Geochemical Survey of the Craig Study Area—Craig and Dixon Entrance Quadrangles and the Western Edges of the Ketchikan and Prince Rupert Quadrangles, Southeast Alaska

U.S. GEOLOGICAL SURVEY BULLETIN 2082

Cover. The Research Vessel *Don J. Miller II* supported fieldwork by the U.S. Geological Survey in Alaska from 1969 to 1985. It was beloved by the many who used it as a floating base camp mostly in southeast Alaska but also in Prince William Sound, the Alaska Peninsula, and as far afield as St. Matthews Island in the Bering Sea. It was named for the eminent Alaska geologist who drowned in 1961 while conducting fieldwork south of the Wrangell Mountains. The vessel was originally built for the Corps of Engineers in 1936 for surveys on the Columbia River and named the *Robert Gray* for the Captain who discovered the Columbia River. It is now in private hands and being restored. Photograph by Donald Grybeck, 1987.

GEOCHEMICAL SURVEY OF THE CRAIG STUDY AREA—CRAIG AND DIXON ENTRANCE QUADRANGLES AND THE WESTERN EDGES OF THE KETCHIKAN AND PRINCE RUPERT QUADRANGLES, SOUTHEAST ALASKA

Judith A. Richards on ridgeline geochemical sampling traverse, Harris Peak, Prince of Wales Island, southeast Alaska. Photograph by John B. Cathrall, 1987.

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A reconnaissance geochemical survey identified 42 areas favorable for the presence of metallic mineral resources and identified 22 mineral deposit types

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1994

U.S. DEPARTMENT OF THE INTERIOR
BRUCE BABBITT, Secretary

U.S. GEOLOGICAL SURVEY
Gordon P. Eaton, Director

Published in the Central Region, Denver, Colorado
Manuscript approved for publication December 27, 1993
Edited by Judith Stoeser
Graphics prepared by Wayne Hawkins
Photocomposition by Mari L. Kauffmann
Tables typeset by Judith Stoeser
Geologic map and correlation prepared by David Brew, edited by Carol Ostergren

For Sale by U.S. Geological Survey, Map Distribution
Box 25286, MS 306, Federal Center
Denver, CO 80225

Library of Congress Cataloging-in-Publication Data

Cathrall, John B.
Geochemical survey of the Craig study area—Craig and Dixon Entrance quadrangles and the western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska / by J.B. Carthrall.
p. cm.—(U.S. Geological Survey bulletin : 2082)
Includes bibliographical references.
Supt. of Docs. no. :I 19.3:2082
1. Geochemistry—Alaska—Tongass National Forest Region. 2. Ore-deposits—Alaska—Tongass National Forest Region. I. Title. II. Series.
QE75.B9 no. 2082
[QE515]
557.3 s—dc20 94–2022
[553.6′09798′2] CIP

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Geochemical Survey of the Craig Study Area—Craig and Dixon Entrance Quadrangles and the Western Edges of the Ketchikan and Prince Rupert Quadrangles, Southeast Alaska

By John B. Cathrall

ABSTRACT

A reconnaissance geochemical survey was conducted in the northwest-trending Alexander terrane, Gravina–Nutzotin overlap assemblage, and Taku terrane in southeast Alaska in the Craig and Dixon Entrance quadrangles and the western edges of the Ketchikan and Prince Rupert quadrangles. Samples of stream sediments and heavy-mineral concentrates were collected and analyzed by semiquantitative emission spectrography and atomic absorption spectrophotometry. These data are augmented by geochemical data from other U.S. Government agencies and from the State of Alaska. Bedrock geology and geophysical, geochemical, and mineral occurrence data were integrated to identify 42 areas favorable for the presence of metallic mineral resources and to identify 22 mineral deposit types that may be expected to be present in the study area.

INTRODUCTION

The U.S. Geological Survey (USGS) is required by the Alaska National Interest Lands Conservation Act (ANILCA, Public Law 96–487) to survey certain Federal lands to determine their mineral resource potential. Results from the Alaska Mineral Resource Assessment Program (AMRAP) must be made available to the public and be submitted to the President and Congress. As a part of AMRAP, a reconnaissance geochemical survey of the Craig study area in southeast Alaska was undertaken by the USGS during the summers of 1983–1985, 1989, and 1991. The study area includes all of the Craig and Dixon Entrance 1:250,000-scale quadrangles and a small part of the western edges of the Ketchikan and Prince Rupert 1:250,000-scale quadrangles (fig. 1).

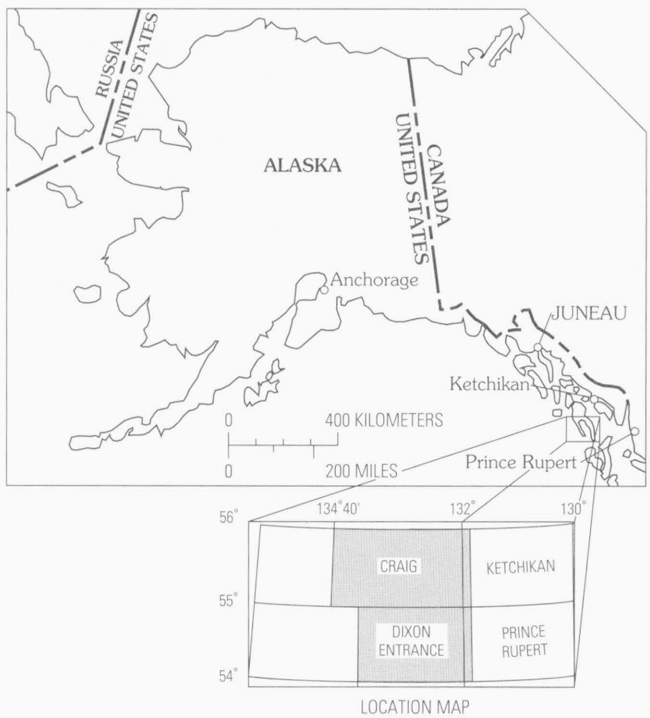

Figure 1. Location of Craig study area in the Craig and Dixon Entrance 1:250,000-scale quadrangles and the western edges of the Ketchikan and Prince Rupert 1:250,000-scale quadrangles, southeast Alaska.

Samples of stream sediments and heavy-mineral concentrates were collected and analyzed by six-step semiquantitative emission spectrographic methods, and selected elements in stream sediments were determined by atomic absorption spectrophotometry (McDanal and others, 1991; Detra and others, 1992). Geochemical maps showing the distribution of selected elements in stream-sediment and heavy-mineral-concentrate samples are in Cathrall,

Figure 2. Areas where additional geochemical information was utilized, Craig study area, southeast Alaska. Sources of data for numbered areas: 1, Clark and others (1970a–f); 2, Herreid and Rose (1966), Herreid (1971), Herreid and Trible (1973), and Herreid and others (1978); 3, Los Alamos National Laboratory (1980, 1982a, 1983) and Oak Ridge Gaseous Diffusion Plant (1981a).

Arbogast, and others (1993) and Cathrall, McDanal, and others (1993).

In this report I present an interpretation of the geochemical data collected during the course of this survey. In addition, I include results from earlier geochemical surveys within parts of the study area undertaken by (1) the USGS as part of the Heavy Metals Program (Clark and others, 1970a–f); (2) the Division of Geological Survey, Department of Natural Resources, State of Alaska (Herreid and Rose, 1966; Herreid, 1971; Herreid and Trible, 1973; Herreid and others, 1978); and (3) the U.S. Department of Energy, Los Alamos National Laboratories, Los Alamos, New Mexico (1980, 1982a, 1983), and Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tennessee (1981a), for the National Uranium Resource Evaluation Program (NURE) (fig. 2).

The geologic time series divisions of the Silurian used in this report are based on those proposed by Berry and others (1970) for North America and are not the divisions in previous common use by the U.S. Geological Survey. Some Geological Survey reports, however, have used the Berry and others' divisions (Hansen, 1991, p. 61). These divisions are, from youngest to oldest, Pridoli, Ludlow, Wenlock, and Llandover. In this report, rocks assigned to Pridoli and Ludlow are considered to be Upper Silurian and those assigned to Wenlock and Llandover to be Lower Silurian. There is no Middle Silurian in this scheme.

Acknowledgments.—Many U.S. Geological Survey colleagues contributed to the collection and analyses of the geochemical samples. Those who collected samples include Nora Shew, Marti Miller, Sue Karl, James Domenico, Richard Grauch, Donald J. Grybeck, and Steve K. McDanal. Semiquantitative emission spectrography analysts include James A. Domenico, Belinda F. Arbogast, Betty M. Adrian, Elizabeth A. Bailey, and Roy T. Hopkins. Atomic absorption analysts include Richard R. O'Leary, F.W. Tippet, R.J. Fairfield, L.S. Laudon, P.L. Hageman, B.H. Roushey, K.A. Romine, and Betty M. Adrian. Thanks to George VanTrump, Jr., for computer programming retrievals and reduction of data, printouts, and geochemical plots. Thanks to B.J. Ramsey and R.P. Walker for help in preparing the draft manuscript.

Thanks to the crew of the U.S. Geological Survey vessel *Don J. Miller II*, Captain A.C. Frothingham, Ed Magalhaes, and John Elf, and to helicopter pilots Ralph Yetka, Albert Jones, and Ken Eickler.

GEOGRAPHIC SETTING

The Craig study area comprises about 1,400 mi^2 (3,600 km^2) between lat 54°40′ and 56° N. and long 131°50′ and 134°40′ W. The area is in the southernmost part of southeast Alaska and is about 15 mi (24 km) west of Ketchikan and 170 mi (273 km) south of Juneau. The study area is entirely in the Tongass National Forest.

The largest part of the land area is Prince of Wales Island, the southernmost major island of the Alexander Archipelago. The island is separated from the Cleveland Peninsula and Etolin Island by the Clarence Strait and from the many large and small islands seaward by generally narrow irregular channels and straits.

The Craig study area includes, from west to east, parts of the Prince of Wales Mountains, Kupreanof Lowland, and Coastal Foothills physiographic divisions of Wahrhaftig (1965) (fig. 3). The Prince of Wales Mountains physiographic division consists of moderately rugged glaciated mountains having rounded hummocky summits 2,000–3,500 ft (610–1,068 m) in altitude and some spirelike aretes as much as 3,800 ft (1,159 m) in altitude. They are dissected by steep-walled U-shaped valleys and by fiords 600–1,000 ft (183–305 m) deep.

The Kupreanof Lowland physiographic division consists of islands and channels. Islands of rolling, heavily glaciated terrane have local relief of 300–500 ft (91–153 m) and maximum relief of 1,000–1,500 ft (305–457 m) and are separated by an intricate network of waterways. Scattered blocklike mountains having rounded hummocky summits 2,000–3,000 ft (610–915 m) in altitude rise above the general level of the lowland. Parts of some islands are plains only a few feet above sea level.

The Coastal Foothills physiographic division consists of blocks of high mountains as much as 4,500 ft (1,372 m) in altitude and 3–30 mi (4.8–48.3 km) in width that are separated by flat-floored valleys and straits 0.5–10 mi (0.8–16 km) wide. Included are closely spaced mountain islands and peninsulas 1,000–4,500 ft (805–1,372 m) in altitude. Mountains less than 3,500 ft (1,068 m) in altitude were glacially overridden and have rounded hummocky summits.

Transportation in the area is limited to boats and aircraft. Most of the shorelines are easily accessible to small boats, and there are many deepwater channels and anchorages for larger vessels. The towns of Craig and Klawock and the villages of Hollis, Hydraburg, and Thorne Bay are on Prince of Wales Island. Public roads connect the towns and villages. Hollis can be reached by ferry from Ketchikan. Numerous logging roads crisscross Prince of Wales Island. Elsewhere, the interior of the islands is accessible only by foot or helicopter.

The climate of the region is mild and has a mean annual rainfall of 100–150 in. (254–381 cm). The dense forest cover and undergrowth is typical of the rain forest of cold temperate regions.

GEOLOGIC SETTING

The Craig study area contains parts of two northwest-trending tectonostratigraphic terranes separated by a similar-trending overlap assemblage (Berg and others, 1972, 1978; Monger and Berg, 1987). From southwest to northeast, they are the Alexander terrane, the Gravina–Nutzotin overlap assemblage, and the Taku terrane (Brew and Ford, 1984) (fig. 3). The geology of the study area is shown on plate 1.

The Alexander terrane consists of Proterozoic and Paleozoic (Pennsylvanian) sedimentary and volcanic rocks that have been intruded by Paleozoic and Mesozoic plutonic rocks on Prince of Wales and Dall Islands southwest of Clarence Strait. Unmetamorphosed rocks of Ordovician and younger age appear to stratigraphically overlay generally low grade metamorphic rocks of the Late Proterozoic and Lower Cambrian Wales Group (Eberlein and Churkin, 1970; Brew, in press). The Wales Group is a structurally complex assemblage of predominantly andesitic to basaltic marine fragmental volcanic rocks and flows interbedded with graywacke, mudstone, shale, and local marble. The Wales Group is regionally deformed and metamorphosed to greenschist facies and, in places, to amphibolite facies. The southern part of the Alexander terrane includes an Ordovician to Silurian volcano-plutonic complex of diorite, trondhjemite,

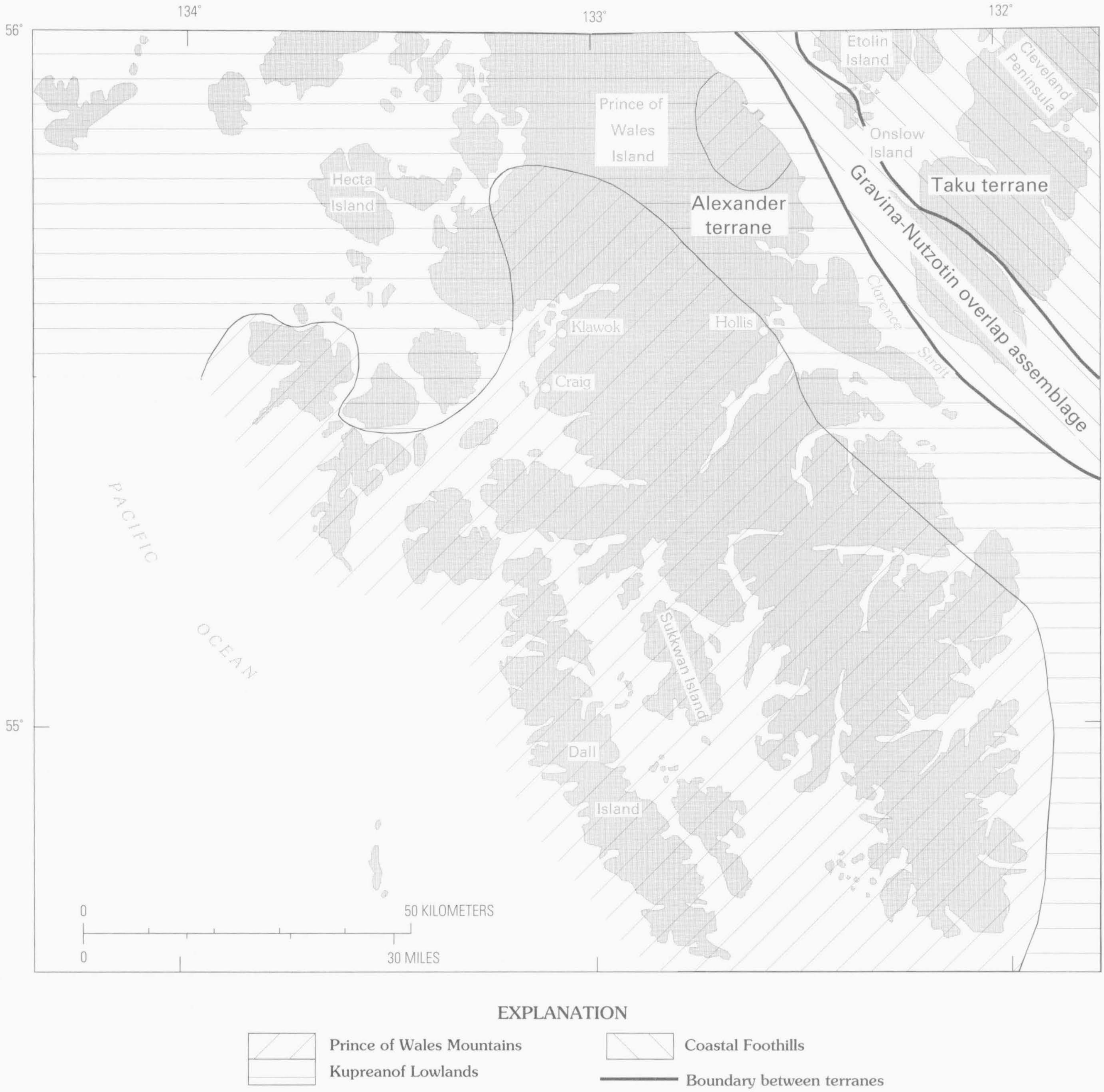

Figure 3. Physiographic divisions (Wahrhaftig, 1965) and tectonostratigraphic terranes (Berg and others, 1972, 1978; Monger and Berg, 1987) of the Craig study area, southeast Alaska.

and cogenetic volcanic and volcaniclastic rocks that is in fault contact with the Wales Group (Eberlein and others, 1983; Gehrels, Saleeby, and Berg, 1983; Gehrels, Saleeby, and others, 1983).

The rocks northeast of Clarence Strait have been assigned to the Gravina–Nutzotin overlap assemblage and Taku terrane (Berg and others, 1978; Brew and Ford, 1984; Monger and Berg, 1987). The Gravina–Nutzotin overlap assemblage underlies the south end of the Cleveland Peninsula and Onslow Island. The overlap assemblage consists of marine flysch, argillite, graywacke, and interbedded andesitic to basaltic volcanic and volcaniclastic rocks that have been intruded by plutons ranging in composition from quartz diorite to peridotite. In the Craig study area, the contact between the rocks of the Gravina–Nutzotin overlap assemblage and the Alexander terrane is the Clarence Strait fault, and the contact between the Gravina–Nutzotin overlap assemblage and the Taku terrane is an unnamed high-angle fault of unknown displacement on southern Cleveland Peninsula (fig. 3).

The Taku terrane consists of upper Paleozoic to Mesozoic bedded rocks (phyllitic mudstone, siltstone, sandstone, conglomerate, and minor limestone) that underlie the northeastern part of the study area on Etolin Island, Bronson Island, and the Cleveland Peninsula. Southeast of these bedded rocks, the terrane consists of complexly deformed and metamorphosed upper Paleozoic or Mesozoic pelitic sedimentary rocks and subordinate felsic to mafic volcanic rocks intruded by intermediate and felsic plutons of Mesozoic and Cenozoic age (Silberling and others, 1982).

Regional structures in the Craig study area include northwest- and east-trending high-angle lateral and extensional faults and some moderate-angle contractional faults. Regional metamorphism generally ranges from zeolite to greenschist facies but locally is as hias as amphibolite facies, particularly in the southern and northeastern parts of the study area (Eberlein and others, 1983).

KNOWN MINERAL OCCURRENCES

Within the last several decades, statewide and regional summaries of Alaskan metalliferous lode and placer deposits have been published by the USGS, the Alaska Division of Geological and Geophysical Surveys, and the U.S. Bureau of Mines. Berg (1984) described more than 275 mines, prospects, claims, and mineral occurrences in the Craig study area, some of which were considered as significant metalliferous lode deposits by Nokleberg and others (1987). The term "significant deposits" was defined as all metalliferous mines, prospects, deposits, or occurrences that the authors and contributors judged to be important on the basis of size, geological importance, or interest. Brew and others (1991), in a resource assessment of the Tongass National Forest for the Craig study area, not only described and summarized data for more than 250 mines, prospects, and mineral occurrences but also described and summarized data for more than 40 mineral resource tracts.

Table 1 lists the mineral deposit types expected in the Craig study area using the terminology and mineral deposit model numbers of Cox and Singer (1986) where possible. Table 2 summarizes some of the metalliferous lode deposits in the Craig study area, giving location, name, major metals or commodities, mineral deposit type, host-rock geology, tonnage grade and production data, description summary, and source of information. Figure 4 shows the location of these deposits, as well as those of several mines for which there is recorded production.

Table 1. Mineral-deposit types expected in the Craig study area, southeast Alaska.

[Models referred to by number are from Cox and Singer (1986); model W is from Dana and Ford (1953); model X is from Nokleberg and others (1987); models Y and Z are from Berg (1984)]

Model	Deposit type
7a	Synorogenic-synvolcanic nickel-copper
9	Alaskan platinum-group element
14a	Tungsten skarn
15a	Tungsten vein
16	Climax molybdenum
17	Porphyry copper
18a	Porphyry copper, skarn related
18b	Copper skarn
18c	Zinc-lead skarn
18d	Iron skarn
19a	Polymetallic replacement
21a	Porphyry copper-molybdenum
21b	Porphyry molybdenum
22c	Polymetallic vein
24b	Besshi massive sulfide
27d	Simple antimony
27e	Disseminated antimony
28a	Kuroko massive sulfide
31b	Bedded barite
36a	Low-sulfide gold-quartz vein
39a	Placer gold
39b	Placer platinum-group elements and gold
39c	Placer titanium
W	Placer uranium, thorium, and rare earth elements
X	Felsic plutonic-related uranium and rare earth elements and related thorium and rare earth element veins
Y	Magmatic oxide and (or) sulfide deposits accompanied by traces of platinum-group elements, gold, and silver
Z	Skarn related

GEOCHEMICAL METHODS

We collected stream-sediment and heavy-mineral-concentrate samples from active alluvium (fig. 5), primarily from first-order (unbranched) and second-order (below junction of two first-order streams) streams, as shown on USGS topographic maps (scale 1:63,360). A total of 1,085 stream-sediment samples and 839 heavy-mineral-concentrate samples from stream sediments were collected. The areas of the drainage basins sampled ranged from about 2 to 10 mi^2 (5–25 km^2).

