303

Location description and accuracy:

Grubstake Bar as described by Reed (1938) is on the right limit of the South Fork, Koyukuk River about 2 miles above Hanshaw Bar (WI155) Maddren (1913) placed it on the northwest bank of South Fork about 9 miles above Gold Bench. For this record, the site on a sand bar on the South Fork, opposite the mouth of Bear Creek, in the northwest corner of section 9, T. 25 N., R. 13 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Maddren (1913) described Grubstake Bar as a low-bench deposit. Reed (1938) described it as a deposit in the present river channel, similar to Hanshaw Bar (WI155). From incomplete records, Kurtak and others (2002) noted that Grubstake Bar produced 194 ounces of gold from 1900 to 1910. The site was examined by Kurtak and others (2002). They found a camp trailer at the mouth of the creek that enters the South Fork from the northeast (locally called Frisbee Creek, WI158). Tailings from recent mechanized mining covered an area about 300 feet by 1,300 feet in area. The tailings piles were up to 20 feet high. About $4,000 in gold (about 200 ounces) was produced from 1900 to 1909 (Maddren, 1913; Kurtak and others, 2002). Claims were active from the mid-90s to 2000 but production records for that period are not available.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Inactive

Workings/exploration:

Maddren (1913) reported that this river bar had been worked with sluice boxes from 1900 to 1910. The site was examined by Kurtak and others (2002). They found a camp trailer at the mouth of the creek that enters the South Fork from the northeast (locally called Frisbee Creek, WI158). Tailings from recent mechanized mining covered an area about 300 feet by 1,300 feet in size. The tailings piles were up to 20 feet high. Claims were active from the mid-90s to 2000.

Production notes:

About $4,000 in gold (about 200 ounces) was produced from 1900 to 1909 (Maddren, 1913; Kurtak and others, 2002). Claims were active from the mid-90s to 2000 but production records for that period are not available.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

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Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Maddren, 1913; Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Chapman Creek

Site type: Occurrence

ARDF no.: WI154

Latitude: 67.0953 **Quadrangle:** WI A-1

Longitude: 150.4738

Location description and accuracy:

Chapman Creek is a west-flowing tributary to the Middle Fork, Koyukuk River. The creek enters the Middle Fork at Chapman Island about 1/2 mile upstream from Tramway Bar (WI156). The coordinates are for a location about a mile upstream from the mouth of Chapman Creek, about midway along the workings, and about 0.5 mile west-northwest of the center of section 8, T. 26 N., R. 13 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Gold was found in shafts sunk in 1908-09 along a stretch of Chapman Creek, 1/4 to 1 mile above its mouth (Maddren, 1913). The workings included thirteen or fourteen shafts, 9 to 14 feet deep. A layer of blue gravel composed mainly of schist that is below barren sand and reddish gravel produced gold values of 2-3 cents per pan (gold at $20.67 per ounce). Maddren (1913) reported that gold values of 5 to 10 cents per pan occurred in bench deposits about 2 miles above the mouth of the creek. The gold in the bench deposits was in a 1- to 3-foot-thick layer of blue gravel composed mainly of schist.

There was considerable activity in 1991 when a company built a road to the mine from the Dalton highway, drilled holes 40-55 feet deep, and dug test pits. Kurtak and others (2002) visited the property and noted that it had been heavily mined, evidenced by abundant tailings. Dump trucks, shovels, washing plants, and camp trailers still remained at the site. They did not report production figures but it may have been substantial.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Inactive

Workings/exploration:

The first mile of the creek was prospected by 13 or 14 shafts in the early 1900s (Reed, 1938). There was considerable activity beginning in 1991 when a company built a road to the mine from the Dalton highway , drilled holes 40-55 feet deep, and dug test pits. Kurtak and others (2002) visited the property and noted that it had been heavily mined, evidenced by abundant tailings. Dump trucks, shovels, washing plants, and camp trailers still remained at the site. They did not report production figures.

Production notes:

There was considerable activity beginning in 1991 when a company built a road to the mine from the Dalton highway, drilled holes 40-55 feet deep, and dug test pits. Kurtak and others (2002) visited the property and noted that it had been heavily mined, evidenced by abundant tailings. They did not report production figures but it may have been substantial.

Reserves:

None.