Each stream-sediment sample was composited from several localities along as much as 50 ft (15 m) of the active stream channel. Each sample was air dried in the field and then sent to the laboratory for analysis. The samples were sieved to –80 mesh (0.177 mm) and then ground to –100 mesh (0.149 mm) prior to analysis. All stream-sediment samples were analyzed by six-step semiquantitative emission spectrographic methods (Grimes and Marranzino, 1968), and selected elements were determined by atomic absorption spectrophotometry (gold, Thompson and others, 1968; arsenic, antimony, zinc, bismuth, O'Leary and Viets, 1986; mercury, modification of McNerney and others, 1972, and Vaughn and McCarthy, 1964). The results are reported in McDanal and others (1991) and Detra and others (1992).

Each heavy-mineral-concentrate sample was collected by wet sieving stream sediment through a 10-mesh (2.0 mm)

Table 2. Summary of some of the metalliferous lode deposits in the Craig study area, southeast Alaska.
[Shown by number in figure 4. Latitude is north and longitude is west. Compiled from Nokleberg and others (1987) and Berg (1984)]

<table>
<tr><th>No.</th><th>Latitude,
longitude</th><th>Name
Commodities</th><th>Deposit type
Geologic host unit</th><th>Tonnage, grade, and production</th></tr>
<tr><td>1</td><td>55°55'
134°21'</td><td>Coronation Island
Lead and zinc</td><td>Replacement lead (zinc) carbonate(?)
Silurian(?) marble intruded by Tertiary(?) diorite</td><td>Produced more than 90 metric tons ore.</td></tr>
<tr><td colspan="5">DESCRIPTION: Lenses of galena, sphalerite, tetrahedrite, and secondary iron, lead, and zinc minerals in clay-carbonate gangue. Lenses are in fault zones as wide as 1.2 m in Silurian(?) marble of Alexander belt intruded by Tertiary(?) diorite. SOURCE: Twenhofel and others (1949).</td></tr>
<tr><td>2</td><td>55°46'
132°06'</td><td>Union Bay (Mount Burnett)
Iron, titanium, chromium, and platinum-group elements</td><td>Alaska-type zoned ultramafic
Cretaceous zoned ultramafic pluton</td><td>Estimated 1,000 million metric tons grading 18–20 percent Fe and possible vanadium. Grab samples contain 0.093 and 0.20 g/t Pd.</td></tr>
<tr><td colspan="5">DESCRIPTION: Disseminated magnetite and chromite in dunite and small, discontinuous stringers of chromite as long as a few centimeters in dunite. Dunite is in pipe and lopolith in center of the zoned Union Bay ultramafic pluton that intrudes Upper Jurassic and Lower Cretaceous flysch of Gravina-Nutzotin belt. Peridotite is present with dunite; pyroxenite and hornblende pyroxenite are present on periphery. SOURCE: Ruckmick and Noble (1959).</td></tr>
<tr><td>3</td><td>55°39'
132°00'</td><td>Gold Standard (Helm Bay)
Gold</td><td>Low-sulfide gold-quartz vein
Upper(?) Mesozoic metamorphosed flysch</td><td>Probably produced a few tens of thousands of grams of gold.</td></tr>
<tr><td colspan="5">DESCRIPTION: Two sets of quartz veins containing sparse gold, pyrite, lesser galena, and tetradymite. Principal vein about 300 m long and as thick as 2 m in metamorphosed upper Mesozoic phyllitic flysch and andesite tuff of Gravina-Nutzotin belt. Most ore was from older set of veins that are parallel with foliation of host rocks. Younger veins that are parallel with strike but dip in opposite direction contain little gold. SOURCE: Wright and Wright (1908).</td></tr>
<tr><td>4</td><td>55°38'
132°34'</td><td>Salt Chuck
Silver, gold, copper, and platinum-group elements</td><td>Magmatic copper in gabbro-pyroxenite
Late Paleozoic or Mesozoic mafic-ultramafic pluton</td><td>Produced about 300,000 metric tons grading 0.95 percent Cu, 1.2 g/t Au, 5.8 g/t Ag, and 2.2 g/t platinum-group elements. Produced 610,400 g platinum-group elements. Grab samples contain as much as 0.57 g/t Pt and 1 g/t Pd.</td></tr>
<tr><td colspan="5">DESCRIPTION: Irregularly and randomly distributed veinlets of bornite, minor chalcopyrite, and secondary chalcocite, covellite, native copper, and magnetite. Sulfide and oxide minerals are along cracks and fractures in pipelike late Paleozoic or Mesozoic gabbro-pyroxenite stock intruding Silurian metagraywacke of Alexander belt. Possible local supergene enrichment. SOURCES: Howard (1935), Gault (1945), Donald Grybeck and David A. Brew (written commun., 1985).</td></tr>
<tr><td>5</td><td>55°31'
132°17'</td><td>Kasaan Peninsula district (sites 52–74, Berg, 1984)
Copper, gold, and silver</td><td>Paleozoic copper-iron (molybdenum) skarn
Lower Paleozoic calcareous metasedimentary rocks</td><td>Produced 5.81 million kg Cu, 215,800 g Au, and 1.74 million g Ag from about 245,000 metric tons ore. Estimated 2.7 million metric tons ore remaining.</td></tr>
<tr><td colspan="5">DESCRIPTION: Contorted tabular masses of magnetite, chalcopyrite, and pyrite and gangue of calcite and calc-silicate minerals. About 30 masses are along a 20-km-long belt. Masses are mainly along contacts between conformable lower Paleozoic calcareous metasedimentary rocks and mafic metavolcanic rocks that are adjacent to irregular dikes, sills, and plugs of Ordovician or Silurian diorite, quartz monzodiorite, and mafic dikes. Skarns to the north contain epidote-quartz endoskarn and pyroxene-garnet-epidote exoskarn with chalcopyrite, magnetite, and calcite. Skarns to south contain hornblende, magnetite, chalcopyrite, and pyrite and low silver and gold. Host rocks are part of Alexander belt. Extensive underground workings. SOURCES: Warner and others (1961), Myers (1984).</td></tr>
<tr><td>6</td><td>55°28'
132°42'</td><td>Dawson
Gold, copper, lead, and zinc</td><td>Low-sulfide gold-quartz vein and polymetallic vein
Black graphitic slate</td><td>Probably produced several tens of thousands of grams each of gold and silver and minor lead. Estimated 40,000 metric tons grading 34.3 g/t Au.</td></tr>
<tr><td colspan="5">DESCRIPTION: Quartz stringers and veins in zone 0.6–1.8 m wide. Most gold is concentrated along contacts of stringers and lower(?) Paleozoic black graphitic slate of Alexander belt. Scattered pyrite, sphalerite, chalcopyrite, and galena in stringers, veins, and wallrocks. Mined from 1900 to 1948; workings to minimum depth of 181 m. Recent drilling and development. SOURCES: Wright and Wright (1908), Harris (1985).</td></tr>
<tr><td>7</td><td>55°18'
132°23'</td><td>Khayyam
Silver, gold, copper, and zinc</td><td>Kuroko massive sulfide
Lower Paleozoic metavolcanic rocks</td><td>Produced about 6.4 million kg Cu and 40,120 g Au from 53,200 metric tons ore. Channel samples contain as much as 5.25 percent Cu, 6.9 g Au, and 106 g/t Ag.</td></tr>
<tr><td colspan="5">DESCRIPTION: Irregular, elongate, almost vertical lenses of massive pyrite, chalcopyrite, sphalerite, pyrrhotite, hematite, gahnite, and magnetite. Gangue of quartz, calcite, epidote, garnet, and chlorite. About seven stacked sulfide lenses as long as 70 m and as wide as 6 m. Lenses are conformable to enclosing felsic to mafic metavolcanic host rocks of the Late Proterozoic and Lower Cambrian Wales Group in the Alexander belt. Coarse fragmental textures in metavolcanic host rocks. Intense chlorite alteration in footwall below sulfide lenses. Lateral gradation between sulfide lenses and enclosing schist. Several hundred meters of underground workings. Principal mining from 1901 to 1907. SOURCES: Fosse (1946), Barrie (1984a, b).</td></tr>
<tr><td>8</td><td>55°15'
132°37'</td><td>Jumbo district
Iron, silver, gold, and copper</td><td>Copper-gold skarn
Lower Paleozoic marble and metasedimentary rocks</td><td>At Jumbo deposit estimated 280,000 metric tons grading 45 percent Fe and 0.73 percent Cu. Deposit produced 4.6 million kg Cu, 220,000 g Au, and 2.73 million g Ag from 111,503 metric tons ore.</td></tr>
<tr><td colspan="5">DESCRIPTION: District includes major deposit at Jumbo, moderate deposits at Magnetite Cliff, Copper Mountain, and Corbin, and lesser deposits at Upper Magnetite, Gonnason, Houghton, Green Monster, Hetta, and Corbin. Deposits all within a few kilometers of Jumbo deposit. Jumbo deposit is chalcopyrite, magnetite, sphalerite, and molybdenite in skarn at contact between marble and Early Cretaceous granodiorite stock; gangue is mainly diopside and garnet; more than 3.2 km of underground workings. Magnetite Cliff is 25-m-thick shell of magnetite that mantles Early Cretaceous granodiorite in contact with garnet-diopside skarn; skarn contains 2–3 percent chalcopyrite and 335,600 metric tons grading 46 percent Fe and 0.77 percent Cu; production from 1902 to 1922. Copper Mountain comprises scattered chalcopyrite and copper carbonate in diopside endoskarn in granodiorite with veins and masses of epidote, garnet, magnetite, and scapolite; produced 101,800 kg Cu, 321,300 g Ag, and 4,510 g Au between 1902 and 1907; about 410 m of tunnels and shafts; deposits are in or adjacent to lower Paleozoic marble and pelitic metasedimentary rocks intruded by mid-Cretaceous hornblende-biotite granodiorite that has concordant hornblende and biotite K-Ar ages of 103 Ma; wallrock part of the Wales Group in Alexander belt. SOURCES: Kennedy (1953), Herreid and others (1978).</td></tr>
<tr><td>9</td><td>55°08'
132°37'</td><td>Copper City
Copper, zinc, silver, and gold</td><td>Metamorphosed sulfide(?)
Lower Paleozoic metavolcanic and metasedimentary rocks</td><td>Chip sample containing 8.5 percent Cu, 7.3 percent Zn, 85.8 g/t Ag, 1.7 g/t Au, and 0.06 percent Pb.</td></tr>
<tr><td colspan="5">DESCRIPTION: Massive chalcopyrite, pyrite, sphalerite, and rarely hematite and gangue quartz, calcite, and epidote in zone as thick as 1.2 m in layers parallel with enclosing metakeratophyre, metaspilite, and quartz-mica schist. Local crosscutting quartz veins and diabase dike. Host rocks part of the Late Proterozoic and Lower Cambrian Wales Group in Alexander belt. Produced about 1,450 metric tons of ore between 1898 and 1910. Deposit remobilized during regional metamorphism. SOURCES: Wright and Wright (1908), Herreid and others (1978).</td></tr>
</table>

Table 2. Summary of some of the metalliferous lode deposits in the Craig study area, southeast Alaska—Continued.
[Shown by number in figure 4. Latitude is north and longitude is west. Compiled from Nokleberg and others (1987) and Berg (1984)]

No.	Latitude, longitude	Name Commodities	Deposit type Geologic host unit	Tonnage, grade, and production
10	55°11' 132°23'	Moonshine Silver, lead, zinc, and copper	Metamorphosed sulfide Lower Paleozoic metasedimentary rocks	Produced as much as 46,500 g Ag. Grab samples containing 20–83 percent Pb and 411–1,030 g/t Ag.
	DESCRIPTION: Galena, sphalerite, minor chalcopyrite, and accessory pyrite and siderite in well-defined fissure veins or reniform pods as wide as a few meters in dolomitized vein breccia cutting obliquely across marble and metasedimentary rocks. Gangue of quartz, siderite, and calcite. Local diabase dikes cross fissures and wallrocks. Several tunnels and shafts. Minor production between 1900 and 1909. Wallrocks part of the Late Proterozoic and Lower Cambrian Wales Group in Alexander belt. SOURCES: Wright (1909), Herreid and others (1978).			
11	55°03' 132°38'	Lime Point Barium	Bedded barite Lower Paleozoic metasedimentary rocks	Estimated 4,500 metric tons grading 91 percent barite.
	DESCRIPTION: Interlayered lenses of barite and dolomite as thick as 2 m in lower Paleozoic marble of pre-Middle Ordovician Wales group in Alexander belt. Local faulting and folding and andesite dikes intruded along faults short adit. Test shipments; no production. SOURCES: Twenhofel and others (1949), Herreid and others (1978).			
12	55°09' 132°03'	Golden Fleece Silver and gold	Gold-quartz vein Lower Paleozoic marble and schist	Considerable production; no records. Assays show 81–341 g/t Ag and 1.7–143 g/t Au.
	DESCRIPTION: Irregular quartz fissure veins as thick as 3 m containing pyrite, tetrahedrite, and gold in silicified and dolomitized marble cut by postmineralization diabase dikes. Local solution caverns along vein system. Veins localized along conjugate(?) system of Cenozoic(?) faults subsidiary to Clarence Strait fault zone. Host rocks part of the Late Proterozoic and Lower Cambrian Wales Group in Alexander belt. Several hundreds of meters of workings. Principal mining from 1900 to 1930. SOURCES: Herreid (1967), Henry C. Berg (written commun., 1984).			
13	55°04' 132°09'	Niblack Copper, gold, and silver	Kuroko massive sulfide Lower Paleozoic metavolcanic rocks	Produced about 636,000 kg Cu, 34,200 g Au, and 466,500 g Ag.
	DESCRIPTION: Lenticular masses and disseminations of chalcopyrite, pyrite, and lesser sphalerite, galena, hematite, and magnetite in mainly quartz-sericite schist derived from pre-Ordovician(?) felsic volcanic or volcaniclastic rocks. Felsic metavolcanic rocks interlayered with intermediate to mafic metavolcanic rocks and lesser slate. Host rocks part of the Late Proterozoic and Lower Cambrian Wales Group in Alexander belt. Workings consist of a 100-m shaft and about 1.6 km of underground workings. Main mining from 1902 to 1909. Recent development. SOURCE: Herreid (1964).			
14	54°56' 132°08'	Bokan Mountain (sites 19–42, Berg, 1984) Uranium, thorium, rare earth elements, and niobium	Felsic plutonic uranium Jurassic peralkaline granite	Produced about 190,000 metric tons grading about 1 percent U_3O_8; thorium not recovered.
	DESCRIPTION: Disseminated uranium, thorium, rare earth element, and niobium minerals including uranothorite, uranoan thorianite, uraninite, xenotime, allanite, monazite, pyrite, galena, zircon, and fluorite in irregular, steeply dipping pipe of Jurassic peralkaline granite. Most ore produced from crudely cigar shaped upper part of pluton. Central zone grades outward to normal granite. Associated pegmatite and vein rare earth element, niobium, thorium, and uranium deposits in outer parts of granite or adjacent country rock that consists of early Paleozoic metamorphosed granitic and sedimentary rocks of Alexander belt. Intermittent mining from 1955 to about 1971. SOURCES: MacKevett (1963), Thompson and others (1982), Lancelot and de Saint-Andre (1982), Armstrong (1985).			
15	54°56' 132°27'	Barrier Islands (sites 64–73, Berg, 1984) Silver, gold, copper, lead, zinc, and barium	Kuroko massive sulfide Lower Paleozoic metavolcanic rocks	Grab samples containing as much as 10 percent Zn, 0.15 percent Pb, 30 g/t Ag, and 0.25 g/t Au.
	DESCRIPTION: Disseminated to massive pyrite and minor sphalerite, galena, and arsenopyrite in zones as long as a few meters and as thick as 3 m. Sulfides also form rinds of pillows in metavolcanic rocks. Hosted in Ordovician and Silurian felsic to intermediate metavolcanic rocks and metagraywacke of Alexander belt. SOURCE: Gehrels, Berg, and Saleeby (1983).			

stainless steel screen, to remove the coarse material, into a 35-cm (14 in.) gold pan. The fraction less than 2.0 mm was panned at the site until most of the quartz, feldspar, organic material, and clay-sized material was removed. The samples were air dried and then shipped to the laboratory where they were sieved to –20 mesh (0.83 mm). Following the removal of the light-mineral fraction by flotation in bromoform (specific gravity about 2.85), the heavy-mineral fraction was separated into three magnetic splits using a Frantz isodynamic separator. The most magnetic, first-fraction material, primarily magnetite, and a second fraction, mostly ferromagnesium silicate minerals and iron oxide minerals, were not analyzed. The third fraction, the least magnetic material, referred to as the nonmagnetic heavy-mineral concentrate, contains high-specific gravity rock-forming minerals, as well as minerals that might indicate mineralization. This fraction was then split if adequate sample was recovered. One part was saved for further studies, and the other part was ground for spectrographic analysis. The analysis was done by a six-step semiquantitative direct-current-arc emission spectrographic method (Grimes and Marranzino, 1968), and the results are reported in McDanal and others (1991) and Detra and others (1992).

A statistical summary of the geochemical data for 18 selected elements for stream sediments is given in table 3 and for the nonmagnetic heavy-mineral-concentrate fractions in table 4. The criteria for selecting these 18 elements is based on the descriptions of approximately 278 mineral deposits in

EXPLANATION

	Name	Deposit type	Commodities
1.	Coronation Island	Polymetallic vein(?)	Lead, zinc
2.	Union Bay	Zoned mafic-ultramafic	Iron, titanium, chromium, platinum-group elements
3.	Gold Standard	Gold quartz vein	Gold
4.	Salt Chuck	Zoned mafic-ultramafic	Silver, gold, copper, platinum-group elements
5.	Kassan Peninsula	Iron skarn	Copper, gold, silver
6.	Dawson	Gold quartz vein-polymetallic vein	Gold, copper, lead, zinc
7.	Khayyam	Kuroko massive sulfide	Silver, gold, copper, zinc
8.	Jumbo District	Copper-gold skarn	Iron, silver, gold, copper
9.	Copper City	Metamorphosed sulfide(?)	Copper, zinc, silver, gold
10.	Moonshine	Metamorphosed sulfide	Silver, lead, zinc, copper
11.	Lime Point	Bedded barite	Barium
12.	Golden Fleece	Gold quartz vein	Silver, gold
13.	Niblack	Kuroko massive sulfide	Copper, gold, silver
14.	Bokan Mountain	Felsic plutonic uranium	Uranium, thorium, rare earth elements, niobium
15.	Barrier Island	Kuroko massive sulfide	Silver, gold, copper, lead, zinc, barium
16.	McCullogh	Polymetallic vein(?)	Copper, zinc
17.	Rush Brown	Skarn	Silver, gold, cobalt, copper, iron, nickel
18.	Lucky Nell	Polymetallic vein(?)	Silver, gold, copper, lead, zinc
19.	Big Harbor	Kuroko massive sulfide	Silver, gold, copper, zinc
20.	Lucky Boy	Vein, kuroko massive sulfide	Silver, gold, copper, lead, zinc
21.	Cymru	Polymetallic vein, skarn(?)	Silver, gold, copper
22.	Flat Island	Vein	Gold
23.	Nelson and Tift	Polymetallic vein, skarn(?)	Silver, gold, copper, lead

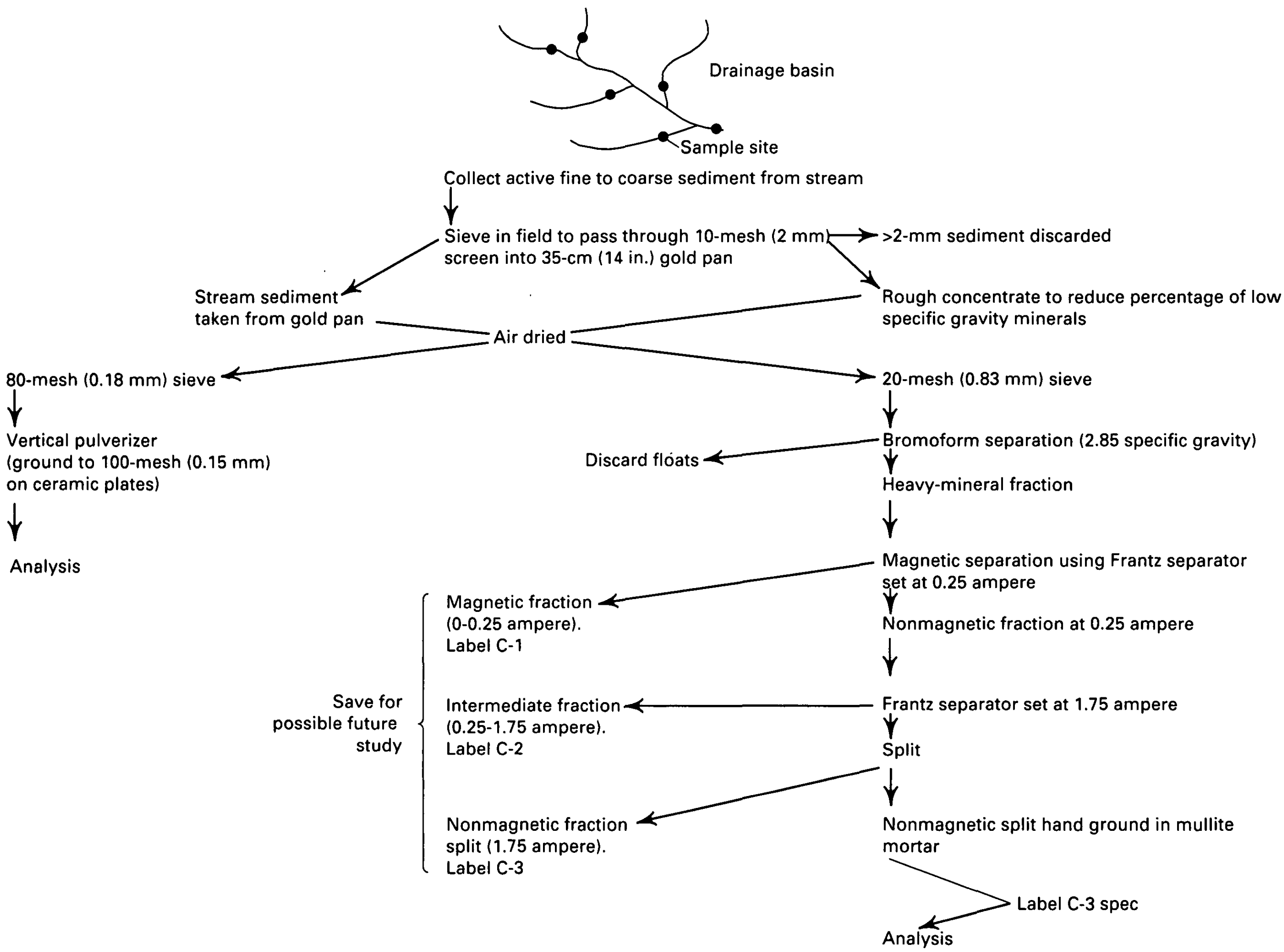

Figure 5. Flow chart showing stream-sediment and heavy-mineral-concentrate sample collection, preparation, and analysis, Craig study area, southeast Alaska.

the study area and the major metals or commodities they are known to contain (Berg, 1984; Nokleberg and others, 1987; Brew and others, 1991). Some of the mineral deposit types in the study area are (1) polymetallic replacement and vein deposits; (2) skarn (copper, lead-zinc, and iron) deposits; (3) porphyry (copper, copper-molybdenum, and molybdenum) deposits; (4) kuroko-type massive sulfide deposits; (5) low-sulfide gold-quartz-vein deposits; (6) felsic plutonic-related uranium and rare earth element deposits; (7) felsic plutonic-related thorium and rare earth element vein deposits; and (8) Alaska platinum-group element deposits (table 1). Copper, lead, zinc, and barium are elements that are of economic significance in the study area and are present in concentrations well above the lower detection limits. Gold, silver, arsenic, antimony, bismuth, cadmium, molybdenum, tin, and tungsten are commonly associated with mineral deposits, but levels of analytical determinations are so high that almost all values suggest mineralization. Lanthanum, niobium, yttrium, beryllium, and thorium are associated with known rare earth element-bearing vein deposits in the study area and are locally accompanied by base- or precious-metals (Denny, 1962; MacKevett, 1963).