Additional comments:

References:

Bundtzen, T.K., Swainbank, R.C., Deagen, J.R., Moore, J.L., 1990 , Alaska's Mineral Industry 1989: Alaska Division of Geological & Geophysical Surveys, Special Report 44, 100 p.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Maddren, A.G., 1913, The Koyukuk-Chandalar region, Alaska: U.S. Geological Survey Bulletin 532, 119 p.

Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Swainbank, R.C., Bundtzen, T.K., and Wood, J.E., 1991, Alaska's mineral industry, 1990: Alaska Division of Geological and Geophysical Surveys Special Report 45, 78 p.

Swainbank, R.C., Bundtzen, T.K., Clough, A.H., Hansen, E.W., and Nelson, M.G., 1993, Alaska's mineral

industry, 1992: Alaska Division of Geological and Geophysical Surveys Special Report 47, 80 p.

Primary Reference: Maddren, 1913

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Hanshaw Bar

Site type: Mine

ARDF no.: WI155

Latitude: 67.0013 **Quadrangle:** WI A-1

Longitude: 150.4741

Location description and accuracy:

Hanshaw Bar as described by Reed (1938) is on the left limit of the South Fork, Koyukuk River about 5 miles downstream from the bridge on the Dalton Highway that crosses the river. It is about 0.7 mile southwest of the center of section 8, T. 25 N., R. 13 W. The location is accurate.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Gold in fine, flat flakes is distributed throughout 2 to 3 feet of medium to fairly fine gravel and sand on a high-water bar in the channel of the South Fork, Koyukuk River. The paying gravel and sand lie on a false bedrock of clayey sand. Reed (1938) noted that the average value of the ground was $0.23 per square foot of bedrock (gold at $35 per ounce) and that the gold was 907 fine. Mining in 1937 was by shoveling into sluice boxes and washing with water from the South Fork (Reed, 1938). Kurtak and others (2002) visited the site but found no evidence of recent mining. However, Bliss and others (1988) reported that there may have been some recent activity at this site and/or upriver at Grubstake Bar (WI153).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes; small

Site Status: Probably inactive

Workings/exploration:

Mining in 1937 was by shoveling into sluice boxes and washing with water from the South Fork (Reed, 1938). Kurtak and others (2002) visited the site but found no evidence of recent mining. However, Bliss and others (1988) reported that there may have been some recent activity at this site and/or upriver at Grubstake Bar (WI153).

Production notes:

Minor production.

Reserves:

None.

Additional comments:

References:

Bliss, J.D., Brosgé, W.P., Dillon, J.T., Cathrall, J.B., and Dutro, J.T., Jr., 1988, Maps and descriptions of lode and placer deposits, prospects, and occurrences in the Wiseman 1 degree by 3 degree quadrangle, Alaska: U.S. Geological Survey Open-File Report 88-293, 52 p., 2 plates, scale 1:250,000.

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Mailbox Creek

Site type: Mine

ARDF no.: WI157

Latitude: 67.1053 **Quadrangle:** WI A-1

Longitude: 150.4832

Location description and accuracy:

Mailbox Creek is a south-flowing tributary to the Middle Fork, Koyukuk River; its mouth is about 1 mile upstream from Tramway Bar and 4 miles south-southwest of Twelvemile Mountain. Placer mining has been reported 2000 feet upstream from the mouth of Mailbox Creek, about 0.5 mile east-southeast of the center of section 6, T. 26 N., R. 13 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Gold was mined from fairly fine gravel that contains numerous erratic boulders about a half mile upstream from the mouth of Mailbox Creek (Reed, 1938). The fine gravel is derived mainly from conglomerate bedrock in the area. Fine, flaky gold occurs throughout the gravel; coarser gold is in a layer of reddish gravel near bedrock. The value of the ground that was being mined in the mid-1930s was about $0.75 in gold per square foot of bedrock. The gold is 898 fine. Kurtak and others (2002) examined the creek and found a cut opened with a dozer 'in recent years' and a boom dam, about 2,000 from the mouth of the creek.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Inactive

Workings/exploration:

The placer was mined in the 1930s by ground sluicing and shoveling in from an open cut. A cut was opened with a dozer, probably some time in the 1980s or 1990s.

Production notes:

Mining occurred from at least 1934 to 1937; there is no record of the production. Possibly some mining in the 1980s or 1990s.

Reserves:

None.