Figure 4 (facing page). Known mineral deposits in the Craig study area, southeast Alaska. Numbers 1–15 are metalliferous lode deposits and are described in table 2; 16–23 are mines. Compiled from Berg (1984) and Nokleberg and others (1987). Deposit types are listed in table 1.

Anomalous element values are those that deviate from the norm or stand out above some geochemical background. Commonly, the 95th percentile for a given geochemical distribution is chosen as a geochemical threshold, and all values greater than that threshold are considered anomalous (Krauskopf, 1967; Levinson, 1974). The 95th percentile values for the 18 selected elements are listed in tables 3 and 4. For some or all of the elements, the reader may wish, however, to adjust geochemical thresholds upward or downward from the 95th percentile to accommodate breaks in

Table 3. Statistical summary of AMRAP geochemical data for 17 elements from stream sediments from the Craig and Dixon Entrance quadrangles and the western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska.

[In parts per million. Elements indicated by asterisk (*) determined by atomic absorption methods; all others determined by direct-current-arc emission spectrography. N indicates not detected at value shown]

Element	DR[1]	N[2]	L[3]	B[4]	G[5]	Based on uncensored values			Percentile values based on censored and uncensored values											
maximum						No. of values	Minimum value	Maximum value	50th	60th	70th	75th	80th	85th	90th	92nd	95th	97.5th	98th	99th
Cu	0.990	2	7	0	1	1,024	5	5,000	30	30	50	50	50	50	70	70	100	150	150	200
Pb	0.769	43	196	0	0	795	10	1,000	10	15	20	20	20	20	30	30	50	50	70	100
Zn	0.333	319	371	0	0	344	200	2,000	<200	<200	200	200	200	200	200	200	300	300	500	500
Zn*	1.000	0	0	42	0	992	5	1,000	82	92	92	110	122	140	172	220	220	270	300	500
Ba	0.999	0	1	0	0	1,033	20	5,000	300	500	500	500	700	700	1,000	1,000	1,500	1,500	2,000	2,000
Cd*	0.692	3	1	1,021	0	9	0.1	0.65	0.1N	0.1N	0.1N	0.1N	0.1N	0.1N	0.1N	0.1N	0.1N	0.1N	0.1	0.63
Au*	0.014	1,005	15	0	0	14	0.05	70	0.05N	0.05N	0.05N	0.05N	0.05N	0.05N	0.05N	0.05N	<0.05	0.07	0.15	0.15
Ag	0.023	974	36	0	0	24	0.5	500	0.5N	0.5N	0.5N	0.5N	0.5N	0.5N	0.5N	0.5N	<0.5	0.5	1	2
As*	0.236	717	36	49	0	232	10	400	10N	10N	<10	<10	10	10	20	20	30	60	70	100
Sb*	0.072	918	3	42	0	71	2	32	2N	2N	2N	2N	2N	2N	2N	<2	2	5	7	10
Bi*	0.009	227	2	803	0	4	10	50	10N	10N	10N	10N	10N	10N	10N	10N	10N	10N	10N	10N
Mo	0.198	623	206	0	0	205	5	100	5N	5N	<5	<5	<5	5	5	7	10	10	15	20
Sn	0.014	1,019	1	0	0	14	10	200	10N	10N	10N	10N	10N	10N	10N	10N	10N	10N	<10	10
La	0.053	935	44	0	0	55	20	200	20N	20N	20N	20N	20N	20N	20N	<20	20	50	70	100
Nb	0.024	988	21	0	0	25	20	100	20N	20N	20N	20N	20N	20N	20N	20N	20N	<20	20	30
Y	0.985	1	14	0	0	1,019	10	500	20	20	30	30	30	30	30	50	50	50	50	70
Be	0.622	43	348	0	0	643	1	20	1	1	1	1.5	1.5	1.5	2	2	2	3	5	5
Th	0.001	1,032	1	0	0	1	100	100	100N	100N	100N	100N	100N	100N	100N	100N	100N	100N	100N	100N

[1]DR, detection ratio, number of uncensored values (that is, those without N, L, and G) divided by total number of samples analyzed.

[2]N, number of samples in which concentration could not be detected at lower determination limit.

[3]L, number of samples in which element was observed, but concentration was less than lower determination limit.

[4]B, number of samples not analyzed.

[5]G, number of samples in which element was observed, but concentration was greater than upper determination limit.

Table 4. Statistical summary of AMRAP geochemical data for 18 selected elements from nonmagnetic heavy-mineral concentrates from the Craig and Dixon Entrance quadrangles and the western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska.

[In parts per million. Determined by semiquantitative emission spectography. N indicates not detected at value shown]

Element maximum	DR[1]	N[2]	L[3]	G[4]	Based on uncensored values: No. of values	Minimum value	Maximum value	Percentile values based on censored and uncensored values: 50th	60th	70th	75th	80th	85th	90th	92nd	95th	97.5th	98th	99th
Cu	0.726	68	146	3	576	10	50,000	20	30	50	70	100	100	200	300	300	700	1,000	2,000
Pb	0.579	201	129	4	459	20	50,000	<20	50	70	70	100	150	200	300	700	1,500	2,000	10,000
Zn	0.179	574	54	9	156	500	20,000	500N	500N	500N	<500	500	700	1,500	2,000	5,000	15,000	20,000	>20,000
Cd	0.052	743	8	1	41	50	1,000	50N	50N	50N	50N	50N	50N	50N	50N	50	200	500	700
Ba	0.798	13	35	112	633	50	10,000	700	1,500	3,000	5,000	7,000	10,000	>10,000	>10,000	>10,000	>10,000	>10,000	>10,000
Au	0.029	763	4	3	23	20	500	20N	20N	20N	20N	20N	20N	20N	20N	20N	<20	20	150
Ag	0.121	666	31	0	96	1	1,500	1N	1N	1N	1N	1N	<1	1.5	3	5	7	10	200
As	0.034	758	7	1	27	500	15,000	500N	500N	500N	500N	500N	500N	500N	500N	500N	500	700	1,500
Sb	0.018	774	5	0	14	200	5,000	200N	200N	200N	200N	200N	200N	200N	200N	200N	200N	<200	300
Bi	0.024	766	8	0	19	20	2,000	20N	20N	20N	20N	20N	20N	20N	20N	20N	<20	20	150
Mo	0.111	657	47	0	88	10	1,000	10N	10N	10N	10N	10N	10N	<10	10	30	70	100	200
Sn	0.141	646	32	3	112	20	2,000	10N	20N	20N	20N	20N	<20	30	50	70	200	200	700
W	0.126	671	22	0	100	100	5,000	100N	100N	100N	100N	100N	<100	<100	200	500	700	700	1,500
La	0.393	214	260	7	312	100	2,000	<100	100	150	200	200	300	300	300	700	1,000	1,500	1,500
Nb	0.334	341	187	0	265	50	700	<50	<50	50	50	70	70	100	100	100	200	200	200
Y	0.958	20	11	2	760	20	3,000	200	200	300	300	500	500	700	700	700	1,000	1,500	2,000
Be	0.066	532	208	1	52	2	700	2N	2N	<2	<2	<2	<2	<2	<2	<2	5	5	15
Th	0.038	758	5	0	30	200	2,000	200N	200N	200N	200N	200N	200N	200N	200N	200N	200N	<200	200

[1]DR, detection ratio, number of uncensored values (that is, those without N, L, and G) divided by total number of samples analyzed.

[2]N, number of samples in which concentration could not be detected at lower determination limit.

[3]L, number of samples in which element was observed, but concentration was less than lower determination limit.

[4]G, number of samples in which element was observed, but concentration was greater than upper determination limit.

Table 5. Type and number of geochemical samples incorporated in the geochemical survey of the Craig and Dixon Entrance quadrangles and the western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska.

Reference	Rock	Stream sediment	Nonmagnetic heavy-mineral concentrate
Herried and Rose (1966), Herried and Trible (1973), and Herreid and others (1978)	140	549	0
Clark and others (1970a–f)	167	258	0
Los Alamos National Laboratory (1980, 1982a, 1983) and Oak Ridge Gaseous Diffusion Plant (1981a)	0	549	0
McDanal and others (1991)	0	1,085	839
Total	307	2,441	839

the percentile distribution of the data. Therefore, additional percentiles and their corresponding values are listed in table 3 for stream sediments and in table 4 for nonmagnetic heavy-mineral concentrates.

Additional analytical and statistical data used in this report were obtained from the USGS heavy-metal program (Clark and others, 1970a–f) and from the mineral resource assessment program of the Division of Geological Survey, Department of Natural Resources, State of Alaska (Herreid and Rose, 1966; Herreid and Trible, 1973; Herreid and others, 1978). The rock geochemical data, reported from these two programs, are in part from samples collected from the known mineral occurrences listed and described in table 7 and shown on plate 1; these data were eliminated from the data set utilized in this report. Also incorporated in the data set are geochemical data obtained from the U.S. Department of Energy Hydrogeochemical and Stream Sediment Reconnaissance part of the NURE program (Los Alamos National Laboratories, 1980, 1982a, 1983; Oak Ridge Gaseous Diffusion Plant, 1981a). Table 5 summarizes the types and numbers of samples used in this report.

Changes in mineral program priorities over the years have dictated that samples be collected and analyzed for different suites of elements. Moreover, analytical variations resulting from the use of different laboratories and analysts, as well as from changes in preparation and analytical methods, have produced complications in the evaluation, interpretation, and integration of the additional heavy-metal, State of Alaska, and NURE geochemical data. These variations complicate the selection of anomalous values and the selection of indicator elements.

The purpose of the NURE program was to gather data with which to make an assessment of the uranium resources in the United States. The Craig study area contains uranium-thorium and rare earth element deposits; therefore, the NURE data for uranium and rare earth elements known to be associated with or suspected to be pathfinders for uranium-mineralized rock are included in this report.

In order to distinguish anomalous concentrations from background concentrations for these additional geochemical data, each set of such data was inspected separately. Threshold concentrations selected for the heavy-metal and State of Alaska stream-sediment data are the same as those shown in the publications reporting the data. Threshold concentrations selected for the rock data were determined following inspection of histograms and percentiles of the data in those publications. Threshold concentrations for the NURE data were arbitrarily selected following inspection of the percentiles and histograms in the publications reporting the data. Table 6 lists threshold concentrations and percentiles of the elements used in this report.

GEOCHEMICALLY ANOMALOUS AREAS

We utilized bedrock geochemistry (Herreid and Rose, 1966; Clark and others, 1970a–f, 1971; Herreid, 1971; Herreid and Trible, 1973; Herreid and others, 1978; McDanal and others, 1991; Arbogast and others, 1991; Cathrall, McDanal, and others, 1991) and stream-sediment and heavy-mineral-concentrate geochemistry (Herreid and Rose, 1966; Clark and others, 1970a–f, 1971; Herreid and Trible, 1973; Herreid and others, 1978; Los Alamos National Laboratory, 1980, 1982a–c; Oak Ridge Gaseous Diffusion Plant, 1981a–c; Arbogast and others, 1991; Cathrall, McDanal, and others, 1991; McDanal and others, 1991) to delineate geochemically anomalous areas. The geochemical maps from the above published sources, together with geochemical computer map plots (J.B. Cathrall, unpub. data, 1990) created from published Los Alamos, NURE, and USGS data, were compared with maps showing bedrock geology (Brew, in press), aeromagnetic and gravity survey results (U.S. Geological Survey, 1984; J. Wynn, U.S. Geological Survey, unpub. data, 1990), and economic geology (Berg, 1984; Nokleberg and others, 1987). The geochemically anomalous areas delineated, and the geologic units, known occurrences, anomalous elements, and expected mineral deposit types in those areas, are summarized in table 7. The terminology and model numbers of Cox and Singer (1986) are used, wherever possible, to designate permissive deposit types. Mineral-deposits types expected in the Craig study area are listed in table 1. The geochemically anomalous areas, known occurrences, and anomalous geochemical sample sites listed in table 7 are shown on plate 1.

Table 6. Threshold concentrations and percentiles by sample media of selected elements, Craig and Dixon Entrance quadrangles and the western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska.

[In parts per million. Number in parentheses indicates percentile. Asterisk (*) following number in 98th percentile value column indicates 99th, not 98th percentile. NA indicates no analysis; ND indicates analyzed for but not detected. NMHMC, nonmagnetic heavy-mineral concentrate from stream sediment. Sources of data: AMRAP, Alaska Mineral Resource Appraisal Program (McDanal and others, 1990); HM, USGS Heavy Metal Program (Clark and others, 1970a–f); NURE, National Uranium Resource Evaluation Program (Los Alamos National Laboratory, 1980, 1982a, 1983); DGGS, Division of Geological Survey, Department of Natural Resources State of Alaska (Herreid and Rose, 1966; Herreid, 1971; Herreid and Trible, 1973; Herreid and others, 1978)]

	NMHMC		Stream sediment								Rock			
	AMRAP		AMRAP		HM		NURE		DGGS		HM		DGGS	
Element	Threshold value	98th percentile value	Threshold value	98th percentile value	Threshold value	98th percentile value	Threshold value	98th percentile value	Threshold value	98th percentile value	Threshold value	98th percentile value	Threshold value	98th percentile value
Cu	200(90)	1,000	100(95)	150	100(92)	200	110(95)	130	110(95)	300	150(92)	500	200(93)	500
Pb	500(93)	2,000	50(95)	70	70(97)	100	19(95)	38	50(95)	100	70(95)	200	50(95)	150
Zn	1,500(90)	20,000	220(92)	382	200(92)	700	237(90)	355	140(96)	350	200(95)	700	200(95)	350
Ba	>10,000(90)	>10,000	1,500(95)	2,000	1,500(93)	3,000	1,186(95)	1,389	2,000(95)	3,000	2,000(95)	3,000	2,000(95)	3,000
Cd	<50(93)	500	0.1(98)	0.1	70(99)	70*	6(95)	8	ND	ND	<50(99)	<50*	20(99)	20*
Au	<20(96)	20	0.05(95)	0.15	0.04(95)	0.3	0.33(99)	0.33*	ND	ND	0.05(95)	0.1	0.03(96)	0.50
Ag	1(89)	10	0.5(95)	1	<.5(97)	0.5	5(99)	5*	1(99)	1*	<.5(92)	2	1(95)	3
As	<500(96)	700	25(94)	70	ND	ND	29(90)	49	100(99)	100*	200(98)	200	ND	ND
Sb	<200(98)	<200	2(95)	7	ND	ND	4(95)	7	100(99)	100*	1,500(99)	1,500*	200(99)	200*
Bi	<20(97)	20	<10(99)	<10*	ND	ND	6(95)	7	ND	ND	100(99)	100	10(99)	10*
Mo	<10(90)	100	7(92)	15	7(90)	30	NA	NA	10(95)	50	7(90)	20	10(95)	50
Sn	30(90)	200	<10(99)	<10*	10(95)	20	12(95)	25	10(96)	50	15(97)	20	30(99)	30*
W	100(91)	700	ND	ND	ND	ND	20(95)	25	50(99)	50*	70(99)	70*	50(99)	50*
La	300(92)	1,500	20(95)	50	20(95)	50	NA	NA	50(95)	100	20(95)	50	20(95)	30
Nb	100(95)	200	<20(97)	20	20(95)	30	22(95)	30	20(96)	30	20(98)	20	20(99)	20*
Y	700(95)	1,500	50(95)	70	70(98)	70	NA	NA	70(99)	70*	70(99)	70*	50(96)	70
Be	2(96)	5	3(97)	5	3(99)	3*	2(90)	4	2(95)	5	3(99)	3*	2(97)	5
Th	<200(98)	200	<100(99)	<100*	NA	NA	12.2(95)	15.9	NA	NA	NA	NA	NA	NA
U	NA	NA	NA	NA	NA	NA	5.4(90)	8.1	NA	NA	NA	NA	NA	NA

Table 7. Summary of favorable geochemically anomalous areas in the Craig and Dixon Entrance quadrangles and the western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska.

[Favorable geochemically anomalous areas (shown by number), localities of known occurrences (shown by letter), and anomalous geochemical sample sites (shown by number) are shown on plate 1. Geologic units are described on plate 1. Location is an occurrence unless labeled prospect or mine. Sources of descriptive information are Berg (1984) and Nokleberg and others (1987) unless noted. Leader (—) indicates no anomalous element concentration detected; asterisk (*) indicates geochemical sample not collected; elements underlined indicate recorded production; elements without parentheses are above 98th percentile and elements in parentheses are between threshold value and 98th percentile (see table 6). Source of data shown as reference by number: 1, McDanal and others (1991) or Detra and others (1992); 2, Clark and others (1970a–f); 3, Los Alamos National Laboratory (1980, 1982a, 1983) or Oak Ridge Gaseous Diffusion Plant (1981a); 4, Herreid and Rose (1966), Herreid (1971), Herreid and Trible (1973), or Herreid and others (1978). Mineral deposit types are listed in table 1]

Geologic unit(s)	Known mine, prospect, or occurrence, resources, and description	Site	Reference	Anomalous elements by sample type: Stream sediment	Anomalous elements by sample type: Nonmagnetic heavy-mineral concentrate from stream sediment	Anomalous elements by sample type: Rock	Mineral deposit type(s) expected
				Area 1—Coronation Island			
Kwqo Shl Shc Shpc SOdg	A. Coronation Island mine—lead, zinc, silver. Small lenticular masses of galena, sphalerite, tetrahedrite, and secondary lead-zinc minerals in clay carbonate gangue in fault zone as wide as 4 ft (1.2 m) in Paleozoic limestone locally cut by diorite	1	1	(Gold, yttrium)	Lead, barium, silver, molybdenum, (zinc, cadmium, tin)	*	Polymetallic replacement (model 19a)
		2	1	Lead, zinc, silver, antimony, (arsenic)	Tungsten	*	
		3	1	Lead, zinc, silver, antimony	Barium, (zinc, tungsten)	*	
		4	1	(Lead)	(Silver)	*	
		5	1	Antimony	—	*	
		6	1	Antimony	Arsenic, (copper)	*	
		7	1	—	(Tin)	*	
		8	1	(Niobium)	(Tin)	*	
		9	1	—	Tungsten	*	
				Area 2—Warren Island			
Kwqo SOdg		1	1	(Arsenic, molybdenum)	(Molybdenum, tin, lanthanum, yttrium)	*	Polymetallic vein (model 22c), Climax molybdenum (model 16)
		2	1	Beryllium	—	*	
		3	1	(Lead)	Arsenic	*	
		4	1	—	Lead, silver, (tin, tungsten)	*	
		5	1	(Beryllium)	(Yttrium)	*	
		6	1	—	(Yttrium)	*	
				Area 3—Kosciusko, Marble, Orr, Tuxekan, and Heceta Islands			
Kwqo DSs Shl Shc SOdg	A. Small galena vein between diorite and calcareous sedimentary rocks	1	1	—	(Lanthanum)	*	Climax molybdenum (model 16), zinc-lead skarn (model 18c)
		2	1	—	(Cadmium, lanthanum)	*	
		3	1	—	(Lanthanum)	*	
		4	1	—	(Copper, molybdenum)	*	
		5	1	—	(Lead)	*	
		6	1	—	(Lanthanum)	*	
		7	1	—	(Lanthanum)	*	
		8	1	—	(Lead)	*	
		9	1	(Barium)	(Beryllium)	*	
		10	1	—	Tungsten, (lead, molybdenum)	*	
		11	1	—	(Molybdenum, tin, lanthanum, yttrium)	*	
		12	1	—	Barium	*	
		13	1	(Beryllium)	(Copper, molybdenum)	*	
		14	1	(Gold)	—	*	
		15	1	—	Molybdenum	*	
		16	1	Molybdenum	—	*	
		17	1	Molybdenum	—	*	
		18	1	Molybdenum, (beryllium)	—	*	
		19	1	Bismuth	—	*	
		20	1	(Molybdenum)	Lead, (silver)	*	
		21	1	—	(Zinc, cadmium)	*	
		22	1	(Beryllium)	(Tin, niobium)	*	
		23	1	Lanthanum	(Tin, lanthanum)	*	
		24	1	—	(Barium)	*	

		25	1	—	(Barium, arsenic)	*	
		26	1	—	(Tin, lanthanum)	*	
		27	1	(Gold)	—	*	
		28	1	—	(Barium)	*	
		29	1	—	(Zinc)	*	
		30	1	(Beryllium)	(Antimony, lanthanum)	*	
		31	1	(Beryllium)	(Tungsten)	*	
		32	1	—	(Lanthanum)	*	
		33	1	(Lanthanum)	—	*	
		34	1	—	Lead, (lanthanum)	*	
					Area 4—Esquibel Island		
SOdg		1	2	*	*	(Copper, barium)	Polymetallic vein (model 22c)
SOdb		2	2	*	*	(Zinc, molybdenum)	
		3	2	*	*	Copper, lead, zinc, gold, silver, (molybdenum)	
		4	2	*	*	(Copper, molybdenum)	
					Area 5—Noyes Island		
Kwqo	A. Diamond drill-core evidence indicates	1	2	(Copper, molybdenum)	*	*	Porphyry copper-molybdenum
Dsj	that hornfelsed andesite contains irregular	2	1	(Copper, arsenic, molybdenum)	Arsenic, bismuth, tungsten	*	(model 21a), zinc-lead skarn (model
Dkbn	masses of chalcopyrite, pyrite, and	3	2	(Molybdenum)	*	*	18c), polymetallic vein (model 22c),
Shl	molybdenite(?)	4	1	(Yttrium, beryllium)	—	*	porphyry molybdenum (model 21b),
SOdg	B. Quartz veins at contact between pluton	5	1	(Lead, beryllium)	(Zinc)	*	copper skarn (model 18b)
SOdb	and bedded rocks contain chalcopyrite and	6	2	Tin, silver, (copper, lead, zinc)	*	*	
	pyrrhotite. Molybdenum is in schist	7	1	Tin, (copper, lead, zinc, silver, molybdenum)	Silver, (zinc, lanthanum)	*	
	C. Quartz chalcopyrite pod in argillite						
	D. Disseminated chalcopyrite in marble;	8	2	(Tin)	*	*	
	copper-stained tactite	9	2	Copper, tin, (lead, silver)	*	*	
		10	1	(Zinc, barium, molybdenum)	—	*	
		11	1	(Barium, molybdenum, beryllium)	Barium	*	
		12	2	*	*	(Silver)	
		13	1	Barium, (silver, antimony, molybdenum, yttrium, beryllium)	*	*	
		14	2	*	*	(Molybdenum)	
		15	1	(Copper)	Copper, (zinc)	*	
		16	2	*	*	(Molybdenum)	
		17	1	(Copper, lanthanum)	—	*	
		18	1	(Beryllium)	*	*	
					Area 6—Lulu Island		
Kwqo		1	2		*	(Barium)	Polymetallic vein (model 22c)
Dkkr		2	2	Copper, tin, (lead)	*	*	
SOdg		3	2	(Tin)	(Zinc, cadmium, lanthanum)	*	
		4	3	Tin, (copper, lead)	Barium, cadmium, (zinc)	*	
		5	2	Copper, lead, tin, (zinc, barium, molybdenum, beryllium)	Barium, (lanthanum)	*	
		6	2	Copper, lead, tin, (zinc)	*	*	
		7	2	Tin, (copper, barium)	*	*	
		8	1, 2	Copper, tin	Barium	*	
		9	2	*	*	(Silver)	
		10	1	(Molybdenum)	—	*	
		11	2	Gold	*	Silver	
		12	2	(Barium)	*	*	
		13	1	(Beryllium)	—	*	
		14	1	—	(Zinc, lanthanum)	*	
		15	1	(Molybdenum)	—	*	

Table 7. Summary of favorable geochemically anomalous areas in the Craig and Dixon Entrance quadrangles and the western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska—Continued.

Geologic unit(s)	Known mine, prospect, or occurrence, resources, and description	Site	Reference	Anomalous elements by sample type: Stream sediment	Anomalous elements by sample type: Nonmagnetic heavy-mineral concentrate from stream sediment	Anomalous elements by sample type: Rock	Mineral deposit type(s) expected
				Area 7—San Fernando Island			
Dkkr		1	1	Molybdenum	(Lanthanum)	*	
SOdg		2	1	—	(Lanthanum)	*	
		3	1	—	Lanthanum	*	
		4	1	(Molybdenum)	(Lanthanum)	*	
		5	1	(Arsenic)	(Lanthanum)	*	
		6	1	Molybdenum	(Lanthanum)	*	
				Area 8—San Juan Bautista Island			
Kwqo	A. San Juan Bautista prospect. Skarn near	1	1	Arsenic, (zinc)	—	*	Porphyry copper (model 17),
Dpr	contact with pluton contains chalcopyrite;	2	2	(Zinc, barium, molybdenum)	*	*	polymetallic vein (model 22c),
	veins below contact contain sphalerite,	3	2	(Zinc, barium, molybdenum)	*	*	copper skarn (model 18b), porphyry
	pyrrhotite, and gudmundite (Brew and	4	2	Zinc, silver, (copper, barium)	*	*	copper, skarn related (model 18a)
	others, 1991). Selected mineralized rock	5	1, 2	(Zinc, silver, molybdenum)	Arsenic	*	
	samples contain >20,000 ppm Cu, as much	6	2	Silver, (copper, zinc, barium)	*	*	
	as 15,000 ppm Pb, >10,000 ppm Zn, as much as 1,500 ppm Mo, and as much as	7	1, 2	Copper, silver, molybdenum, (lanthanum)	Molybdenum, lanthanum, yttrium, (tungsten)	*	
	1,500 ppm Sb (McDanal and others, 1991)	8	2	(Silver, lanthanum)	*	*	
	B. Pyrrhotite and chalcopyrite in diorite	9	2	*	*	(Lead, silver, lanthanum)	
	and tactite	10	1, 2	Arsenic, (silver, lanthanum)	Arsenic, barium, lanthanum, yttrium	*	
		11	2	Arsenic, (lanthanum)	*	*	
				Area 9—Baker Island			
Kwqo	A. Port San Antonio prospect. Stockwork	1	1	(Antimony)	*	*	Porphyry molybdenum (model 21b),
Dkkr	of metalliferous quartz veins in argillite	2	1	(Lead)	Lanthanum	*	polymetallic vein (model 22c),
Shl	contains sphalerite, galena, and pyrite and	3	1	—	(Lead)	*	bedded barite (model 31b), tungsten
SOdg	reportedly high values in gold.	4	1, 2	Tin, (copper)	(Beryllium)	*	skarn (model 14a) and (or) tungsten
SOdb	Development consists of open cuts	5	2	Gold, (tin)	*	*	vein (model 15a)
	B. Intensely brecciated and silicified zones	6	1	—	Barium, (zinc, cadmium)	*	
	in quartz diorite and metasedimentary rocks	7	1	Copper, gold	*	*	
	contain many quartz veinlets that carry	8	2	Yttrium, (copper, tin)	*	*	
	small amounts of pyrite, arsenopyrite, and	9	2	(Copper, tin, yttrium)	*	*	
	pyrrhotite and possibly a little gold and	10	2	(Silver)	*	*	
	molybdenum	11	2	(Copper, tin, yttrium)	*	*	
	C. Pyrite, pyrrhotite, and chalcopyrite in	12	1	(Copper)	*	*	
	quartzite D. Pyrite and minor chalcopyrite in	13	1, 2	Arsenic, antimony, (zinc, molybdenum, silver)	Silver, arsenic, tungsten, (antimony, molybdenum)	*	
	phyllite	14	1, 2	(Copper, silver, molybdenum)	*	*	
	E. Stringers of barite in sandstone	15	1	—	Niobium, (lanthanum, yttrium)	*	
		16	1	(Gold)	(Tungsten)	*	
		17	1, 2	(Zinc, barium, molybdenum)	Barium, (tungsten)	*	
		18	1, 2	Barium, (zinc, molybdenum)	Barium, (tin, tungsten, niobium)	*	
		19	1, 2	Barium, molybdenum	(Molybdenum, tin, tungsten, niobium)	*	
		20	1	—	Molybdenum, (tungsten)	*	
		21	1, 2	Gold, silver, lanthanum, (lead)	Molybdenum, niobium, (lead)	*	
		22	2	*	*	Lead, gold, silver	
		23	1, 2	Lanthanum	Niobium	*	
		24	1	Gold, arsenic	Barium, arsenic, tungsten, (lead, zinc)	*	

		25	1, 2	Molybdenum, (lanthanum)	(Tungsten)	*	
		26	1, 2	(Molybdenum, lanthanum)	Beryllium	*	
		27	2	*	*	(Copper, zinc, molybdenum)	
		28	2	(Zinc, barium, silver, molybdenum)	*	*	
		29	2	(Barium, silver)	*	*	
		30	2	*	*	Barium, (zinc, silver, molybdenum)	
		31	2	*	*	(Barium, silver, lanthanum)	
		32	2	*	*	(Barium)	
		33	2	(Copper, silver)	*	*	
		34	1, 2	Lanthanum, (zinc, barium, arsenic, antimony)	*	*	
Area 10—Suemez Island							
Kwqo		1	1	—	Tin	*	Polymetallic vein (model 22c),
Dpr		2	1	Zinc	Zinc, barium, (cadmium)	*	porphyry molybdenum (model 21b)
Dprv		3	1	(Arsenic)	*	*	
		4	1	(Arsenic, niobium)	(Zinc, lanthanum, yttrium)	*	
		5	1	(Arsenic, niobium)	(Lead)	*	
		6	1	Niobium	(Lead)	*	
		7	1	Lanthanum	Barium, arsenic	*	
		8	1	Lanthanum	Bismuth, molybdenum, tungsten	*	
		9	1	(Arsenic)	—	*	
		10	1	(Niobium)	*	*	
		11	1	Niobium, (beryllium)	(Lanthanum, yttrium)	*	
		12	1	Niobium	—	*	
		13	1	Molybdenum, (niobium)	*	*	
		14	1	Tin, lanthanum, niobium, yttrium, (molybdenum)	*	*	
		15	1	(Beryllium)	*	*	
		16	1	(Lead, beryllium)	Lead, barium, silver, beryllium	*	
		17	1	—	Copper, zinc, cadmium, silver, gold, molybdenum	*	
		18	1	Lead, molybdenum, (zinc)	—	*	
		19	1	(Zinc)	—	*	
		20	1	—	(Zinc, beryllium)	*	
		21	1	Niobium	Barium, (niobium)	*	
Area 11—Forrester Island							
Kwqo	Veinlets and disseminations in altered	1	2	Uranium, thorium	*	*	Porphyry molybdenum (model 21b),
SOdg	porphyritic quartz monzonite and	2	1	*	*	(Lanthanum, molybdenum)	felsic plutonic-related uranium and
	granodiorite in contact-metamorphosed	3	2	Beryllium	*	*	rare earth elements and related
	conglomerate containing molybdenite, pyrite, chalcopyrite, and pyrrhotite	4	2	Uranium, thorium, beryllium, (uranium, thorium)	*	*	thorium and rare earth element veins (model X)
	A. Forrest Point—molybdenum	5	2	Thorium, beryllium	*	*	
	B. Wood Cove—copper, molybdenum	6	2	Lead, barium, cadmium, bismuth	*	*	
		7	1	*	*	(Lanthanum)	
		8	1	*	*	(Copper, lanthanum)	
		9	1	*	*	(Copper, barium, silver, lanthanum)	
		10	1	*	*	(Silver)	
		11	2	Lead, barium, cadmium, bismuth, beryllium	*	*	

Table 7. Summary of favorable geochemically anomalous areas in the Craig and Dixon Entrance quadrangles and the western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska—Continued.

Geologic unit(s)	Known mine, prospect, or occurrence, resources, and description	Site	Reference	Anomalous elements by sample type: Stream sediment	Anomalous elements by sample type: Nonmagnetic heavy-mineral concentrate from stream sediment	Anomalous elements by sample type: Rock	Mineral deposit type(s) expected
Area 12—Northern part of Dall Island							
Kwqo	A. Yellowstone prospect—gold, copper.	1	1	Copper, lanthanum	—	*	Polymetallic vein (model 22c), zinc-
Kwgb	Auriferous quartz-calcite-chalcopyrite-	2	1	—	(Barium)	*	lead skarn (model 18c), porphyry
Dpr	pyrrhotite veins	3	1	—	(Silver)	*	molybdenum (model 21b),
Shl	B. Moonshine prospect—gold, lead.	4	1	(Copper)	(Barium)	*	polymetallic replacement (model
Shc	Prospect on lode containing argentiferous	5	1	(Copper)	*	*	19a)
SOdg	galena	6	1	(Molybdenum)	(Zinc, barium)	*	
	C. Miller prospect—copper; Shellhouse	7	1	—	(Lead, zinc)	*	
	prospect—copper. Quartz calcite veins in limestone and siliceous schist contain	8	1	Barium, arsenic, antimony, (lead, silver, molybdenum, beryllium)	Niobium, (barium)	*	
	chalcopyrite and pyrrhotite D. Silver Star prospect—silver, gold,	9	1	Barium, antimony, (lead, silver, zinc)	Zinc, cadmium, barium, (copper, silver)	*	
	copper, lead, zinc. Two parallel veins in limestone contain sphalerite, chalcopyrite,	10	1	Zinc, barium, antimony, molybdenum, (silver)	(Copper, silver, arsenic)	*	
	galena, and unknown amounts of gold and	11	1	Barium, (zinc, arsenic)	Barium, (niobium)	*	
	silver. Explored in early 1900's by adit	12	1	Barium, (zinc, silver, arsenic)	Barium, niobium	*	
	and drifts	13	1	Arsenic, antimony	Silver	*	
		14	1	(Arsenic)	Lead	*	
		15	1	Barium, molybdenum	(Niobium)	*	
		16	1	Barium, antimony	(Beryllium)	*	
		17	1	Molybdenum, (barium, silver, arsenic, antimony)	*	*	
		18	1	(Zinc, yttrium)	(Beryllium)	*	
		19	1	Barium, molybdenum, (zinc, silver, antimony	Silver, arsenic, (copper)	*	
		20	1	Molybdenum, (barium, silver)	(Copper, arsenic)	*	
		21	1	Antimony, molybdenum, (zinc, barium, silver)	Barium, (copper)	*	
		22	1	Barium, molybdenum, (zinc, silver, antimony)	*	*	
		23	1	—	Bismuth	*	
		24	1	(Zinc, barium, molybdenum)	Barium	*	
		25	1	Zinc, barium, antimony, molybdenum, lanthanum, (silver)	*	*	
		26	1	Zinc, barium, antimony, molybdenum, (silver)	*	*	
		27	1	—	Barium	*	
		28	1	Molybdenum	Lead, (barium)	*	
		29	3	(Beryllium)	*	*	
		30	1	Barium	Niobium	*	
		31	1	—	(Zinc, barium)	*	
		32	1, 3	Barium, cadmium, uranium, (zinc, beryllium)	Barium	*	

Area 13—Southern part of Dall Island and Long Island							
Kwgd Shl Shc SOpx SOdg Ꞓqd Ꞓgb ꞒZwg ꞒZwm	A. Mount Vesta prospect—silver, gold, copper, lead, zinc. Tetrahedrite, chalcopyrite, galena, and sphalerite as veinlets and seams in limestone near contact with granite. Explored by open cuts and 80-ft tunnel in early 1900's B. Lucky Strike prospect—copper. Shear zone in schist contains chalcopyrite and pyrite C. Security Cove. Stratabound massive sulfide copper-lead-zinc-silver prospects; grades of as much as 1 percent Cu, 8 percent Zn, 4 percent Pb, and 2 oz /ton Ag reported D. McLeod Bay prospect—gold, copper, lead. Many gold claims on quartz veins and stringers in shear zones in schist. Deposits contain chalcopyrite, pyrite, galena, and visible gold E. Coning Inlet. Stratabound massive sulfide copper-lead-zinc-gold prospects; grades as much as 1 percent Cu, 8 percent Zn, 4 percent Pb, and 2 oz /ton Ag	1	1	—	(Zinc)	*	Kuroko massive sulfide (model 28a), polymetallic vein (model 22c), low-sulfide gold-quartz vein (model 36a), skarn related (model Z), magmatic oxide-sulfide deposits with trace platinum-group elements, gold, and silver (model Y), placer platinum-group elements, gold, silver (model 39b), placer gold (model 39a)
		2	3	(Uranium)	*	*	
		3	3	Tin, (beryllium)	*	*	
		4	3	Bismuth, tin, (lead, barium, cadmium, uranium)	*	*	
		5	1	*	Zinc, (lead, cadmium, silver)	*	
		6	3	(Uranium, beryllium)	*	*	
		7	3	(Zinc)	*	*	
		8	1	(Barium)	—	*	
		9	1	Lead, barium, (zinc, silver, molybdenum)	*	*	
		10	3	Cadmium, bismuth, tungsten, (lead, zinc, beryllium)	*	*	
		11	1, 3	Cadmium, (barium, tin, tungsten)	Lead, (copper)	*	
		12	1	Lanthanum, (arsenic, molybdenum)	—	*	
		13	1, 3	Gold, (lanthanum)	*	*	
		14	3	(Zinc, cadmium)	*	*	
		15	3	(Copper, zinc)	*	*	
		16	1	*	Copper, lead, zinc, cadmium, silver, antimony	*	
		17	3	(Zinc, tungsten, beryllium)	*	*	
		18	3	(Uranium).	*	*	
		19	3	(Zinc, beryllium)	*	*	
		20	3	(Cadmium)	—	*	
		21	1, 3	Cadmium	(Tin)	*	
		22	1, 3	Bismuth	(Silver)	*	
		23	3	Tungsten, (zinc, bismuth)	*	*	
		24	1	Copper, (molybdenum)	Molybdenum, tungsten, (tin, yttrium)	*	
		25	3	(Tin, niobium, beryllium)	*	*	
		26	1, 3	Gold, cadmium, bismuth, (zinc, tungsten, beryllium)	Tin	*	
		27	1, 3	Copper, tin, (zinc, molybdenum, tungsten)	Silver, bismuth, (tin)	*	
		28	3	Bismuth	—	*	
		29	1, 3	Bismuth, (cadmium, tungsten)	Tungsten	*	
		30	1	(Zinc)	(Molybdenum, tungsten, niobium)	*	
		31	1	*	Molybdenum, (tin, niobium)	*	
		32	1	Molybdenum, (yttrium)	Bismuth, molybdenum, (silver, tin)	*	
		33	1, 3	(Zinc, cadmium)	(Niobium, yttrium)	*	
		34	1, 3	Lead, tin, (tungsten, beryllium)	Copper, lead, silver, antimony, bismuth, (tin)	*	
		35	1, 3	Lead, cadmium, zinc, molybdenum, tungsten	*	*	
		36	1, 3	(Lead, tin, tungsten, lanthanum, niobium, beryllium)	*	*	
		37	1	(Zinc)	—	*	
		38	3	(Lead, zinc)	*	*	
		39	3	(Lead, zinc)	*	*	
		40	1	Niobium, beryllium	(Molybdenum, tin, niobium, yttrium)	*	
		41	3	Bismuth	*	*	
		42	1, 3	(Lead, zinc, beryllium)	—	*	
		43	1, 3	(Cadmium, beryllium)	Barium	*	
		44	3	(Tungsten, beryllium)	*	*	
		45	1	—	(Molybdenum, tin)	*	
		46	1, 3	Gold, silver, cadmium, (zinc)	*	*	
		47	1	Zinc, (copper, lead, arsenic, silver)	(Tin)	*	

Table 7. Summary of favorable geochemically anomalous areas in the Craig and Dixon Entrance quadrangles and the western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska—Continued.