Additional comments:

References:

Cobb, E.H., 1976, Summary of references to mineral occurrences (other than mineral fuels and construction materials) in the Chandalar and Wiseman quadrangles, Alaska: U.S. Geological Survey Open-File Report 76-340, 205 p.

Cobb, E.H., 1981, Summaries of data on and lists of references to metallic and selected nonmetallic mineral occurrences in the Wiseman quadrangle, Alaska; Supplement to Open-File Report 76-340; Part B, Lists of references to January 1, 1981: U.S. Geological Survey Open-File Report 81-732-B, 22 p.

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Mulligan, J.J., 1974, Mineral resources of the Trans-Alaska Pipeline corridor: U.S. Bureau of Mines Information Circular 8626, 24 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Reed, 1938

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (near head St. Patricks Creek)

Site type: Prospect

ARDF no.: WI161

Latitude: 67.9114 **Quadrangle:** WI D-1

Longitude: 150.4613

Location description and accuracy:

This prospect is on a ridge at an elevation of about 5,200 feet, about 0.6 mile east of the small lake at the head of St. Patricks Creek. It is about 0.3 mile south-southeast of the center of section 27, T. 36 N., R. 13 W. The location is accurate.

Commodities:

Main: Cu, Pb, Zn

Other:

Ore minerals: Chalcopyrite, galena

Gangue minerals: Calcite, quartz

Geologic description:

This prospect on the Lucky Boy claims was staked in 1963, again sometime in the 1970s, and was examined by the Bureau of Land Management in about 2000. The rocks in the area are Cambrian to Ordovician?), andesitic to basaltic volcaniclastic rocks, locally accompanied by tuffaceous phyllite, gabbro, diabase, and black phyllite (Dillon and others, 1986). There is little mineralization. On the ridgetop, numerous quartz-carbonate segregations with galena and chalcopyrite occur in the noses of folds in phyllite. On the east side of the ridge, iron-oxide-stained mudstone is coated with malachite and azurite. The highest values in the several samples collected by Kurtak and others (2002) was 62 parts per million (ppm) lead, 824 ppm copper, and 130 ppm zinc. WGM (1978) reported that samples contained gold and platinum-group elements, but none of the samples collected by Kurtak and other (2002) contained gold and they were not analyzed for the platinum-group elements.

Alteration:

None noted.

Age of mineralization:

Cambrian to Ordovician(?) or younger based on the age of the host rocks.

Generic deposit model:

Deposit model:

Galena-chalcopyrite-quartz segregations.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Inactive

Workings/exploration:

None other than the several claims that were staked by industry and limited sampling by the Bureau of Land Management in about 2000.

Production notes:

None.

Reserves:

None.

Additional comments:

Now in the Gates of the Arctic National Park which is closed to prospecting and mining.

References:

Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, 2 vols., 845 p.

WGM Inc., 1978, Mineral studies of the western Brooks Range, Alaska: U.S. Bureau of Mines Open-File Report 103-78, p. 140.

Primary Reference: Kurtak and others, 2002

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Seward Creek

Site type: Prospects

ARDF no.: WI162

Latitude: 67.5129 **Quadrangle:** WI C-4

Longitude: 151.6895

Location description and accuracy:

This site is located about a mile up Seward Creek west of Wild Lake where some shafts were sunk prior to 1938. The prospects are near the northwest corner of section 20, T. 31 N., R. 18 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Reed (1938) reported extensive prospecting along Seward Creek including some shafts about 3 miles above its mouth. Kurtak and others (2002) reported that nineteen claims were staked in 1977 but they found no indication of mining.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer gold (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Some prospecting prior to 1938 and several shafts were sunk about 3 miles above the mouth of the creek. No indications of more recent mining.

Production notes:

Probably none.

Reserves:

None.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, 2 vols., 845 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): J.M. Britton (Anchorage); D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): McCamant Creek

Site type: Prospect

ARDF no.: WI163

Latitude: 67.3887 **Quadrangle:** WI B-4

Longitude: 151.8853

Location description and accuracy:

This site is somewhat arbitrarily located about 4 miles from the mouth of McCamant Creek in about the center of the area where Kurtak and others (2002) found evidence of mining. Various signs of prospecting or mining are spread along about 5 miles of the upper part of the creek. The site is about 0.5 mile north-northeast of the center of section 32, T. 30 N., R. 19 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

There apparently is no record of prospecting or mining on McCamant Creek prior to the report by Kurtak and others (2002) who noted that claims had been staked in 1957. They found test pits, campsites, the remains of a cabin, suction dredging equipment, and the dump of a shaft along the creek from about one mile above its mouth to about 5 miles above its mouth. They found no evidence of large-scale mechanical mining. The few samples they panned contained no visible gold.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer gold (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Undetermined

Site Status: Probably inactive

Workings/exploration:

Indications of prospecting and possible suction-dredge mining sometime between 1957 and about 2000. No indication of mechanical mining.

Production notes:

Minor at most.

Reserves:

None.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (in Glacier Creek)

Site type: Prospects

ARDF no.: WI164

Latitude: 67.4675 **Quadrangle:** WI B-1

Longitude: 150.4887

Location description and accuracy:

This site consists of several deep shafts that were sunk along the valley of Glacier Creek in the 'early days'. The southernmost was off the mouth of Mascot Creek, the middle shaft was about 2.5 miles upstream from the mouth of Mascot Creek, and at least one more was sunk about 3.5 miles upstream from the mouth of Mascot Creek. The coordinates are at the middle shaft, apparently the only one that showed gold. This shaft is near the center of section 32, R. 31 N., R. 13 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Reed (1938) reported that several shafts were sunk in the valley of Glacier Creek in the 'early days' One shaft 250-feet deep near the mouth of Mascot Creek did not reach bedrock. A shaft about 2.5 miles northeast of the mouth of Mascot Creek hit bedrock at 168 feet; small amounts of gold were recovered but apparently not enough to encourage further work. Another shaft was sunk about 3.5 miles upstream from the mouth of Mascot Creek. It hit bedrock at 258 feet but there is no indication that any gold was found. Claims were active in the area from 1977 to 1985 but there is no record of mining then (Kurtak and others, 2002).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Reed (1938) reported that several shafts were sunk in the valley of Glacier Creek in the 'early days.' One shaft 250-feet deep near the mouth of Mascot Creek did not reach bedrock. A shaft about 2.5 miles northeast of the mouth of Mascot Creek hit bedrock at 168 feet; small amounts of gold were recovered but apparently not enough to encourage further work. Another shaft was sunk about 3.5 miles upstream from the mouth of Mascot Creek. It hit bedrock at 258 feet but there is no indication that any gold was found. Claims were active in the area from 1977 to 1985 but there is no record of mining then (Kurtak and others, 2002).

Production notes:

A small amount of gold was recovered in one deep shaft about 2.5 miles upstream from the mouth of Mascot Creek but apparently not enough to encourage any further work.

Reserves:

None.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (near Bluecloud Mountain)

Site type: Prospect

ARDF no.: WI165

Latitude: 67.4004 **Quadrangle:** WI B-1

Longitude: 150.4324

Location description and accuracy:

Kurtak and others (2002) reported that WGM Inc. found disseminated galena on the north side of Bluecloud Mountain and subsequently drilled a strong geophysical anomaly on the south side of the mountain. apparently near the coordinates given above. The details of the location are vague. The site is probably in the northwest quarter of section 27 or the southwest quarter of section 22, T. 30 N., R. 13 W.

Commodities:

Main: Pb

Other:

Ore minerals: Galena, pyrite, pyrrhotite

Gangue minerals:

Geologic description:

Bluecloud mountain is cut by the Wiseman fault which thrusts Proterozoic(?) or Paleozoic(?) quartzite and graphitic schist over Devonian schist, phyllite, sandstone, and conglomerate (Dillon and Reifenstuhl, 1990). The Devonian phyllite probably correlates with the Devonian Hunt Fork Shale to the north.

In following up geochemical anomalies identified in 1975, WGM Inc. found disseminated galena along faults on the north side of Bluecloud Mountain. (Kurtak and others, 2002). Subsequent geophysical surveys identified a strong EM anomaly on the south slope of Bluecloud Mountain. One 150-foot hole was drilled in 1978. A small amount of field work and sampling by ASA Inc. followed in 1992; they concluded that the earlier WGM geochemical anomalies only reflected background. There apparently has been no work by industry since. Kurtak and others (2002) found little signs of mineralization other than disseminated pyrite and pyrite in schist. None of their samples contained notable metals.