Geologic unit(s)	Known mine, prospect, or occurrence, resources, and description	Site	Reference	Anomalous elements by sample type: Stream sediment	Anomalous elements by sample type: Nonmagnetic heavy-mineral concentrate from stream sediment	Anomalous elements by sample type: Rock	Mineral deposit type(s) expected
				Area 13—Southern part of Dall Island and Long Island—Continued			
		48	1, 3	Silver, tin, yttrium, beryllium	(Tin, beryllium), yttrium	*	
		49	1, 3	Zinc, (cadmium, beryllium)	(Tin)	*	
		50	1, 3	Cadmium, molybdenum, tin, (barium, tungsten)	*	*	
		51	1	(Copper)	(Copper)	*	
		52	1, 3	Bismuth, (beryllium)	Barium	*	
		53	1	—	Tungsten	*	
		54	1, 3	Bismuth, (beryllium)	Tungsten	*	
		55	3	Cadmium, silver, tin, tungsten	*	*	
		56	3	(Zinc, uranium)	*	*	
		57	1	—	(Tin, niobium, yttrium)	*	
		58	3	Cadmium, silver, tin, (bismuth, tungsten)	*	*	
		59	1, 3	(Zinc, cadmium)	Niobium	*	
		60	3	(Zinc)	*	*	
		61	1	—	(Lead, silver, molybdenum)	*	
		62	3	(Zinc, cadmium)	*	*	
		63	3	(Zinc, cadmium, barium, tin)	*	*	
		64	1	*	Lead, barium, tin, tungsten, (silver, molybdenum)	*	
		65	1	—	Barium, (lead, tin, niobium)	*	
		66		—	Copper, (silver, niobium)	*	
		67	3	Tin, (cadmium)	*	*	
				Area 14—Waterfall			
Dpr		1	1	(Lead)	—	*	Polymetallic vein (model 22c), porphyry copper (model 17), kuroko massive sulfide (model 28a)
Dprv		2	1	Barium	Barium	*	
		3	1	Copper, (molybdenum)	*	*	
		4	1, 2	Molybdenum, (lead, barium, beryllium)	Barium, (beryllium)	*	
		5	1, 2	Barium, (molybdenum, antimony)	Barium	*	
		6	2	*	*	(Copper)	
		7	1, 2	(Gold, silver)	—	*	
		8	2	(Zinc)	*	*	
		9	2	Copper, molybdenum, yttrium, (zinc)	*	*	
		10	1	Molybdenum	—	*	
		11	1, 2	(Lanthanum, niobium)	Lead, antimony	*	
		12	2	Zinc, lanthanum	—	*	
		13	2	*	*	(Silver)	
		14	1	Silver, yttrium, beryllium	—	*	
		15	2	*	*	(Zinc, copper)	
		16	2	(Molybdenum)	*	*	
		17	1	(Molybdenum)	—	*	
		18	1	Beryllium	Barium, lanthanum	*	
		19	1	Beryllium, (lead, yttrium)	—	*	
		20	1	(Molybdenum)	—	*	
		21	1	(Gold)	Lead, gold, silver, antimony, bismuth, beryllium, (zinc, cadmium)	*	
		22	1	—	Lead, zinc	*	

Area 15—Sukkwan Island

Kwqo, PPsy, SOpx, SOdg, SOdb	A. Flat Island mine. A few thousand dollars worth of gold said to have been recovered in 1900 from prospect on beach B. Gould prospect. Schist, in places pyritic, locally in contact with granitic rocks. Schist is veined with stringers of chalcopyrite and pyrrhotite that follow and cut schistosity C. Lakeside prospect. Chalcopyrite-bearing rocks are in shear zones along contact between pyroxenite and greenstone	1	1	—	Barium, (lead)	*	Felsic plutonic-related uranium and rare earth elements and related thorium and rare earth element veins (model X), kuroko massive sulfide (model 28a), polymetallic vein (model 22c), magmatic oxide-sulfide deposits with trace platinum-group elements, gold, and silver (model Y), skarn related (model Z)., placer platinum-group elements, gold, silver (model 39b), placer uranium, thorium, and rare earth elements (model W)
		2	1	—	(Lead)	*	
		3	1	—	Barium	*	
		4	1	Copper	—	*	
		5	1	(Beryllium)	Tungsten, lanthanum, niobium, (molybdenum, yttrium)	*	
		6	1	Silver	(Beryllium)	*	
		7	1	(Molybdenum, niobium)	Tungsten, (molybdenum, lanthanum)	*	
		8	1	Niobium, (molybdenum, beryllium)	—	*	
		9	1	Beryllium	Molybdenum, (lead)	*	
		10	1	Molybdenum, niobium, beryllium, (yttrium)	Thorium, (tin, lanthanum, niobium, yttrium)	*	
		11	1	Lanthanum, niobium, yttrium, beryllium, (molybdenum)	Molybdenum, lanthanum, niobium, (tin, yttrium)	*	
		12	1	Lead, (zinc, silver, niobium)	Molybdenum, niobium, (lead, zinc, tin, lanthanum, yttrium)	*	
		13	1	(Lead, barium)	Niobium	*	

Area 16—Onslow, Etolin, and Brownson Island

Tsh, Tge, Krtn, Krtp, MzPzms		1	1	—	(Tin, molybdenum, niobium)	*	Tungsten skarn (model 14a) and tungsten vein (model 15a), polymetallic vein (model 22c)
		2	1	—	(Niobium)	*	
		3	1	(Lanthanum)	(Niobium)	*	
		4	1	—	(Tin)	*	
		5	1	(Antimony)	(Tin)	*	
		6	1	(Antimony, yttrium)	(Arsenic, molybdenum, niobium)	*	
		7	1	Yttrium, (arsenic)	Niobium, (molybdenum)	*	
		8	3	Thorium	*	*	
		9	1	(Yttrium, arsenic)	(Tin, niobium)	*	
		10	1	(Arsenic)	(Arsenic, tin, niobium)	*	
		11	1	(Arsenic, beryllium)	Tin, tungsten, (molybdenum, niobium)	*	
		12	1	(Arsenic, lanthanum)	(Niobium)	*	
		13	1	—	(Tin, molybdenum, niobium)	*	
		14	3	Antimony, arsenic	*	*	

Area 17—Union Bay

Kkdu, Kkgu, MzPzms	A. Disseminated magnetite and chromite in Cretaceous zoned ultramafic complex that intrudes gabbro and metasedimentary rocks. Anomalous amounts of platinum-group elements, magnetite, and chromite in dunite. Deposit estimated to contain about a billion tons of material containing 18-20 percent Fe and significant amounts of vanadium	1	1	Lead	Copper, gold, silver, (molybdenum, niobium)	*	Alaskan platinum-group elements (model 9), placer platinum-group elements, gold, titanium, magnetite, and chromite (models 39a, b, c)
		2	1	Lead, gold, yttrium	Copper, gold, silver, (molybdenum)	*	
		3	1	(Molybdenum)	Copper, gold	*	
		4	1	(Molybdenum, yttrium)	Copper, (molybdenum, lanthanum)	*	
		5	1	Antimony	Silver, (copper, lanthanum)	*	
		6	1	—	(Copper)	*	
		7	1	Antimony	Copper	*	
		8	1	—	Copper	*	
		9	1	(Lead)	Copper, lead, silver, (niobium)	*	
		10	1	(Lead)	Copper, (niobium)	*	
		11	1	Lead, (yttrium)	Copper, silver, (niobium)	*	
		12	1	—	Copper, (arsenic, molybdenum, niobium)	*	
		13	1	—	(Copper, lanthanum)	*	
		14	1	(Copper), antimony	(Copper, lanthanum)	*	

Sites 3, 4, 13, and 14: 1,000–5,000 ppm Cr, 15–20 percent Fe, and 500 ppm V for stream sediments.
Sites 5, 6, 8, 10, and 12: 1,000–5,000 ppm Cr for stream sediments.
Sites 6, 8, 10, 12, and 14: 1,000 ppm Cr for nonmagnetic heavy-mineral concentrate from stream sediment.

Table 7. Summary of favorable geochemically anomalous areas in the Craig and Dixon Entrance quadrangles and the western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska—Continued.

Geologic unit(s)	Known mine, prospect, or occurrence, resources, and description	Site	Reference	Anomalous elements by sample type: Stream sediment	Anomalous elements by sample type: Nonmagnetic heavy-mineral concentrate from stream sediment	Anomalous elements by sample type: Rock	Mineral deposit type(s) expected
				Area 18—Helm Bay and Caamano Point			
Krtn	Gold, pyrite, chalcopyrite, and lesser	1	1	*	Copper, tin, (molybdenum, niobium)	*	Simple antimony (model 27d) and
MzPzms	amounts of galena, sphalerite, and	2	1	Arsenic	(Tungsten, niobium)	*	disseminated antimony (model 27e),
MzPzmv	tetrahedrite are disseminations and	3	1	Arsenic, yttrium	Copper	*	low-sulfide gold-quartz veins (model
MzPzmc	individual veins, veinlets, stringers,	4	1, 3	Arsenic, thorium	(Niobium)	*	36a), polymetallic vein (model 22c),
MzPzmi	stockworks, fissure veins, and fracture	5	1	(Arsenic, yttrium)	Tungsten, (niobium)	*	placer gold (model 39a)
SOms	fillings within granodiorite and	6	1	Arsenic	Copper	*	
SOmy	metamorphosed upper Paleozoic to	7	1, 3	(Arsenic)	Molybdenum	*	
SOmc	Mesozoic phyllitic flysch and andesitic tuff	8	1	Arsenic, antimony	*	*	
	of the Gravina-Nutzotin belt	9	1	Arsenic, antimony	*	*	
	A. Helm Bay mine—gold; Helm Bay King mine—gold, copper, lead	10	1	(Antimony, molybdenum, lanthanum, yttrium	(Molybdenum)	*	
	B. Blue Jay mine—gold	11	1	Lanthanum, (yttrium)	Tin	*	
	C. Gold Standard mine—gold, copper bismuth, lead; Bay View mine—gold; S.	12	1	Antimony, (arsenic, molybdenum, tin)	Lead, gold, silver, bismuth, tin	*	
	Lakewood mine—gold, copper D. Keystone mine—gold, silver; Melville	13	1, 3	(Lead, gold, arsenic)	Silver, (copper, molybdenum, niobium)	*	
	mine—gold	14	1	(Gold, arsenic)	Silver, (arsenic)	*	
	E. Gold Mountain mine—gold, copper,	15	1	Gold, (arsenic)	(Zinc)	*	
	lead; Old Glory mine—gold	16	1	Copper, gold, silver, yttrium	*	*	
	F. Hoffman prospect—gold; Midnight Sun prospect—gold; Puzzler prospect—gold	17	1, 3	Lead, (gold, arsenic, tungsen)	(Silver, arsenic, molybdenum, lanthanum)	*	
	G. Last Chance prospect—gold, copper	18	1	(Arsenic, antimony)	Arsenic, (copper, molybdenum)	*	
	H. Rainy Day prospect—gold, lead, zinc;	19	1	Antimony, (copper)	(Molybdenum, lanthanum)	*	
	Kingston prospect—gold	20	1	Arsenic, antimony, (molybdenum)	—	*	
	I. Smugglers Cove prospect—gold	21	1, 3	(Lead, thorium, lanthanum)	(Silver, molybdenum, lanthanum)	*	
	J. Mary T prospect—gold, copper; US prospect—gold	22	1	Antimony, (arsenic)	Arsenic, (copper, molybdenum, tungsten)	*	
	K. Little Maumee prospect—gold; Blue Bucket prospect—gold L. Bond Bay prospect—gold, silver	23	1, 3	Lead, arsenic, antimony molybdenum, lanthanum, uranium, (lanthanum)	Copper, (zinc, cadmium, silver, arsenic, lanthanum	*	
	M. Caamano Point prospect—antimony	24	1	Antimony, molybdenum, (lanthanum)	(Gold, silver)	* *	
		25	1, 3	Antimony, uranium, (barium, arsenic)	*		
		26	1	Copper, (molybdenum, yttrium)	Lanthanum	*	
		27	1	Gold, (antimony)	*	*	
		28	1	Copper, (silver)	*	*	
		29	1	Lanthanum, (arsenic)	(Tin)	*	
		30	1	(Molybdenum)	Tungsten (niobium)	*	
		31	1	—	Gold, silver	*	
		32	1	—	Copper	*	
		33	1	(Molybdenum)	Tungsten, (copper)	*	
		34	1	Gold	Gold, (silver)	*	
		35	1	(Arsenic, lanthanum)	Copper, tungsten, niobium, (lead)	*	
		36	1	*	Tungsten, lanthanum, thorium	*	

	Area 19—Barrier Islands and Nichols Bay						
Dkkt Dkcg SOdr SOdb Odi Ogd	A–I. Disseminated to massive pyrite and minor sphalerite, galena, and arsenopyrite	1	1	(Lead, beryllium)	Barium, silver, (copper, zinc, cadmium, molybdenum)	*	Kuroko massive sulfide (model 28a)
	in zones as long as a few meters and 3 m	2	1	(Molybdenum, beryllium)	—	*	
	thick. Sulfides also form rinds of pillows in	3	3	Niobium, (cadmium)	*	*	
	metavolcanic rocks. Hosted in Ordovician	4	1, 3	(Zinc, beryllium)	—	*	
	and Silurian felsic to intermediate	5	3	Tin, (beryllium)	—	*	
	metavolcanic rocks and metagraywacke of	6	3	(Niobium)	*	*	
	Alexander belt. Analyses of grab samples	7	3	Bismuth	*	*	
	indicate as much as 10 percent Zn, 1,500	8	1	Molybdenum	—	*	
	ppm Pb, 30 ppm Ag, 0.25 ppm Au, and	9	1	(Silver)	—	*	
	>5,000 ppm Ba	10	1	(Molybdenum, beryllium)	—	*	
	J. Ranger prospect—copper, iron. Quartz	11	3	(Niobium, beryllium)	*	*	
	veins carry irregular bunches of magnetite,	12	1, 3	(Lead, cadmium)	*	*	
	chalcopyrite, and pyrrhotite. Veins cut	13	3	(Niobium)	*	*	
	altered volcanic rocks intruded by granitic	14	1	—	Tin, (tungsten, niobium)	*	
	dikes. Adit and some stripping to expose	15	3	(Beryllium)	*	*	
	outcrops	16	1	*	Barium, silver, molybdenum, tin, niobium	*	
	K. Brownson Bay—gold, copper, lead, zinc. Stratabound(?) massive sulfide deposit; high-grade deposit containing as much as 20 percent Zn, 11 percent Pb, 1 percent Cu, and 4 oz/ton Ag	17	3	Uranium	*	*	
	Area 20—Mallard Bay						
SOpx SOsy SOqm Oqd Odi	A. Nelson and Tift mine—silver, gold,	1	3	Tin, uranium	*	*	Polymetallic vein (model 22c), felsic plutonic-related uranium and rare earth elements and related thorium and rare earth element veins (model X), porphyry molybdenum (model 21b), magmatic oxide-sulfide deposits with trace platinum-group elements, gold, and silver (model Y), placer uranium, thorium, rare earth elements (model W), placer platinum-group elements, gold, silver (model 39b)
	copper, lead. Massive and disseminated	2	3	Cadmium	*	*	
	pyrite, chalcopyrite, and bornite lens in a septum of marble, and other calcareous	3	1	Beryllium	Lanthanum, (molybdenum, tin, yttrium)	*	
	rocks in quartz diorite. Total production	4	1, 3	(Tin)	(Molybdenum, tin)	*	
	before World War II, 1,300 tons of ore	5	1	—	Barium, (lanthanum)	*	
	from which copper, lead, gold, and silver were recovered	6	1	—	Beryllium, (molybdenum, tin, tungsten, lanthanum)	*	
	B. Gardner Bay prospect. Sparsely distributed black radioactive minerals in	7	1	—	Thorium, (molybdenum, tin, lanthanum)	*	
	pegmatite that cuts quartz diorite	8	3	Cadmium	*	*	
	C. McLean Arm prospect. Magnetite	9	1	*	Molybdenum, tin, lanthanum, yttrium	*	
	associated with hornblende-rich	10	3	Barium, (beryllium)	—	*	
	concentrations in diorite and quartz diorite	11	1	(Arsenic, molybdenum)	*	*	
	D. Spik prospect. Bornite, chalcopyrite,	12	3	Beryllium	*	*	
	and pyrrhotite as irregular masses in	13	1	(Lead, molybdenum)	Thorium, lanthanum, (niobium)	*	
	greenstone	14	3	Uranium, (beryllium)	*	*	
	E. Polson and Ickis prospects. Quartz-	15	1	Copper, lanthanum	Thorium, lanthanum, (yttrium)	*	
	calcite-barite veins in faults in monzonite	16	1, 3	Tungsten, niobium, (beryllium)	Barium, molybdenum, tungsen, (tin)	*	
	contain pyrite, chalcoyrite, bornite, hematite, and gold	17	1, 3	Antimony, molybdenum, niobium, (beryllium)	(Molybdenum, tungsten)	*	
	F. Decker and West/Veta prospects;	18	1	Lead, (molybdenum)	Thorium, lanthanum, (niobium)	*	
	Copper prospect. Quartz, pyrite,	19	1	—	(Yttrium)	*	
	chalcopyrite, and bornite in diorite or greenstone	20	1	Molybdenum	Thorium, (molybdenum, tin, lanthanum, niobium)	*	
	G. Mallard Bay prospect. As much as 10	21	3	(Barium)	*	*	
	percent magnetite in pyroxenite and radioactive minerals	22	3	Bismuth, uranium, thorium, niobium, (beryllium)	*	*	
		23	3	Lead, cadmium, uranium, (zinc, tin, beryllium)	*	*	

Table 7. Summary of favorable geochemically anomalous areas in the Craig, Dixon Entrance, and western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska—Continued.

Geologic unit(s)	Known mine, prospect, or occurrence, resources, and description	Site	Reference	Anomalous elements by sample type: Stream sediment	Anomalous elements by sample type: Nonmagnetic heavy-mineral concentrate from stream sediment	Anomalous elements by sample type: Rock	Mineral deposit type(s) expected
	Area 20—Mallard Bay—Continued						
	H. Stonerock Bay prospect. Radioactive minerals in quartz hematite veins in altered andesitic dikes that cut syenite I, J. Feickert prospects—copper. Chalcopyrite-bearing quartz veins in andesitic greenstone at one prospect (I) and in granite and quartz diorite at the other prospect (J). Surface stripping, a shaft, and open cuts K. Alice prospect—copper. Chalcopyrite as irregular bunches and veinlets in limestone interbedded with andesitic greenstone. Two old shafts filled with water in 1916	24	1	Lead, molybdenum	Lanthanum, niobium, yttrium, (molybdenum, tin)	*	
		25	1	Lead, molybdenum, lanthanum, (arsenic)	Lanthanum, thorium, (yttrium)	*	
		26	1	Lanthanum, (zinc, molybdenum, yttrium)	Lanthanum, thorium, (copper, yttrium)	*	
		27	3	Lead, (cadmium)	*	*	
		28	3	(Barium)	*	*	
		29	1	(Lanthanum)	Lanthanum, thorium, (copper, lead, yttrium)	*	
		30	1	Arsenic, antimony, (lead)	Zinc, barium, molybdenum, tin, tungsten, lanthanum, niobium, (silver, cadmium)	*	
		31	1	Lead, arsenic	Lead, barium, silver, molybdenum, lanthanum, (tungsten)	*	
		32	1	Arsenic, (zinc)	Tungsten, thorium, lanthanum, yttrium	*	
		33	1	—	Thorium, lanthanum, yttrium, (copper, molybdenum, tin, niobium)	*	
		34	1	Lanthanum, (beryllium)	Thorium, lanthanum, yttrium	*	
	Area 21—Hessa Lake						
SOqm Oqd Ogd		1	1, 3	Niobium, (lead, zinc, silver, arsenic, uranium, beryllium)	Tungsten	*	Felsic plutonic-related uranium and rare earth elements and related thorium and rare earth element veins (model X), polymetallic vein (model 22c), porphyry molybdenum (model 21b), skarn related(?) (model Z), placer uranium, thorium, rare earth elements (model W)
		2	1	(Arsenic, molybdenum, lanthanum)	Bismuth, tin, thorium, beryllium, (yttrium)	*	
		3	1, 3	Antimony, lanthanum, (lead, molybdenum, beryllium)	Beryllium, (molybdenum, tin, lanthanum, niobium)	*	
		4	1	Arsenic, antimony	Silver, bismuth, (copper, lead, zinc, molybdenum, tungsten, lanthanum, niobium)	*	
		5	1, 3	(Lanthanum, niobium)	Tin, thorium, yttrium, (beryllium, niobium)	*	
		6	3	Zinc, antimony, (cadmium, beryllium)	*	*	
		7	1	Gold, (beryllium)	Tungsten, (molybdenum)	*	
	Area 22—Hunter Bay						
SOdb Odi Ogd	A. Goodhope prospect. Quartz veins containing irregular bunches of magnetite, chalcopyrite, and pyrrhotite in volcanic rocks cut by granitic dikes	1	1	Arsenic, (molybdenum)	(Tungsten, lanthanum, niobium, beryllium, thorium)	*	Polymetallic vein (model 22c), felsic plutonic-related uranium and rare earth elements and related thorium and rare earth element veins (model X), placer uranium, thorium, rare earth elements (model W)
		2	3	Niobium, (uranium, thorium, beryllium)	*	*	
		3	1	Gold, (molybdenum)	(Zinc, cadmium, tin)	*	
		4	3	Tungsten, (zinc, cadmium)	*	*	
		5	1	Gold, (arsenic, molybdenum)	Gold, silver, barium, thorium, yttrium, beryllium, (lanthanum)	*	
		6	1	*	Molybdenum, tin, tungsten, (niobium, yttrium)	*	
		7	1	Gold, molybdenum	—	*	
		8	3	Cadmium	*	*	

Area 23—Bokan Mountain							
Jbgr SOqm SOdg SOdb Oqd	A–K. Bokan Mountain mines—beryllium, niobium, lead, rare-earth elements, thorium, uranium. Uranium-thorium deposits and rare earth element-bearing minerals mainly in or near a 3-mi^2 boss of the Jurassic peralkaline granite of Bokan Mountain. Most of the uranium-thorium deposits that were mined were hydrothermal veins or replacement bodies in or near fractures; a few were concentrations of accessory minerals in the granite or in dikes, and one consisted of hydrothermal minerals in the interstices of metasedimentary country rocks. Deposits contain uranothorite, uranoan thorianite, uraninite, rare earth element minerals, niobates, and fluorite. Ross-Adams (I) deposit is an irregular steeply dipping pipe in peralkaline granite; central zone is richest, surrounding transitional zone grades into normal peralkaline granite. Deposit discovered in 1955 and mined intermittently until about 1975. Production, all from the Ross-Adams mine, has been about 120,000 tons of ore averaging about 1 percent U_3O_8, about the same amount of thorium in ore was not recovered	1	1	(Molybdenum, beryllium)	Beryllium, (yttrium, tin)	*	Felsic plutonic-related uranium and rare earth elements and related thorium and rare earth element veins (model X), placer uranium, thorium, rare earth elements (model W)
		2	1	*	Gold, tin, beryllium, (tungsten, niobium)	*	
		3	1, 3	Molybdenum, (bismuth, beryllium)	Tin, thorium, yttrium, beryllium, (molybdenum, tungsten)	*	
		4	3	Copper, bismuth, tin, uranium, thorium, niobium, beryllium, (lead)	*	*	
		5	1	Tin, niobium, yttrium, beryllium, (molybdenum)	Thorium, yttrium, beryllium, (tin, cadmium)	*	
		6	3	Uranium, thorium, niobium, beryllium	*	*	
		7	3	Uranium, thorium, beryllium, (lead, zinc)	*	*	
		8	1	Lead, thorium, lanthanum, yttrium, (zinc, cadmium, molybdenum, niobium)	Thorium, beryllium, (cadmium, tin)	*	
		9	1	Molybdenum, thorium, lanthanum, (silver, niobium, yttrium)	Cadmium, tin, thorium, yttrium, beryllium	*	
		10	1	(Arsenic, lanthanum, beryllium)	*	*	
		11	1, 3	Uranium, (molybdenum)	Silver, bismuth, tin, yttrium, beryllium, (lanthanum)	*	
		12	1	Arsenic, (lanthanum)	Tin, thorium, lanthanum, beryllium, (tungsten, yttrium)	*	
		13	3	Bismuth, uranium, thorium, niobium, beryllium, (lead, zinc)	*	*	
		14	3	Lead, bismuth, uranium, thorium, niobium, beryllium, (zinc)	*	*	
		15	1, 3	Cadmium, uranium, niobium, yttrium, beryllium, (lanthanum, tin)	Silver, yttrium, beryllium, (zinc, molybdenum, tin)	*	
		16	1	—	Thorium, (tin, yttrium)	*	
		17	1	Gold, yttrium	Yttrium, (tin)	*	
		18	1, 3	Molybdenum, (copper, zinc)	(Molybdenum, tin, yttrium)	*	
		19	1	Molybdenum	(Copper, tin, yttrium, beryllium)	*	
Area 24—Hidden Bay							
Kwqo Dkkt SOqm SOdg SOdr SOda		1	1	—	Barium	*	Felsic plutonic-related uranium and rare earth elements and related thorium and rare earth element veins (model X), polymetallic vein (model 22c), placer uranium, thorium, rare earth elements (model W)
		2	1	(Arsenic)	(Tin)	*	
		3	1	(Copper, arsenic)	Silver, (copper)	*	
		4	1, 3	(Cadmium, tin, uranium)	(Tin, niobium, yttrium)	*	
		5	1,	Tin, tungsten, cadmium, (lead, beryllium)	(Niobium, tin)	*	
		6	3	Beryllium	—	*	
		7	1	(Arsenic)	—	*	
		8	1, 3	Uranium, niobium, (lead, cadmium, tin, molybdenum, beryllium)	Beryllium	*	
		9	1	Copper, zinc, arsenic, molybdenum, (cadmium, antimony, lanthanum)	*	*	
		10	3	Bismuth, (copper)	*	*	
		11	1	(Arsenic, molybdenum)	—	*	
		12	1, 3	Uranium, (bismuth, niobium)	(Yttrium, molybdenum)	*	
		13	3	(Uranium)	*	*	
		14	3	Uranium, (cadmium)	*	*	

Table 7. Summary of favorable geochemically anomalous areas in the Craig, Dixon Entrance, and western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska—Continued.