Alteration:

None noted.

Age of mineralization:

No definitive information; could be as old as Proterozoic.

Generic deposit model:

Deposit model:

No definitive information.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Probably inactive

Workings/exploration:

From 1971 to 1983, WGM inc. conducted geochemical and geophysical surveys, mapped, sampled, and drilled one 150-foot hole (WGM 1976; WGM 1978; WGM, 1979; Nicol, 1983). ASA Inc. reviewed the information in 1992 and collected some samples. The Bureau of Land Management briefly examined the property and collected a few samples in about 2000 (Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Dillon, J.T., and Reifenstuhl, R.R., 1990, Geologic map of the Wiseman B-1 quadrangle, southcentral Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 101, 1 sheet, scale 1:63,360.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Nichol, D.L., 1983, Evaluation of the mineral potential of Doyon Ltd.'s Blocks 5 and 22: Unpublished report 83-04 for Doyon Ltd. (on file at Doyon Ltd., Fairbanks, Alaska).

WGM Inc., 1976, Doyon Project, 1975 annual progress report, volume 1: Doyon, Ltd. Report 76-05a, 169 p. (Report held by Doyon, Ltd., Fairbanks, Alaska).

WGM Inc., 1978, 1977 Annual progress report, Doyon Ltd. project, v. III, west Wiseman Block 5: Doyon Ltd. Report 78-06, 13 p. (Report held by Doyon Ltd., Fairbanks, Alaska)

WGM Inc., 1979, Doyon Ltd. annual progress report, Block 5, general, southern Block 5, and Bluecloud base-metal anomalies: Doyon Ltd. Report 79-17 for Doyon Ltd., 5 p. (Report held by Doyon Ltd., Fairbanks, Alaska.)

Primary Reference: Kurtak and others, 2002

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Snoeshoe Creek

Site type: Mine?

ARDF no.: WI166

Latitude: 67.4749 **Quadrangle:** WI B-1

Longitude: 150.2979

Location description and accuracy:

There is almost no information on a placer on Snowshoe Creek and the site is arbitrarily located at about the middle of the creek, about 1.7 mile west of Nolan. The site is near the northeast corner of section 31, T. 31 N., R. 12 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

The only reference to prospecting or mining along Snoeshoe Creek is Kurtak and others (2002). During a regional mineral assessment, they examined the creek for mineralization and collected several samples. They found test pits along the creek and a small boom dam but no other sign of mining. The gold content of the samples they collected was barely anomalous.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Undetermined

Workings/exploration:

There is no sign of mining on Snowshoe Creek other than some test pits and a small boom dam (Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Webster Gulch

Site type: Mine

ARDF no.: WI167

Latitude: 67.4994 **Quadrangle:** WI B-1

Longitude: 150.1917

Location description and accuracy:

Webster Gulch is an informal name for a small creek that flows west into Nolan Creek about 0.7 mile north of Fay Creek. It is in the northeast quarter of section 22, T. 31 N., R. 12 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Reed (1938) noted that some gold had been found on Webster Creek. Bureau of Mines records indicate that there was some mining in or prior to 1942, but furnish no details. The area was examined by Kurtak and others (2002) who found the remains of an old shaft near the mouth of the gulch and some placer cuts further up the gulch.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Undetermined

Workings/exploration:

There is some evidence of mining, probably before 1942.

Production notes:

The few workings and the absence of reports of mining on Webster Gulch suggest that if any gold was produced, it was probably only a small amount.

Reserves:

None.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Eden, K., 2000, Geology and gold mineralization of the Nolan area in the Brooks Range, Alaska: U.S. Bureau of Land Management Open-File Report 78, 87 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (benches upper Hammond River)

Site type: Prospect

ARDF no.: WI168

Latitude: 67.5255 **Quadrangle:** WI C-1

Longitude: 150.111

Location description and accuracy:

This site includes extensive,benches underlain by thick gravel, perched on the valley walls on both sides of the Hammond River from the mouth of Canyon Creek to the mouth of Vermont Creek. The coordinates are about at the middle of these benches which cover much of the eastern half of section 12 of T. 31 N., R. 12 W. and the western half of section 7, T. 31 N., R 11 W.

Commodities:

Main: Au

Other:

Ore minerals: Gold

Gangue minerals:

Geologic description:

Kurtak and others (2002) sampled benches on both sides of the Hammond River between the mouth of Vermont and Canyon Creeks. Auriferous gravel up to 150 feet thick rests on phyllite and schist of the Upper Devonian Beaucoup Formation (Eden, 2000). One composite, 0.01 cubic yard sample was assembled by systematically sampling a section of gravel 150 feet thick. It assayed 0.0008 ounce of gold per cubic yard. Another 0.01 cubic yard sample taken on bedrock below the gravel assayed 0.006 ounce of gold per cubic yard. Kurtak and others (2002) estimate an 'inferred resource' of 360,000 cubic yards of material that averages 0.007 ounce of gold per cubic yard.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Deposit model:

Thick auriferous bench gravels.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Inactive

Workings/exploration:

The only documented work on these thick, low grade, auriferous gravels is by Kurtak and others (2002). They collected and analyzed two large samples.

Production notes:

None.

Reserves:

Kurtak and others (2002) estimated an 'inferred resource' of 360,000 cubic yards of material that averages 0.007 ounce of gold per cubic yard.

Additional comments:

References:

Eden, K., 2000, Geology and gold mineralization of the Nolan area in the Brooks Range, Alaska: U.S. Bureau of Land Management Open-File Report 78, 87 p.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Jennie Creek

Site type: Mine?

ARDF no.: WI169

Latitude: 67.4856 **Quadrangle:** WI B-1

Longitude: 150.0312

Location description and accuracy:

Jennie Creek is a south-flowing creek that enters the Hammond River about 1.7 miles north of the junction of the Hammond River and the Middle Fork of the Koyukuk River. It is uncertain when or even if the creek was mined, but there is evidence of considerable prospecting along it. The coordinates are about 0.3 mile from the mouth of the creek near the northwest corner of section 28, T. 31 N., R. 11 W., where most of activity seems to have taken place.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Reed (1938) reported that there was drilling near the mouth of Jennie Creek but that no pay was found. There is no subsequent record of any production. However, Kurtak and others (2002) visited the creek and found abundant signs of prospecting if not mining. There are numerous test pits along the creek, evidence of booming, and the ruins of several small cabins, mainly in the flat area southwest of the entrance to a canyon about 0.7 mile upstream. They also found a small placer cut and associated tailings about 250 feet upstream from the mouth of the creek.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Undetermined

Site Status: Probably inactive

Workings/exploration:

There is no record of production. However, Kurtak and others (2002) visited the creek and found abundant signs of prospecting if not mining. There are numerous test pits along the creek, evidence of booming, and the ruins of several small cabins, mainly in the flat area southwest of the entrance to a canyon about 0.7 mile upstream. They also found a small placer cut and associated tailings about 250 feet upstream from the mouth of the creek.

Production notes:

There is no record of production.

Reserves:

None.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Reed, I.M., 1938, Upper Koyukuk region, Alaska (Wiseman, Chandalar, and Bettles): Alaska Territorial Department of Mines Miscellaneous Report 194-7, 201 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Hidden Creek

Site type: Prospect

ARDF no.: WI170

Latitude: 67.0262 **Quadrangle:** WI A-1

Longitude: 150.0879

Location description and accuracy:

This prospect is about 2 miles upstream from the mouth of Hidden Creek on the South Fork, Koyukuk River and about 10 miles southeast of Cathedral Mountain. It is about 0.3 mile north of the center of section 1, T. 25 N., R. 12 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Placer claims were active on Hidden Creek from 1978 to 1982 and a bulldozer trail was driven from the South Fork, Koyukuk River for two miles to test pits along the creek. Kurtak and others (2002) collected several samples and panned them but found only a small amount of fine gold. They saw no bedrock along the creek. A contact between Cretaceous quartz monzonite and Triassic or Jurassic greenstone cuts across the upper part of the creek (Dillon and others, 1986).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: None

Site Status: Probably inactive

Workings/exploration:

Only some text pits about 2 miles upstream from the mouth of the creek. Sampled by the Bureau of Land

Management in about 2000 (Kurtak and others, 2002).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Dillon, J.T., Brosgé, W.P., and Dutro, J.T., Jr., 1986, Generalized geologic map of the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 86-219, 1 sheet, scale 1:250,000.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Bear Creek