Geologic unit(s)	Known mine, prospect, or occurrence, resources, and description	Site	Reference	Anomalous elements by sample type: Stream sediment	Anomalous elements by sample type: Nonmagnetic heavy-mineral concentrate from stream sediment	Anomalous elements by sample type: Rock	Mineral deposit type(s) expected
				Area 25—West Arm of Moira Sound			
Kwqo	A. Moira Sound—gold. Auriferous calcite veins in fault zone cutting metamorphosed volcanic rocks. Veins contain pyrite and minor gold	1	1	(Arsenic)	—	*	Polymetallic vein (model 22c), zinc-lead skarn (model 18c), porphyry molybdenum (model 21b)
Kwgd		2	1	—	(Silver, molybdenum)	*	
Dkkt		3	1	(Zinc, arsenic)	(Silver)	*	
SOdg		4	1	—	(Antimony)	*	
SOdb		5	1	Silver, (molybdenum, beryllium)	*	*	
Oqd		6	1	(Barium)	—	*	
Ogd		7	1	(Barium)	—	*	
		8	1	Molybdenum, (beryllium)	—	*	
		9	1	Lead, molybdenum, (beryllium)	*	*	
		10	1	(Barium)	—	*	
		11	1	Barium, molybdenum, (silver, arsenic)	Niobium, (yttrium, molybdenum)	*	
		12	3	Uranium, (beryllium)	*	*	
		13	1, 3	Zinc, cadmium, barium, antimony, molybdenum, uranium, beryllium, yttrium, (copper, silver, tin)	*	*	
		14	1	Molybdenum, yttrium, (barium)	Lead, silver, tin	*	
		15	3	Cadmium	*	*	
		16	1	(Zinc)	(Tin)	*	
		17	1, 3	Tungsten, molybdenum, lanthanum, niobium	Barium, tungsten, (lead, zinc, molybdenum, tin, niobium)	*	
		18	1	Lead, (molybdenum)	—	*	
		19	1	(Copper, lanthanum, molybdenum)	Lanthanum, (molybdenum, tungsten)	*	
		20	1	Molybdenum, (lanthanum)	Tungsten, beryllium, (molybdenum)	*	
		21	1	Arsenic, (molybdenum, niobium)	Copper, (molybdenum, lanthanum, niobium)	*	
		22	1, 3	Uranium, thorium, (zinc, arsenic, antimony, molybdenum, beryllium)	—	*	
		23	1	(Molybdenum)	Molybdenum, tungsten, (tin, lanthanum, yttrium)	*	
		24	1	Molybdenum	Molybdenum	*	
		25	1, 4	Molybdenum, antimony, (zinc)	—	*	
		26	4	Zinc	*	*	
		27	4	Antimony	*	*	
		28	1	Arsenic	—	*	
		29	3, 4	Zinc, barium, tungsten, (beryllium)	*	*	
		30	1	Arsenic, antimony, (barium, molybdenum, beryllium)	—	*	
				Area 26—Kassa Inlet			
Kwgd Kwgb		1	1	Copper, (zinc, yttrium)	Copper, zinc, cadmium, silver, antimony, (molybdenum)		Felsic plutonic-related uranium and rare earth elements and related thorium and rare earth element veins (model X), kuroko massive sulfide (model 28a), polymetallic vein (model 22c), porphyry molybdenum (model 21b), skarn related(?) (model Z), placer uranium, thorium, rare earth elements (model W)
Dkkt		2	1	Molybdenum	—		
Dkcg		3	1	Molybdenum, (beryllium)	—		
Sld		4	1	—	(Zinc, silver)		
SOdg SOdr		5	1	(Arsenic, molybdenum)	(Copper, zinc, silver, molybdenum, tungsten)		
SOdb		6	1, 3	(Tin)	Barium, (silver, molybdenum)		
Omr		7	1	(Yttrium)	(Silver)		
Ogd		8	3	Tin	*		
ЄZwg		9	1, 4	Antimony, (molybdenum)	(Silver)		

ꞒZwgb		10	3, 4	Antimony, (zinc, cadmium, beryllium)	*		
		11	4	Silver	*		
		12	3, 4	Tin, tungsten, (copper, zinc, barium, uranium, niobium, beryllium)	*		
		13	3, 4	Barium, cadmium, antimony, tungsten, (zinc, tin)	*		
		14	1	Molybdenum	(Silver, arsenic, molybdenum)		
		15	1, 3, 4	Molybdenum, antimony, cadmium, (beryllium)	*		
		16	1, 3	Lead, zinc, cadmium, niobium	Zinc, cadmium, barium, (copper, molybdenum)		
		17	1	(Molybdenum)	—		
		18	3	(Niobium, beryllium)	*		
		19	3	Uranium, thorium, beryllium, (bismuth)	*		
		20	3	Gold, bismuth, uranium, thorium, beryllium	*		
		21	1	(Molybdenum)	Lanthanum, thorium		
		22	4	Tin, antimony, lanthanum, yttrium	*		
		23	1	Antimony, molybdenum, (zinc, silver)	Zinc, cadmium, (copper, silver, molybdenum, tin)	*	
		24	3	Zinc, cadmium, antimony, uranium, beryllium	*	*	
		25	3	Zinc, cadmium, (copper, tin, niobium, beryllium)	*	*	
		26	4	Lead, zinc, antimony	*	*	
		27	1,3	Cadmium, (zinc, molybdenum, niobium, beryllium)	*	*	
				Area 27—Mount Jumbo			
Kwqo	A. Jumbo mine—copper, gold, silver,	1	1	Copper	Gold	*	Copper skarn (model 18b), zinc-lead
SOdg	molybdenum, iron, zinc. Chalcopyrite,	2	1	—	Silver	*	skarn (model 18c), iron skarn (model
ꞒZwg	magnetite, sphalerite, and molybdenite in	3	1	(Yttrium)	(Lanthanum, yttrium)	*	18d), polymetallic replacement (model
ꞒZwm	skarn contact between marble and Early	4	1	(Silver, beryllium)	Silver	*	19a), kuroko massive sulfide (model
	Cretaceous granodiorite stock. More than 2	5	1	—	Lanthanum, (yttrium)	*	28a)
	mi (3.2 km) of underground workings	6	4	Tungsten, (zinc)	*	*	
	B. Corbin mine—gold, silver, copper. Fissure veins in greenstone consist mainly	7	1	(Zinc, silver, arsenic, antimony, molybdenum)	*	*	
	of pyrite and chalcopyrite. Schist contains	8	4	Copper, zinc, (lead)	*	*	
	stratiform pyrite lenses	9	1, 4	Zinc, molybdenum, barium, (copper)	*	*	
	C. Copper Mountain mine—gold, silver,	10	4	Tin, lanthanum, molybdenum, (lead)	*	*	
	copper. Skarn near limestone-granite contacts contains bornite, malachite, and	11	1	*	Zinc, cadmium, barium, molybdenum, tungsten	*	
	azurite	12	4	*	*	Lead, zinc, silver	
	D. Sultana prospect—copper, cobalt, nickel	13	1, 4	Molybdenum, tungsten, (zinc, beryllium)	Molybdenum	*	
	E. Gould Island prospect—copper, lead,	14	1	Molybdenum	Tin	*	
	zinc	15	4	Antimony, tin, molybdenum	*	*	
	F. Mt. Jumbo prospect—silver, copper,	16	4	Copper, tin, gold	*	*	
	zinc	17	1	Thorium, (molybdenum)	Lanthanum, tin	*	
	G. Houghton prospect—copper, iron	18	4	Copper, zinc, antimony	*	*	
	H. Upper Magnetite prospect—copper,	19	1	(Barium, molybdenum)	Copper, molybdenum, tin	*	
	iron	20	1, 4	Antimony, (copper, molybdenum)	*	*	
	I. Green Monster prospect—gold, copper,	21	4	Antimony, (zinc)	*	*	
	molybdenum, iron	22	4	Copper, zinc, tungsten	*	*	
	J. Rex prospect—copper, iron	23	1, 4	Copper, gold, molybdenum, tungsten	*	*	

Table 7. Summary of favorable geochemically anomalous areas in the Craig, Dixon Entrance, and western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska—Continued.

Geologic unit(s)	Known mine, prospect, or occurrence, resources, and description	Site	Reference	Anomalous elements by sample type: Stream sediment	Anomalous elements by sample type: Nonmagnetic heavy-mineral concentrate from stream sediment	Anomalous elements by sample type: Rock	Mineral deposit type(s) expected
	Area 27—Mount Jumbo—Continued						
	K. Russian Bear prospect—copper; Texas prospect—copper; Summit Lake prospect—molybdenum	24	4	Copper, zinc, tin, tungsten	*	*	
		25	4	Copper, tungsten, molybdenum	*	*	
		26	4	*	*	Lead, gold, niobium	
	L. Paris prospect—gold, copper; Gould prospect—copper; Iron Crown prospect—cobalt, nickel	27	1, 4	Copper, lead	*	*	
		28	1, 4	Copper	*	*	
		29	1, 4	Arsenic, molybdenum	Tungsten, lanthanum	*	
	M. Hetta Mountain prospect—copper	30	1	Copper	Copper, (molybdenum)	*	
		31	4	Antimony	*	*	
		32	4	Copper, lead, tin	*	*	
		33	1	Yttrium	Molybdenum, tin, silver	*	
		34	4	*	*	Copper, lead, zinc, barium, cadmium, silver, gold, molybdenum	
		35	4.	Copper, molybdenum	*	*	
		36	4	Copper, silver, tin	*	*	
		37	1, 4	Molybdenum, (copper, zinc, yttrium)	Tungsten, (molybdenum, tin, lanthanum)	*	
		38	1	(Yttrium, beryllium)	Tungsten, (lanthanum)	*	
		39	4	Tungsten	*	*	
		40	4	Copper, silver, yttrium	*	*	
		41	4	Tin, yttrium, silver	*	*	
		42	1	Tin	*	*	
		43	4	Copper, tin	*	*	
		44	1	*	Bismuth, tungsten, lanthanum	*	
	Area 28—Nutkwa Lagoon						
Kwqo Kwgd SOdg €Zwg	A. Marion prospect—copper, lead. Quartz-calcite vein along fault in graywacke schist contains pyrite, chalcopyrite, and galena	1	4	Antimony	*	*	
		2	4	Tungsten	*	*	
		3	1	—	(Silver)	*	
		4	1	Molybdenum, (arsenic, barium)	Copper, barium, (zinc, silver, molybdenum, yttrium)	*	
	B. Keete Inlet prospect—copper. Shear zone in siliceous beds in greenstone schist contains disseminated chalcopyrite and pyrite. Pieces of quartz veins containing bornite and chalcopyrite on dump	5	4	Antimony	*	*	
		6	4	Antimony	*	*	
		7	1	—	Tungsten, (silver)	*	
		8	1	—	(Tin)	*	
		9	1	—		*	
		10	1, 4	Silver	Barium, (molybdenum)	*	
		11	4	Copper, zinc	(Tin)	*	
		12	4	—	(Tin)	*	
		13	1	—	Barium	*	
		14	4	Zinc, (copper)	*	*	
		15	1	—	Tungsten	*	
		16	4	Antimony	*	*	
		17	4	Antimony	*	*	
		18	4	Silver	*	*	
		19	1, 4	Zinc	Molybdenum	*	
		20	1, 4	Lead, antimony, (arsenic)	—	*	
		21	1	Lanthanum	Lanthanum, (molybdenum, yttrium)	*	
		22	1	—	Silver, (zinc, tungsten, lanthanum)	*	

				Area 29—Niblack Anchorage			
Kwqo SOdg €Zwg	A. Niblack mine—silver, gold, copper, lead, zinc. Disseminations and lenticular masses of chalcopyrite and pyrite accompanied by smaller amounts of sphalerite, galena, and hematite or magnetite. The sulfide minerals are mainly in layers of quartz-sericite rock derived from felsic volcanic or other volcanic related rocks. These rocks, in turn, are intercalated with intermediate or mafic metavolcanic rocks B. Navaho (Hope) prospect—gold, copper. Quartz vein in silicified porphyritic diorite or chloritic schist contains free gold, pyrite, and chalcopyrite C. Westlake prospect—gold, lead, zinc. Quartz vein along and near contact between granite and schist contains pyrite, sphalerite, galena, and gold D. Wakefield prospect—silver, gold, copper. Lenticular masses of chalcopyrite in belt of mineralized schist E. Edith M prospect—gold, copper; Lookout prospect—silver, gold, copper; Zones of quartz-sericite schist contain quartz vein and small masses of sulfides F. Dama prospect—gold, copper. Lenticular bodies of massive sulfides in quartz-sericite schist	1	1	Arsenic	—	*	Kuroko massive sulfide (model 28a), polymetallic vein (model 22c), low-sulfide gold-quartz vein (model 36a)
		2	1	Arsenic	Tin, niobium, (gold, tungsten)	*	
		3	1	—	(Tin, tungsten, niobium)	*	
		4	1	Molybdenum	—	*	
		5	1	—	(Zinc, cadmium, beryllium)	*	
		6	1	Copper, (lead, zinc)	Copper, lead, zinc, cadmium, silver, beryllium	*	
		7	1	(Molybdenum)	*	*	
		8	1	(Arsenic, molybdenum)	—	*	
		9	1	(Molybdenum, beryllium)	—	*	
				Area 30—Dolomi–Dutch Harbor			
€Zwg €Zwm	A. Cymru mine—gold, silver, copper. Four veins 1–5 ft wide (0.3–1.5 m) in Paleozoic marble consist of pyrite and chalcopyrite in quartz and calcite gangue. Underground workings B. Valpariso mine—silver, gold, copper, lead, zinc C. Golden Fleece mine—gold, silver, copper D. Fortune mine—gold, silver, copper E–I. Quartz-calcite-graphite veins in limestone contain pyrite, chalcopyrite, gold, and silver. Some veins contain inclusions of limestone country rock and talc schist E. Equator prospect—gold, copper F. Gladstone prospect—silver, gold, copper G. Saco prospect—silver, gold, copper H. Parkview prospect—gold, copper I. O.K. prospect—gold, copper, lead, zinc	1	1	Silver	Gold, silver, (tin, tungsten, niobium)	*	Low-sulfide gold-quartz vein (model 36a), polymetallic vein (model 22c), polymetallic replacement (model 19a)
		2	1	Molybdenum	—	*	
		3	1	—	Gold, silver	*	
		4	1	(Molybdenum)	(Tin)	*	
		5	1	Lanthanum, (lead, molybdenum, tin, niobium, yttrium, beryllium)	(Tin)	*	
		6	1	Yttrium	—	*	
		7	1	(Molybdenum)	—	*	
		8	1	Lead, tin	*	*	
		9	1	(Yttrium)	—	*	
		10	1	(Molybdenum)	—	*	
		11	1	Copper, tin	*	*	
		12	1	(Molybdenum)	*	*	
		13	1	(Molybdenum)	Molybdenum	*	
		14	1	(Molybdenum)	(Molybdenum)	*	
		15	1	*	Copper (tin)	*	

Table 7. Summary of favorable geochemically anomalous areas in the Craig, Dixon Entrance, and western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska—Continued.

Geologic unit(s)	Known mine, prospect, or occurrence, resources, and description	Site	Refer-ence	Anomalous elements by sample type: Stream sediment	Anomalous elements by sample type: Nonmagnetic heavy-mineral concentrate from stream sediment	Anomalous elements by sample type: Rock	Mineral deposit type(s) expected
	Area 30—Dolomi–Dutch Harbor—Continued						
	J–M. Irregular quartz fissure veins as thick as 3 m (9.8 ft) containing pyrite, tetrahedrite, and gold in silicified and dolomitized marble cut by postmineralization diabase dikes. Local solution caverns along vein systems. Veins localized along conjugate(?) system of Cenozoic(?) faults subsidiary to Clarence Strait fault zone. Host rocks part of the Late Proterozoic and Lower Cambrian Wales Group in Alexander belt. Several hundred meters of workings J. Well Fleet prospect—gold K. Alpha prospect—gold, copper L. House prospect—copper; Standby prospect—gold; Triangle 2 prospect—gold M. Matilda prospect—gold; Moonshine prospect—gold, copper; Jumbo prospect—silver, copper; Beauty prospect—silver, gold, copper; Welcome prospect—gold; Salmon prospect—gold, copper, lead; Amazon prospect—gold N–P. Quartz veins in schist intercalated with limestone contain pyrite, chalcopyrite, galena, sphalerite, gold, and silver N. Washington prospect—silver, gold, copper, zinc O. Oregon prospect—silver, gold, copper, zinc P. Kid prospect—gold, copper, lead, zinc Q. Frisco prospect—gold; Alameda prospect—gold R. Croesus prospect—gold, copper. Quartz veins in greenstone schist and limestone contain native copper and gold						
	Area 31—Dora Bay						
Jbsy SOdg ꞒZwg ꞒZwm	A. Dora Bay. Rare earth elements. Eudialyte-bearing nepheline syenite and associated pegmatites between Dora Bay and South Arm of Cholmondeley Sound B. Lucky Boy prospect—silver, gold, copper, lead, zinc. Quartz-calc breccia veins in limestone and schist contain sphalerite, galena, chalcopyrite, pyrite, gold, and silver	1	1	Lanthanum, niobium, yttrium, beryllium, molybdenum (zinc, tin)	Zinc, thorium, yttrium, beryllium, (cadmium)	*	Felsic plutonic-related uranium and rare earth elements and related thorium and rare earth element veins (model X), polymetallic vein (model 22c), placer uranium, thorium, rare earth elements (model W)
		2	1	Yttrium, tin, (lanthanum, niobium, beryllium)	Zinc, thorium, yttrium, (beryllium, cadmium)	*	
		3	1	Molybdenum, lanthanum, yttrium, beryllium, (niobium, tin)	Molybdenum, bismuth, yttrium, beryllium	*	
		4	1	(Arsenic)	—	*	
		5	1	(Arsenic)	Barium	*	
		6	1	(Lead, silver)	*	*	
		7	1	(Arsenic, yttrium)	Arsenic	*	
		8	1	(Yttrium)	—	*	
		9	1	(Beryllium)	(Silver, tin)	*	

				Area 32—South Arm of Cholmondeley Sound			
SOdg	A. Moonshine mine—gold, copper, lead,	1	1	(Barium)	—	*	Polymetallic replacement (model 19a),
ꞒZwg	zinc, antimony. Galena, sphalerite, minor	2	4	Antimony	*	*	kuroko massive sulfide (model 28a),
ꞒZwm	chalcopyrite, and accessory pyrite and	3	1	Zinc, (barium)	—	*	simple antimony (model 27d),
	siderite in well-defined fissure veins or	4	1, 4	Antimony, (yttrium)	Silver	*	disseminated antimony (model 27e)
	reniform pods as wide as a few meters in a	5	4	Lead, zinc, tin	*	*	
	dolomitized vein breccia cutting obliquely	6	1	Zinc, (barium)	—	*	
	across marble and metasedimentary rocks.	7	4	Zinc, barium	—	*	
	Gangue of quartz, siderite, and calcite.	8	4	Lead, zinc	*	*	
	Local diabase dikes crossing fissure and	9	4	Zinc	*	*	
	wallrocks. Several tunnels and shafts.	10	4	Lead, zinc	*	*	
	Minor production between 1900 and 1909.	11	4	Copper, lead, zinc, silver	*	*	
	Wallrocks part of the Late Proterozoic and	12	4	Zinc	*	*	
	Lower Cambrian Wales Group in	13	4	Silver	*	*	
	Alexander belt	14	4	Antimony	*	*	
	B. Friendship prospect—gold, copper;	15	4	Antimony	*	*	
	Research prospect—lead, zinc. Irregularly	16	4	Copper, antimony	*	*	
	distributed bunches of chalcopyrite and	17	4	Antimony, (copper)	*	*	
	bornite in a gangue of quartz and calcite	18	4	*	*	Copper, silver, gold, antimony	
	along fault contact between schistose	19	4	Tungsten, antimony	*	*	
	greenstone and marble	20	4	*	*	Copper, lead, silver, antimony,	
	C. Ketchikan Copper Co. prospect—					cadmium, gold	
	silver, gold, copper. Schist contains veins						
	and disseminated grains of pyrite						
	chalcopyrite, galena(?), gold, and silver						
	D. Hope prospect—silver, lead, zinc.						
	Sphalerite, galena, epidote, and garnet have						
	replaced marble and calcite lenses in schist						
				Area 33—McKenzie Inlet			
SOdi	A. Khayyam mine—silver, gold, copper,	1	3	Barium, (lead)	*	*	Kuroko massive sulfide (model 28a)
ꞒZwg	zinc. Mines contain irregular, elongate,	2	1	(Zinc)	(Silver, bismuth)	*	
	almost vertical lenses of massive pyrite,	3	1	—	(Tungsten)	*	
	chalcopyrite, sphalerite, pyrrhotite,	4	3	(Arsenic, uranium)	*	*	
	hematite, gahnite, and magnetite. About	5	1	(Zinc, yttrium)	—	*	
	seven stacked sulfide lenses as much as 70	6	3	(Lead, zinc)	*	*	
	m (230 ft) in length and 6 m (19.6 ft) in	7	1	Yttrium	—	*	
	thickness. Lenses conformable with	8	1	—	(Bismuth)	*	
	enclosing felsic to mafic metavolcanic host	9	1	—	(Tin)	*	
	rocks of the Wales Group						
	B. Stumble On mine—silver, gold, copper,						
	zinc. Elongated massive sulfide lenses						
	parallel to foliation of intermediate and						
	felsic schist country rock of the Wales						
	Group						
	C. Anderson prospect—copper.						
	Chalcopyrite in 3-ft (0.91 m)-wide zones in						
	gneiss or schist. Crosscut driven 95 ft (289						
	m) to footwall						
	D. Hecla prospect—copper; Bertha						
	prospect—copper; Red Rose prospect—						
	copper						
	E. Fowlkes prospect—copper.						
	Chalcopyrite in 12-ft (3.6 m)-wide zone in						
	gneiss or schist						

Table 7. Summary of favorable geochemically anomalous areas in the Craig, Dixon Entrance, and western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska—Continued.

Geologic unit(s)	Known mine, prospect, or occurrence, resources, and description	Site	Reference	Anomalous elements by sample type: Stream sediment	Nonmagnetic heavy-mineral concentrate from stream sediment	Rock	Mineral deposit type(s) expected
				Area 34—Kina Cove			
Kwgd	A. Sunny Day prospect—copper, gold,	1	1, 3	(Arsenic)	(Lead, barium)	*	Copper skarn (model 18b), iron skarn
SOdi	silver. Vein adjacent to porphyry dike in	2	1, 3	(Barium, molybdenum)	Thorium, (copper, zinc, silver,	*	(model 18d), polymetallic vein (model
SOdg	metamorphosed greenstone contains				molybdenum)		22c)
	chalcopyrite, gold, and silver	3	1	(Beryllium)	(Zinc, molybdenum)	*	
	B. Baker Point prospect—iron. Small	4	1	Gold, silver	Tungsten	*	
	pods and lenses of magnetite in banded	5	1	Molybdenum, (copper)	*	*	
	chert and argillite in contact with an altered	6	1, 3	Zinc, tungsten, (lead, arsenic)	*	*	
	dike or flow	7	1	—	Molybdenum, tungsten	*	
	C, D. Kina Cove—copper. Chalcopyrite	8	1	(Molybdenum)	—	*	
	in recrystallized limestone and in quartz	9	3	Arsenic, (copper)	*	*	
	vein that borders a quartz diorite pluton.	10	3	(Zinc, arsenic)	*	*	
	Other small quartz veins in schist contain	11	1	—	Bismuth	*	
	pyrrhotite and chalcopyrite	12	3	Arsenic	*	*	
	E. Hatchet—gold. Mineralized zone about	13	3	Arsenic	*	*	
	4 ft (1.2 m) thick along fissure vein in						
	carbonaceous, pyritic schist						
				Area 35—Kasaan Peninsula			
SOdi	A. Palmer Cove mine—gold, copper	1	1	Cadmium, (silver)	(Copper)	*	Copper skarn (model 18b), iron skarn
SObl	B. Haida mine—gold, silver, copper, iron,	2	3	(Arsenic, uranium)	*	*	(model 18d)
SOdg	molybdenum	3	3	(Arsenic)	—	*	
	C. Brown and Metzdorf mines—gold,	4	1, 3	(Copper, molybdenum)	—	*	
	silver, copper, molybdenum	5	1	(Molybdenum, beryllium)	—	*	
	D. Alarm mine—copper	6	1	(Beryllium)	—	*	
	E. It mine—gold, silver, copper,	7	1	Molybdenum	—	*	
	molybdenum	8	1	—	Barium	*	
	F. Uncle Sam mine—gold, copper	9	3	Uranium, (arsenic)	*	*	
	G. Rich Hill mine—copper, silver, iron,	10	1	(Copper, yttrium)	Beryllium	*	
	molybdenum	11	1	Copper, (beryllium)	—	*	
	H. Tacoma and Peacock mines—copper,	12	1	Copper, (molybdenum)	Copper, molybdenum, (silver)	*	
	iron, molybdenum	13	3	(Tungsten)	*	*	
	I. Mamie mine—gold, silver, copper, iron	14	1	—	(Lead)	*	
	J. Mount Andrews mine—gold, silver,	15	1, 3	Tin, (copper, arsenic, antimony)	Copper, lead, silver, bismuth, tin	*	
	copper, iron, cobalt	16	1, 3	(Arsenic)	Arsenic	*	
	K. Stevenstown mine—gold, silver, copper	17	1	Copper	Tin	*	
	L. Copper Center prospect—silver, gold,	18	1, 3	(Copper, arsenic, yttrium)	*	*	
	copper, iron	19	1	(Copper)	*	*	
	M. Charles prospect—copper, iron, gold,	20	1	Copper, lead, zinc, barium, gold,	Gold, silver	*	
	silver			silver, arsenic, antimony, bismuth,			
	N. Reed prospect—silver, gold, copper,			molybdenum			
	molybdenum	21	1	(Yttrium)	Zinc, cadmium, (lanthanum)	*	
	O. Morning Star prospect—gold, copper,	22	1, 3	(Arsenic)	Barium	*	
	iron	23	1	—	Barium	*	
	P. Poorman prospect—silver, gold,	24	1	(Yttrium)	Lanthanum	*	
	copper, iron; Copper King prospect—gold,						
	copper, iron						
	Q. Iron King No. 1 prospect—silver,						
	gold, copper, iron						

	R. Copper Queen prospect—copper, iron						
	S. Elm City prospect—copper, gold; Skookum prospect—copper, gold						
	T. Hole In The Wall prospect—copper, iron						
	U. Big Six prospect—copper, iron						
	V. Chachelot prospect—silver, gold, copper						
	W. Big Five prospect—copper, iron						
	X. Iron Cap prospect—silver, gold, copper, iron						
	Y. Wallace prospect—copper, iron						
	Z. Tolstoi prospect—copper, iron						
				Area 36—Salt Chuck			
Kwgd	A. Rush Brown mine—gold, silver, copper, iron, nickel, cobalt	1	1	Copper, silver	*	*	Copper skarn (model 18b), iron skarn (model 18d), polymetallic vein (model 22c), synorogenic-synvolcanic nickel-copper (model 7a), magmatic oxide or sulfide deposits with copper,-gold, platinum-group elements (model Y), Alaskan platinum-group elements (model 9), placer platinum-group elements, gold, silver (model 39b)
SOpx	B. Salt Chuck and Leibrant mines—gold, silver, copper, platinum, palladium, iron, copper	2	1	Copper, silver, (molybdenum)	Copper, lead, antimony, bismuth	*	
SOdi	C. Alexander prospect—gold, copper	3	1	(Arsenic)	*	*	
SOdg	D. North Pole Hill prospect—gold, copper	4	1	Cadmium, (silver)	—	*	
	E. Paul Young prospect—copper; Venus prospect—gold, silver, copper, zinc; Young prospect—copper	5	1	Cadmium, (silver)	—	*	
	F. Stevens prospect—copper	6	1	*	Copper, lead, gold, silver, antimony, bismuth, tin	*	
		7	1	Copper, lead, gold, silver, bismuth, (arsenic)	*	*	
				Area 37—Sweetwater Lake–Thorne Bay			
QTvb	A. McCullough mine. Quartz breccia vein about 10 ft (3 m) wide crops out over a distance of 350 ft (46.4 m). Vein contains chalcopyrite, sphalerite, pyrite, and secondary copper minerals. Country rock is banded argillite and graywacke. Developed 60 ft (18 m) shaft and open cuts	1	1	(Beryllium)	Lead, antimony, (silver, tin)	*	Besshi massive sulfide (model 24b), polymetallic vein (model 22c), felsic plutonic-related uranium and rare earth elements and related thorium and rare earth element veins (model X), skarn related (models 18b, 18c, Z), placer uranium, thorium, rare earth elements (model W), placer gold (model 39a)
Kwqo		2	1	(Beryllium)	Cadmium, (zinc)	*	
SObl		3	1	(Zinc, beryllium)	Cadmium, (zinc)	*	
SOdg		4	1	(Beryllium)	Copper, (zinc, silver)	*	
		5	1	Molybdenum	(Tin, niobium)	*	
		6	1	—	(Zinc, tin, niobium, yttrium)	*	
		7	1	—	(Niobium)	*	
		8	1	—	(Tin, niobium, yttrium)	*	
		9	1	—	Tin	*	
		10	1	(Zinc, antimony)	*	*	
		11	1	(Zinc)	—	*	
		12	1	—	Gold, silver	*	
		13	1	(Zinc)	(Tin)	*	
		14	1	—	(Lanthanum)	*	
		15	1	(Zinc)	—	*	
		16	1	(Niobium, beryllium)	—	*	
		17	1	—	(Tungsten)	*	
		18	1	Cadmium, (copper)	—	*	
		19	1	Cadmium, (copper, zinc)	Molybdenum	*	
		20	1	Gold, cadmium, (copper)	—	*	
		21	1	—	(Antimony, tin, tungsten)	*	
		22	1	*	(Zinc, arsenic)	*	
		23	1	Cadmium, (copper)	—	*	
		24	1	—	Lanthanum	*	
		25	1	—	Lanthanum	*	
		26	1	*	Gold	*	
		27	1	Cadmium, (copper)	—	*	
		28	1	—	Gold, silver	*	
		29	1	—	Molybdenum, (tungsten)	*	
		30	1	(Copper)	—	*	

Table 7. Summary of favorable geochemically anomalous areas in the Craig, Dixon Entrance, and western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska—Continued.

Geologic unit(s)	Known mine, prospect, or occurrence, resources, and description	Site	Reference	Anomalous elements by sample type: Stream sediment	Anomalous elements by sample type: Nonmagnetic heavy-mineral concentrate from stream sediment	Anomalous elements by sample type: Rock	Mineral deposit type(s) expected
				Area 37—Sweetwater Lake–Thorne Bay—Continued			
		31	1	Cadmium)	—	*	
		32	1	Cadmium, (zinc)	—	*	
		33	1	Cadmium, (copper, arsenic)		*	
		34	1	—	(Tungsten)	*	
		35	1	—	(Arsenic, tungsten)	*	
		36	1	Copper, cadmium, arsenic	Copper	*	
		37	1	(Copper)	—	*	
		38	1	(Copper)	—	*	
		39	1	Cadmium, (zinc)	—	*	
		40	1	—	(Tungsten)	*	
		41	1	Cadmium	—	*	
						*	
		42	1	—	Molybdenum, thorium, (lanthanum, yttrium)	*	
		43	1, 3	Uranium, thorium, lanthanum, niobium, (yttrium, beryllium, molybdenum)	Thorium, yttrium, (molybdenum, tin, lanthanum, niobium)	*	
		44	1	Niobium	—	*	
		45	1	Lanthanum, niobium	Molybdenum, thorium, (lanthanum)	*	
		46	1	(Lanthanum, niobium)	Niobium	*	
		47	1	(Beryllium)	(Niobium)	*	
		48	1	Niobium, (beryllium)	Thorium, (molybdenum, lanthanum, yttrium)	*	
		49	1	Niobium	Niobium	*	
		50	1	(Copper, arsenic)	—	*	
		51	1	Silver, (copper, niobium)	—	*	
		52	1, 3	Arsenic, niobium, (lead, silver)	Silver, arsenic, bismuth, cadmium, (zinc)	*	
		53	1, 3	Arsenic	Thorium, (niobium)	*	
				Area 38—Control Lake			
DSs		1	1	(Copper)	—	*	Besshi massive sulfide (model 24b)
SObl		2	1	Copper, (zinc)	Silver	*	
SOdg		3	1	(Arsenic)	Tungsten, (beryllium)	*	
		4	1	(Arsenic)	Tungsten, (lanthanum)	*	
		5	1	—	Barium, (zinc)	*	
		6	1	—	Bismuth, tungsten, (lanthanum)	*	
		7	1	(Lead)	Molybdenum, (barium, yttrium)	*	
		8	1	—	(Lanthanum, yttrium)	*	
		9	1	—	Silver, (barium)	*	
		10	1	Arsenic	Arsenic, tungsten, (zinc, silver)	*	
		11	1	(Arsenic)	(Arsenic, tungsten)	*	
		12	1	(Zinc)	Arsenic, tungsten	*	
		13	1	(Copper)	Tungsten, (lead)	*	
		14	1	(Copper, zinc)	*	*	
		15	1	(Zinc, molybdenum)	Tungsten	*	

			Area 39—Staney Cone–Kogish Mountain			
Dkkr	1	1	—	(Zinc, barium)	*	Besshi massive sulfide (model 24b), polymetallic vein (model 22c), porphyry copper, skarn related (model 18a)
DSs	2	1	Copper	(Lanthanum, yttrium)	*	
SObl	3	1	—	(Tungsten)	*	
SOdg	4	1	—	(Silver)	*	
SOdb	5	1	—	Bismuth, tungsten, (copper)	*	
	6	1	—	Tungsten, lanthanum, (barium)	*	
	7	1	(Niobium)	*	*	
	8	1	—	Lanthanum, (copper, tungsten)	*	
	9	1	(Lanthanum, niobium, beryllium)	*	*	
	10	1	(Niobium, beryllium)	(Lanthanum, yttrium)	*	
	11	1	(Copper, zinc)	*	*	
	12	1	(Lead, molybdenum)	(Copper, zinc, barium, silver, molybdenum)	*	
	13	1	—	(Tungsten)	*	
	14	1	(Zinc, lanthanum, yttrium)	Barium, lanthanum, (yttrium)	*	
	15	1	(Lanthanum)	*	*	
	16	1	(Molybdenum)	Barium, (molybdenum, tungsten, lanthanum)	*	
	17	1	(Molybdenum)	Cadmium, barium, (zinc, silver, molybdenum, tungsten, lanthanum)	*	
	18	1	—	(Copper)	*	
	19	1	(Molybdenum)	*	*	
	20	1	—	Barium, (copper, lanthanum)	*	
	21	1	—	Cadmium, (zinc, molybdenum, tungsten)	*	
	22	1	—	Cadmium, (copper, zinc, tin, lanthanum)	*	
	23	1	(Arsenic, molybdenum)	*	*	
	24	1	Zinc, molybdenum, (antimony)	*	*	
	25	1	—	Barium, (zinc)	*	
	26	1	—	Cadmium, barium, (zinc, silver, tin)	*	
	27	1	—	Zinc, barium	*	
	28	1	Antimony, (silver, molybdenum)	Zinc, cadmium, (silver)	*	
	29	1	(Zinc)	—	*	
	30	1	Bismuth, (beryllium)	—	*	
	31	1	(Molybdenum)	Zinc, barium, molybdenum, lanthanum	*	
	32	1	(Antimony)	Copper, lanthanum	*	
			Area 40—Sunny Hay Mountain			
Kwqo PIPsy	1	1	Lead, zinc, silver, (antimony, molybdenum, lanthanum)	Silver	*	Felsic plutonic-related uranium and rare earth elements and related thorium and rare earth element veins (model X), porphyry molybdenum (model 21b), polymetallic vein (model 22c), placer uranium, thorium, rare earth elements (model W)
IPk	2	1	Zinc, (antimony, lanthanum)	(Silver)	*	
Mp	3	1	(Zinc, arsenic, antimony, lanthanum)	—	*	
Dksn	4	1	(Niobium)	—	*	
SObl	5	1	(Molybdenum)	—	*	
SOdg	6	1	*	Lead, barium, antimony, (zinc, cadmium)	*	
	7	1	Zinc, molybdenum, (barium, niobium, beryllium)	*	*	
	8	1	(Molybdenum, niobium)	—	*	
	9	1	Beryllium, (molybdenum, niobium)	*	*	
	10	1	Zinc, lead, niobium, (silver, arsenic, antimony, lanthanum)	—	*	
	11	1	(Molybdenum, niobium, beryllium)	*	*	
	12	1	Barium, molybdenum, niobium	Barium	*	
	13	1	Molybdenum, niobium, beryllium	*	*	

Table 7. Summary of favorable geochemically anomalous areas in the Craig, Dixon Entrance, and western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska—Continued.

Geologic unit(s)	Known mine, prospect, or occurrence, resources, and description	Site	Reference	Anomalous elements by sample type: Stream sediment	Anomalous elements by sample type: Nonmagnetic heavy-mineral concentrate from stream sediment	Anomalous elements by sample type: Rock	Mineral deposit type(s) expected
				Area 40—Sunny Hay Mountain—Continued			
		14	1	Zinc, (antimony, molybdenum, lanthanum)	(Silver, molybdenum)	*	
		15	1	(Zinc, antimony, molybdenum)	(Molybdenum)	*	
		16	1	(Niobium)	—	*	
		17	2	*	*	Zinc, molybdenum	
		18	2	Zinc, (silver, barium, molybdenum, niobium)	*	*	
		19	2	Zinc, molybdenum, niobium, (barium, lanthanum)	*	*	
		20	2	Zinc, molybdenum, niobium, (silver, barium)	*	*	
		21	2	Zinc, barium, molybdenum, niobium, (silver)	*	*	
		22	2	Zinc, molybdenum, niobium, (copper, silver, lanthanum, barium)	*	*	
		23	2	Zinc, (lanthanum, niobium)	*	*	
		24	1	Antimony, beryllium, niobium, (barium, molybdenum, lanthanum, yttrium)	Zinc, cadmium, barium	*	
		25	1	Zinc, molybdenum, niobium, beryllium, (barium, antimony, lanthanum)	Barium, lanthanum	*	
		26	1	Zinc, silver, antimony, molybdenum, (copper, arsenic, lanthanum, niobium)	*	*	
		27		Copper, zinc, antimony, (lead, silver, cadmium, barium, lanthanum, beryllium, niobium)	Barium, (copper, zinc, silver)	*	
		28	1	—	Molybdenum, (silver, tin)	*	
		29	1	Cadmium, (zinc, barium, silver, antimony, molybdenum)	Silver	*	
		30	1	Cadmium, (lanthanum)	(Silver)	*	
		31	1	*	Copper, barium, gold, silver, arsenic, lanthanum, (lead, zinc, niobium, beryllium)	*	
		32	1	(Niobium, beryllium)	—	*	
		33	2	(Copper, silver, lanthanum, niobium)	*	*	
		34	2	(Copper, silver)	*	*	
		35	1	(Arsenic, antimony, molybdenum, beryllium)	Barium, (lead, zinc)	*	
		36	2	Zinc, molybdenum, (silver)	*	*	
		37	2	(Silver, molybdenum)	*	*	
				Area 41—Black Bear–Wolf–St. Nicholas Lakes			
Kwqo	A. Lucky Nell mine—slver, gold, copper,	1	1	Cadmium, (arsenic)	(Copper)	*	Polymetallic vein (model 22c), low-
Kwgd	lead, zinc. Quartz fissure vein about 4 ft	2	1	Cadmium, (arsenic)	—	*	sulfide gold-quartz vein (model 36a),
SObl	(1.2 m) thick in diorite porphyry contains	3	1	Molybdenum	Molybdenum, tungsten, lanthanum, niobium)	*	porphyry molybdenum (model 21b),
SOdg	pyrite, chalcopyrite, galena, and sphalerite.						placer gold (model 39a)
SOdb	Sulfide minerals comprise more than half	4	1	Cadmium, (copper, molybdenum)	—	*	
	the vein in places	5	1	Gold, cadmium, (copper)	(Copper)	*	

B. Harris Creek mine—gold. Gold-	6	1	—	Zinc, cadmium, barium, arsenic	*
bearing quartz veins in granitic-bearing	7	1	Copper, silver, (barium)	Barium, tungsten, (zinc,	*
schist associated with fine-grained, light-				molybdenum, lanthanum)	
colored dikes	8	1	(Zinc, molybdenum)	Barium, (copper)	*
C. Dawson mine—silver, gold, copper,	9	1	—	Barium, bismuth, tungsten, (arsenic)	*
lead, zinc. Quartz stringers and veins in	10	1	Antimony, molybdenum	Barium	*
zone 2–6 ft (0.6–1.8 m) wide. Most gold	11	2	*	*	(Silver)
concentrated along contacts of stringers	12	2	*	*	Molybdenum, (silver)
and lower(?) Paleozoic black graphitic slate	13	1	Copper, barium, (zinc, molybdenum)	*	*
of Alexander belt. Scattered sulfides—	14	1	Copper, (molybdenum)	Lead, silver, antimony, bismuth, tin,	*
pyrite, chalcopyrite, galena, and	15	1	(Arsenic, molybdenum)	(copper, arsenic)	
sphalerite—in stringers, veins, and				Tungsten, (molybdenum, lanthanum)	*
wallrock. Mined from 1900 to 1948	16	1	Copper, gold, bismuth, tin, (zinc,	Copper, (silver, molybdenum)	*
D. Crackerjack mine—gold, silver,			silver, arsenic, lanthanum)		
copper, lead, zinc. Quartz veins as thick as	17	1	Molybdenum, (copper, lead)	Gold, silver, tin, tungsten, (lead)	*
5 ft (1.5 m) mainly follow one or more	18	1	(Lanthanum)	Copper	*
porphyry dikes parallel to bedding of black	19	1	Zinc, arsenic, antimony, bismuth	(Silver, molybdenum)	*
slate country rock. Metallic minerals are	20	1	Zinc	—	*
pyrite, chalcopyrite, galena, sphalerite,	21	1	Molybdenum	Barium, lanthanum, (yttrium)	*
tetrahedrite, gold, and silver	22	1	(Molybdenum)	(Lanthanum)	*
E. Cascade mine—silver, gold, copper,	23	1	(Molybdenum, yttrium)	(Lanthanum, yttrium)	*
lead, zinc. Quartz lenses and veinlets in a	24	1	(Zinc, yttrium)	(Tin, lanthanum, yttrium)	*
fracture zone of altered mafic intrusive	25	1	(Molybdenum)	(Lanthanum, yttrium)	*
rocks contain pyrite, sphalerite, galena,	26	1	(Zinc, molybdenum)	(Yttrium)	*
chalcopyrite, and free gold	27	1	(Zinc)	—	*
F. Puyallup mine—silver, gold, copper,	28	1	(Zinc, molybdenum)	Molybdenum, (tin, lanthanum,	*
lead, zinc. Quartz vein follows hanging				niobium, yttrium)	
wall of a thin porphyritic dike. Vein	29	1	(Zinc)	(Tin, yttrium)	*
contains free gold, pyrite, galena,	30	1	(Molybdenum, lanthanum)	(Tin, niobium, yttrium)	*
sphalerite, chalcopyrite, bornite, and	31	1	Molybdenum, (arsenic)	(Barium, tin)	*
telluride minerals	32	1	—	(Tin)	*
G. Flagstaff mine—silver, gold, copper,	33	1	Copper, lead, (silver)	Copper, (tin)	*
lead, zinc. Quartz fissure vein can be	34	1, 3	(Lead, zinc, silver, molybdenum)	*	*
traced on surface for more than a mile (1.6	35	1	*	Barium, gold, silver, arsenic,	*
km) through a vertical range of 1,300 ft				(copper, zinc)	
(452 m); in mine workings vein is about 18	36	1	Copper, lead, (silver, arsenic)	Barium, (copper, silver)	*
in. (0.9 m) thick and follows the footwall of	37	1	Lead, zinc, gold, molybdenum,	Copper, zinc, barium, gold, silver,	*
a diabase dike; country rock is diorite. Vein			(copper, barium, silver, arsenic,	antimony, (lead, arsenic)	
is mainly quartz with gold, galena,			antimony, yttrium)		
chalcopyrite, sphalerite, covellite,	38	1, 2	Zinc, gold, silver, arsenic (copper,	Arsenic, bismuth, (silver,	*
chalcocite, and native copper			lead, antimony, molybdenum,	molybdenum, lanthanum)	
H. Big Harbor mine—gold, silver, copper,			yttrium)		
zinc. Lenses of chalcopyrite, pyrite, and	39	2	*	*	Copper, lead, zinc, gold, silver,
sphalerite at contact of greenschist and					bismuth, (molybdenum,
quartz-mica schist contain gold and silver.					lanthanum)
Workings included shafts, several levels, a	40	1	*	Copper, zinc, cadmium, silver,	*
few stopes, and an adit				arsenic, (lead)	
I. Saxe prospect—silver, gold, copper,	41	2	*	*	Zinc, gold, silver, (molybdenum)
lead, zinc	42	1	(Arsenic)	Gold, (silver)	*
J. Klawock Lake prospect—molybdenum	43	1	(Zinc)	Gold, silver	*
K. Independent prospect—gold, lead, zinc	44	1	Zinc	Gold, silver, tungsten, (zinc,	*
L. Constitution prospect—copper, gold,				molybdenum)	
lead, zinc	45	2, 3	Copper, lead, zinc, cadmium, gold,	*	*
M. Gervis prospect—gold			silver, molybdenum		
N. Dew Drop prospect—gold, silver	46	2	Copper, gold, (silver)	*	*

Table 7. Summary of favorable geochemically anomalous areas in the Craig, Dixon Entrance, and western edges of the Ketchikan and Prince Rupert quadrangles, southeast Alaska—Continued.