Site type: Mine

ARDF no.: WI171

Latitude: 66.9998 **Quadrangle:** WI A-1

Longitude: 150.4292

Location description and accuracy:

Bear Creek flows into the South Fork, Koyukuk River across the river from Grubstake Bar and about 4 miles down river from where the Dalton Highway crosses the river. The site is about 0.5 mile upstream from the mouth of the creek and about 0.5 mile south of the center of section 9, T. 25 N., R 13 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:

Claims were staked on Bear Creek and it was prospected in the 1970s and 1980s. Kurtak and others (2002) visited the creek and found parts of an old bulldozer, mining equipment, stacked rocks and mine tailings about 0.5 mile above the mouth of the creek. There are no production records.

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Placer deposits (Garnett and Bassett, 2005)

Deposit model:

Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

39a

Production Status: Yes

Site Status: Undetermined

Workings/exploration:

Claims were staked on Bear Creek and it was prospected in the 1970s and 1980s. Kurtak and others (2002) visited the creek and found parts of an old bulldozer, mining equipment, stacked rocks and mine tailings about 0.5 mile above the mouth of the creek.

Production notes:

There are no production records from the activity in the 1970s and 1980s but stacked rocks and tailings indicate that some gold was probably recovered.

Reserves:

None.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Primary Reference: Kurtak and others, 2002

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Tobin Creek

Site type: Mine

ARDF no.: WI172

Latitude: 67.5905 **Quadrangle:** WI C-4

Longitude: 151.5125

Location description and accuracy:
This placer mine is about 4 miles upstream from the mouth of Tobin Creek at the north end of Wild Lake. It is about 0.5 mile north of the center of section 23, T. 32 N., R. 18 W.

Commodities:

Main: Au

Other:

Ore minerals:

Gangue minerals:

Geologic description:
Kurtak and others (2002) found evidence of mining about 4 miles upstream from the mouth of Tobin Creek. The evidence includes a cache with pump, hoses, a sluice box, and a small area of stacked rocks. They thought the equipment and evidence of mining was no more than 3 years old. A placer claim was also staked near the mouth of Tobin Creek in 1954.

Alteration:

Age of mineralization:
Quaternary.

Generic deposit model:
Placer deposits (Garnett and Bassett, 2005)

Deposit model:
Placer Au (Cox and Singer, 1986; model 39a).

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production Status: Yes

Site Status: Undetermined

Workings/exploration:
There is a cache with some mining equipment and a small area of stacked rocks that date to the late 1990s.

Production notes:

Uncertain but possibly a small amount of gold was recovered.

Reserves:

None.

Additional comments:

References:

Cox, D.P, and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 379 p.

Garnett, R.H.T., and Bassett, N.C., 2005, Placer deposits, in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P., eds., Economic Geology, One hundredth anniversary volume, 1905-2005: Society of Economic Geologists, Littleton, Colorado, p. 813-843.

Kurtak, J.M., Klieforth, R.F., Clark, J.M., and Maclean, E.A., 2002, Mineral investigations in the Koyukuk mining district, northern Alaska: Final Report: U.S. Bureau of Land Management Technical Report 50, v. 1 and 2, 845 p.

Primary Reference:

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-01

Site name(s): Unnamed (northwest of Dry Bay)

Site type: Prospect

ARDF no.: YA013

Latitude: 59.2566 **Quadrangle:** YA B-3

Longitude: 138.7965

Location description and accuracy:

This prospect consists of a large block of claims covering an area up to about 4 miles wide that stretches northwest along the coast for about 18 miles from the mouth of Dry Bay. The coordinates are at approximately the center of the claims near the center of section 1, T. 31 S., R. 39 E.

Commodities:

Main: Ag, Au, Fe, Ti

Other:

Ore minerals: Gold, ilmenite, magnetite

Gangue minerals:

Geologic description:

Beginning in 2006, Geohedral LLC with financial backing from the Beard Company staked claims over an area up to 4 miles wide and 18 miles long covering about 49,000 acres along the coast northwest of Dry Bay. The claims were believe to have significant quantities of iron, titanium, gold, and silver in black sands on elevated marine beach terraces. Geohedral drilled 11 core holes in 2008. In 2009, their efforts expanded inland to the Tarnis Mesa area (YA014). In 2010, the Beard Company commissioned an independent analysis of the samples and reported that 'Geohedral's mining claims failed to indicate commercial quantities of gold or silver in any of Geohedral's present claims and have shown significantly less magnetite and ilmenite within the Black Sands area than was documented previously.' (Beard Company, 2010).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Deposit model:

Black sands in raised marine terraces.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

Beginning in 2006, Geohedral LLC with financial backing from the Beard Company staked claims over an area up to 4 miles wide and 18 miles long covering about 49,000 acres along the coast northwest of Dry Bay. They drilled 11 core holes in 2008.

Production notes:

None.

Reserves:

None.

Additional comments:

References:

The Beard Company, 2009, 2009 Annual Report: http://beardco.com/sites/default/files/2009%20Annual%20Report.pdf (as of Jan 10, 2011).

The Beard Company, 2010, The Beard Company reports third quarter operating results: http://beardco.com/sites/default/files/brco%20111610.pdf (News release, Nov. 16, 2010).

Primary Reference: Beard Company, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28

Site name(s): Unnamed (near Tarnis River)

Site type: Prospect

ARDF no.: YA014

Latitude: 59.241 **Quadrangle:** YA A-2

Longitude: 138.5151

Location description and accuracy:

This prospect of uncertain boundaries consists of 521 claims covering about 16,000 acres near Tarnis Mesa, an informal name that probably refers to the hills that occupy most of section 10, T.31 S., R. 41 E. The coordinates are arbitrarily on the top of hill 535, which presumably is the top of the mesa.

Commodities:

Main: Ag, Au, Fe, Ti, Pd, Pt

Other:

Ore minerals:

Gangue minerals:

Geologic description:

In 2009, Geohedral LLC with financial backing from the Beard Company staked 521 claims totaling about 16,000 acres in the Tarnis Mesa area (which probably refers to the unnamed low hills in section 10 that rise above the coastal plain) (Beard Company, 2009 [Annual Report]). These claims were contiguous to the claims they had staked the previous year along the coast (YA013). The Tarnis Mesa claims were believe to have significant quantities of iron, titanium, gold, silver, platinum, and palladium in black sands in elevated marine beach terraces. In 2009, Geohedral drilled 30 holes up to 27.1 feet deep and another 30 holes 3 to 6 feet deep (Beard Company, 2009 [gold discovery]). As reported in a press release: 'Preliminary evaluation of the assays indicates that the unconsolidated materials above the bedrock in the Tanis Mesa area contain appreciable amounts of gold and silver, averaging 0.30 oz/ton of gold and 0.75 oz/ton of silver. The 400 claims of primary interest are projected to produce 34,800,000 troy ounces of gold' In 2010, the Beard Company commissioned an independent analysis of the samples and reported that 'Geohedral's mining claims failed to indicate commercial quantities of gold or silver in any of Geohedral's present claims and have shown significantly less magnetite and ilmenite within the Black Sands area than was documented previously.' (Beard Company, 2010).

Alteration:

Age of mineralization:

Quaternary.

Generic deposit model:

Deposit model:

Black sands in raised marine terraces

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production Status: None

Site Status: Undetermined

Workings/exploration:

In 2009, Geohedral LLC with financial backing from the Beard Company staked 521 claims totaling about 16,000 acres in the Tarnis Mesa area (which probably refers to the unnamed low hills in section 10 that rise above the coastal plain) (Beard Company, 2009 [Annual Report]). In 2009, Geohedral drilled 30 holes up 27.1 feet deep and another 30 holes 3 to 6 feet deep in 2009 (Beard Company, 2009 [gold discovery]).

Production notes:

None.

Reserves:

None.

Additional comments:

References:

The Beard Company, 2009, 2009 Annual Report: http://beardco.com/sites/default/files/2009%20Annual%20Report.pdf (as of Jan 10, 2011).

The Beard Company, 2009, Geohedral LLC reports expanded holdings and significant gold discovery in southeastern Alaska: http://beardco.com/sites/default/files/brco%20092109.pdf (News release, Sept. 21, 2009).

The Beard Company, 2010, The Beard Company reports third quarter operating results: http://beardco.com/sites/default/files/brco%20111610.pdf (News release, Nov. 16, 2010).

Primary Reference: Beard Company, 2010

Reporter(s): D.J. Grybeck (Contractor, USGS)

Last report date: 2011-02-28