Geologic unit(s)	Known mine, prospect, or occurrence, resources, and description	Site	Reference	Anomalous elements by sample type: Stream sediment	Anomalous elements by sample type: Nonmagnetic heavy-mineral concentrate from stream sediment	Anomalous elements by sample type: Rock	Mineral deposit type(s) expected
	Area 41—Black Bear–Wolf–St. Nicholas Lakes—Continued						
	O. Salmon Lake prospect—copper, lead,	47	2	Zinc, (lead, silver, molybdenum)	*	*	
	tungsten; Go By prospect—gold, lead, tungsten; Juneau prospect—gold, lead,	48	2	Copper, zinc, (lead, silver, molybdenum, lanthanum)	*	*	
	zinc; Copper 1, 2 prospects—gold, lead, zinc; Bendigo prospect—gold; Buckham 1,	49	1, 2	Zinc, (silver, molybdenum, beryllium)	Tungsten	*	
	2 prospects—gold, lead, zinc; Granite	50	1	Zinc, molybdenum, (copper, barium)	*	*	
	Mountain prospect—gold; Cutter	51	2	(Gold)	*	*	
	prospect—gold, lead, zinc; Lookout	52	1, 2	Zinc, gold, silver, antimony, arsenic	*	*	
	prospect—gold, lead, zinc; Clipper	53	1, 3	(Arsenic)	(Zinc)		
	prospect—gold, lead, zinc	54	1, 3	(Arsenic)	*	*	
	P. Stella prospect—gold, lead, zinc;	55	1, 3	(Arsenic)	Zinc, cadmium, (silver)	*	
	Monday prospect—silver, gold, zinc	56	3	(Arsenic)	*	*	
	Q. Copper Hill prospect—copper	57	1, 3	Yttrium, (arsenic)	Copper, gold, silver, (lead, zinc)	*	
	R. Harris Peak prospect—gold, copper,	58	2	*	*	(Copper, gold)	
	lead, zinc; Snowdrift prospect—gold	59	1	Copper, gold, (silver)	Copper, (silver, molybdenum)	*	
	S. Shelton prospect—silver, gold, copper	60	1	(Silver, arsenic)	—	*	
	T. Black Bear Lake prospect—copper	61	1	Copper	Copper, gold, silver, (antimony)	*	
	U. Pin Peak prospect—copper, molybdenum	62	1	Copper, (zinc, silver, antimony, molybdenum)	Zinc, cadmium, barium, (silver, molybdenum)	*	
	V. Harris River prospect—copper	63	2	Molybdenum, (copper, zinc, silver)	*	*	
	W. Burke-Lange prospect—gold	64	2	(Copper, zinc, silver, molybdenum)	*	*	
	Y. Unnamed—copper; unnamed—copper	65	2	(Gold)	*	*	
		66	2	(Gold)	*	*	
		67	1, 2	(Zinc)	Zinc, cadmium, barium, (silver, molybdenum)	*	
		68	1, 2	Gold, (molybdenum)	(Lead, tungsten)	*	
		69	2	(Zinc, silver, molybdenum, lanthanum)	*	*	
		70	2	Copper, (barium)	*	*	
		71	2	Copper, (barium)	*	*	
		72	2	Gold, (copper, silver, molybdenum, lanthanum)	*	*	
		73	1	(Molybdenum)	—	*	
		74	1	—	Barium, (copper, lead)	*	
		75	2	(Molybdenum)	*	(Lanthanum, niobium)	
		76	1	Molybdenum	—	*	
		77	1	(Molybdenum, beryllium)	Beryllium, (zinc)	*	
		78	2	Copper, gold, (silver)	*	*	
		79	2	Copper, lead, zinc, cadmium, silver, (gold, molybdenum)	*	*	
		80	1	*	Zinc, (copper, cadmium)	*	
		81	2	Copper	*	*	
		82	1	Copper, lead, zinc, cadmium, silver, (gold, molybdenum)	*	*	
		83	1, 2	Copper, zinc, (lead, arsenic)	Zinc, cadmium, barium, (silver, molybdenum)	*	
		84	2	*	*	Molybdenum, (copper)	
		85	2	*	*	Molybdenum	
		86	2	*	*	Molybdenum, (lanthanum, yttrium)	
		87	1	(Zinc, gold)	—	*	
		88	2	Molybdenum	*	*	

				Area 42—Twelvemile Creek			
€Zwg	A. Nancy prospect—copper. Quartz	1	2	(Molybdenum)	*	*	Kuroko massive sulfide (model 28a)
€Zwm	stringers in silicified shear zone 25 ft (7.2	2	1	(Arsenic, antimony, molybdenum,	(Barium)	*	
	m) wide in greenstone contain chalcopyrite			barium)			
	and pyrite	3	1	(Barium, silver, antimony,	(Molybdenum, tungsten), niobium	*	
	B. Marble Heart prospect—copper, lead.			beryllium)			
	Small vein of galena and chalcopyrite in	4	1	—	(Gold, silver)	*	
	intensely deformed crystalline limestone.	5	2	(Gold)	*	*	
	Explored about 1900 by a shallow shaft	6	2	(Copper, silver)	*	*	
	and short tunnel	7	2	*	*	Copper, silver, (lanthanum,	
	C. Cave Creek—copper. Calcareous					yttrium)	
	greenstone contains pyrite and chalcopyrite	8	1	—	Silver, (tungsten)	*	
	D. Dolly Varden—Silver, gold, copper.	9	1	—	Lead, (silver, molybdenum)	*	
	Quartz vein in marble interlayed with	10	3	(Arsenic)	*	*	
	metamorphosed sedimentary and volcanic	11	1, 3	(Silver, arsenic)	*	*	
	rocks	12	2	*	*	Lanthanum	
	E. Twelvemile Creek—copper. Pyrite and	13	2	*	*	Molybdenum	
	chalcopyrite in limestone (marble) quarries	14	1, 2	(Barium, silver, molybdenum)	Lanthanum	*	
	F. Unnamed—copper. Chalcopyrite in	15	2	(Barium, silver, molybdenum,	*	*	
	quartz vein in deformed lava			lanthanum)			
		16	2	(Zinc, barium, silver)	*	*	
		17	2	*	*	Barium, (lanthanum)	
		18	2	Zinc, (barium, silver, molybdenum)	*	*	
		19	2	*	*	(Lead)	
		20	2	*	*	(Zinc)	
		21	2	*	*	(Copper, molybdenum, yttrium)	
		22	1	(Barium, silver, antimony, molybdenum, beryllium)	Molybdenum, (copper)	*	

AREAS 1–12, CORONATION ISLAND, WARREN ISLAND, KOSCIUSKO, MARBLE, ORR, TUXEKAN, AND HECETA ISLANDS, ESQUIBEL ISLAND, NOYES ISLAND, LULU ISLAND, SAN FERNANDO ISLAND, SAN JUAN BAUTISTA ISLAND, BAKER ISLAND, SUEMEZ ISLAND, FORRESTER ISLAND, AND THE NORTHERN PART OF DALL ISLAND

Geochemically anomalous areas 1–12 include (1) Coronation Island, (2) Warren Island, (3) Kosciusko, Marble, Orr, Tuxekan, and Heceta Islands, (4) Esquibel Island, (5) Noyes Island, (6) Lulu Island, (7) San Fernando Island, (8) San Juan Bautista Island, (9) Baker Island, (10) Suemez Island, (11) Forrester Island, and (12) the northern part of Dall Island. These areas contain numerous outcrops of hornblende quartz monzodiorite and minor tonalite, granodiorite, quartz diorite, diorite, quartz monzonite, and monzodiorite (unit Kwqo, plate 1). This plutonic unit, which contains areas of disseminated metal sulfide minerals (Berg, 1984), intrudes Paleozoic sedimentary clastic rocks (mudstone, siltstone, some slightly pyritic, shale, sandstone, graywacke, turbidites, and conglomerate), Paleozoic carbonate rocks (limestone and limestone breccia), and Paleozoic volcanic and associated volcaniclastic rocks. A series of aeromagnetic highs (U.S. Geological Survey, 1984; J. Wynn, unpub. data, 1990) associated with areas 1–12 delineates exposed and inferred buried granitic rocks (unit Kwqo).

Within these anomalous areas there are reported mines, prospects, and mineral occurrences (table 7, plate 1). The Coronation Island mine (A of area 1) contains small lenticular masses of galena, sphalerite, tetrahedrite, and secondary lead-zinc minerals in clay carbonate gangue in fault zones within Paleozoic limestone locally cut by diorite (Berg, 1984). The mineral occurrence on Marble Island (A of area 3) consists of galena veins between diorite and calcareous sedimentary rocks (Berg, 1984). Drill-core evidence on Noyes Island (A of area 5) indicates the presence of chalcopyrite, pyrite, and molybdenite(?). Mineral occurrences on Noyes Island (A–D of area 5) are quartz veins at the contact between plutonic and bedded rocks that contain chalcopyrite and pyrrhotite; disseminated chalcopyrite in marble; and quartz chalcopyrite in argillite. Mineral occurrences on San Juan Bautista Island (A and B of area 8) contain pyrrhotite, pyrite, and chalcopyrite in diorite and tactite (Berg, 1984). The Port San Antonio prospect on Baker Island (A of area 9) is a stockwork of metalliferous quartz veins in argillite containing sphalerite, galena, pyrite, and reportedly high values in gold (Berg, 1984). Mineral occurrences on Baker Island (B, C, and D of area 9) are intensely brecciated and silicified zones in quartz diorite and metasedimentary rocks containing many quartz veinlets that contain small amounts of pyrite, arsenopyrite, and pyrrhotite; pyrite, pyrrhotite, and chalcopyrite in quartzite; and pyrite and minor chalcopyrite in phyllite (Berg, 1984). Mineral occurrence E (area 9) contains stringers of barite in sandstone and conglomerate of the Descon Formation (Berg, 1984). Two reported mineral occurrences on Forrester Island (A and B of area 11) are veinlets and disseminations in altered porphyritic quartz monzonite and granodiorite in contact-metamorphosed conglomerate containing molybdenite, pyrite, chalcopyrite, and pyrrhotite (Clark and others, 1971f). The Yellowstone, Moonshine, Miller, Shellhouse, and Silver Star prospects (A, B, C, and D of area 12) on the northern part of Dall Island in the vicinity of Thunder, Squaw, and White Mountains are auriferous quartz-calcite-chalcopyrite-pyrrhotite veins; argentiferous galena; quartz-calcite veins in limestone and siliceous schist that contain chalcopyrite and pyrrhotite; and quartz-calcite veins in limestone that contain chalcopyrite, sphalerite, galena, and unknown amounts of gold and silver (Berg, 1984).

The anomalous suite of lanthanum, niobium, yttrium, and beryllium, together with molybdenum, tin, and tungsten, verifies the presence of granitic rocks in these areas. The geologic environment, aeromagnetic anomalies, anomalous amounts of copper, lead, zinc, gold, silver, antimony, arsenic, molybdenum, tin, and tungsten, reported mineral occurrences, and occurrences of disseminated base-metal sulfides associated with granitic plutons all suggest that areas 1–12 have a potential for mineral resources.

The carbonate rocks suggest a potential for base- and precious-metal skarn and vein (models 14a, 15a, 18b, 18c) and replacement (model 19a) deposits within a few miles (kilometers) of the granitic rocks. The clastic rocks have a potential for a wide variety of disseminated and vein mineral (models 15a, 18a) deposits within a few miles (kilometers) of the granitic rocks. The granitic rocks themselves have a potential for porphyry-type deposits of disseminated base-metal sulfides or molybdenum, tin, tungsten, copper, or gold (models 16, 17, 21a, 21b). The near-surface fractures and breccias within the thermal aureole clusters of the intrusions and peripheral to their porphyry systems, together with the numerous reported quartz-carbonate gold, silver, and base-metal sulfide veins, suggest the potential for polymetallic vein deposits (model 22c).

Although almost all felsic igneous rocks contain rare earth element-bearing accessory minerals and, in some cases, uranium-thorium minerals, the fissure veins in or along the margins of the alkalic granitic plutons in these areas suggest a potential for felsic plutonic-related uranium-rare earth element and related thorium-rare earth element vein deposits (model X).

Geochemical data and mineral occurrences on Forrester Island suggest the potential not only for molybdenum porphyry deposits (model 21b) but also for felsic plutonic-related uranium-thorium and rare earth element deposits (model X). Stream-sediment samples collected during NURE that show the anomalous suite of uranium-thorium-rare earth elements and base-metal elements (lead, bismuth, cadmium, and barium) compare favorably with the geochemical signature of the known Bokan Mountain uranium-thorium-rare earth element deposits (see Bokan Mountain section, this report).

AREA 13, SOUTHERN PART OF DALL ISLAND AND LONG ISLAND

The southern part of Dall Island and Long Island are underlain by Late Proterozoic and Lower Cambrian rocks of the Wales Group. The group comprises an assemblage of greenstone, greenschist, black phyllite (locally containing sulfide-rich horizons), quartz-sericite schist, metakeratophyre, and minor marble (unit eZwg, plate 1) and an assemblage of marble and minor calc-silicate rocks (unit eZwm). Rocks of both assemblages are intruded by metagranodiorite-diorite-gabbro suites (units eqd, egb). Rocks of the Wales Group were thrust over Ordovician and Silurian strata of the Descon (unit SOdg) and Heceta (units Shl, Shc) Formations. The youngest rocks in the area are Cretaceous granodiorite (unit Kwgd).

Prospects in the Twin Peaks area in the southern part of Dall Island are the Mount Vesta prospect (A of area 13, table 7, plate 1), which contains tetrahedrite, chalcopyrite, galena, and sphalerite in veinlets and seams in limestone near the contact with granite (Berg, 1984), and the Lucky Strike prospect (B of area 13), where chalcopyrite and pyrite are in a shear zone in schist (Berg, 1984). Many gold claims are near the McLeod Bay prospect (D of area 13), where chalcopyrite, pyrite, galena, and visible gold are in quartz veins and stringers in shear zones in schist (Berg, 1984). The Security Cove area (C of area 13) contains stratabound massive sulfide copper-lead-zinc and silver deposits having grades of as much as 1 percent Cu, 8 percent Zn, 4 percent Pb, and 2 ounces of silver per ton (62.6 g/t); these deposits are very similar to mineral occurrences in the Coning Inlet area on Long Island (area E) (Berg, 1984).

Aeromagnetic highs (J. Wynn, unpub. data, 1990) within the southern part of Dall Island and the western edges of Long Island delineate exposed and inferred intrusive rocks (units Kwgd, SOpx, eqd, egb, plate 1). Near–surface fractures, which are common within the thermal aureole of intrusions, together with the reported mineral occurrence in veins and the anomalies for copper, lead, zinc, cadmium, silver, gold, arsenic, antimony, and bismuth (table 7), suggest the potential for polymetallic vein (model 22c) and low-sulfide gold-quartz vein (model 36a) deposits. The suite of copper, zinc, cadmium, and silver (table 7) may delineate areas within the Wales Group that contain reported sulfide-rich horizons and thus suggest the potential for massive sulfide deposits (model 28a). The suite of molybdenum, tin, and tungsten, together with copper, lead, zinc, silver, gold, arsenic, and antimony, suggests a potential for skarn-related deposits (model Z).

Copper, gold, and silver anomalies in stream sediments are associated with intrusive pyroxenite and gabbro (unit SOpx, plate 1) and suggest a potential for magmatic oxide-sulfide deposits (model Y) that are commonly accompanied by traces of platinum-group elements, gold, and silver. Erosion of these deposits can produce placers of platinum-group elements, gold, and silver (see discussion of the Mallard Bay area (area 20)).

AREA 14, WATERFALL

Devonian sedimentary (graywacke, mudstone, and siltstone) and volcanic rocks (agglomerate, pillow basalt, and aquagene tuff) of the Port Refugio Formation (units Dpr, Dprv, plate 1) underlie the Waterfall geochemically anomalous area.

An aeromagnetic high (J. Wynn, unpub. data, 1990), together with the anomalous suite of copper, molybdenum, gold, silver, antimonly, lead, zinc, beryllium, and rare earth elements (lanthanum, niobium, and yttrium), in the northern two-thirds of the Waterfall anomalous area suggests a potential for porphyry copper (model 17) and polymetallic vein (model 22c) deposits. Sample sites 21 and 22 have an anomalous suite of lead, zinc, cadmium, gold, silver, bismuth, and antimony that suggests a potential for kuroko-type massive sulfide deposits (model 28a).

AREA 15, SUKKWAN ISLAND

On Sukkwan Island, three plutons of undivided granitic rocks (unit Kwqo, plate 1), leucosyenite (unit Phsy), and gabbro and associated mafic rocks (unit SOpx) intrude graywacke and banded mudstone, siltstone, and argillite (unit SOdg) and marine andesitic to basaltic rocks (unit SOdb). Zones of hornfels have developed adjacent to the intrusive bodies. An aeromagnetic high (J. Wynn, unpub. data, 1990) is centered over the intrusive rocks.

The Flat Island mine (A of area 15, table 7, plate 1) produced a few thousand dollars worth of gold in 1900 (Berg, 1984). The Gould prospect (area B) is in schist, in places pyritic, that is veined with stringers of chalcopyrite and pyrrhotite. The Lakeside prospect (area C) contains chalcopyrite-bearing rock in shear zones along the contact between pyroxenite and greenstone (Berg, 1984).

The anomalous elements lanthanum, niobium, ytrrium, beryllium, and thorium (table 7) in areas where Paleozoic sedimentary (unit SOdg, plate 1) and Paleozoic volcanic rocks (unit SOdb) are intruded by leucosyenite (unit Phsy) suggest the possibility for felsic plutonic-related uranium, thorium, and rare earth element deposits (model X). The lead, zinc, molybdenum, tin, and tungsten anomalies in area 15 suggest possible skarn deposits (model Z) in contact-metamorphosed hornfels. The geological environment, reported mineral occurrences, and reported resources of gold and copper (table 7), together with the anomalies of lead and zinc (table 7), suggest that polymetallic vein deposits (model 22c) may be present within the thermal aureole of the plutons. In the vicinity of the Gould prospect (B of area 15, plate 1), pyrite-bearing schist and stratiform stringers and lenses of chalcopyrite and pyrrhotite (Berg, 1984) suggest a potential for kuroko-type massive sulfide deposits (model 28a). Pyroxenite and gabbro (unit SOpx) could be a host source for magmatic oxide-sulfide deposits (model Y), as well as a source for placers of platinum-group elements, gold, and silver (model 39b; see discussion of Mallard Bay area (20)).

AREA 16, ONSLOW, ETOLIN, AND BROWNSON ISLANDS

On the Onslow, Etolin, and Brownson Islands, Paleozoic and Mesozoic metasedimentary and metavolcanic rocks (unit cgms, plate 1), Cretaceous granitic rocks (units Krtn, Krtp), and hornfelsed sedimentary rocks (unit Tsh) are intruded by Tertiary granitic rocks (units Tme, Tge). Anomalous molybdenum, tin, tungsten, arsenic, and animony suggest potential for tungsten-skarn, tungsten-vein, and polymetallic-vein (models 14a, 15a, 22c) deposits.

AREA 17, UNION BAY

In the Union Bay area, dunite, pyroxenite, and peridotite of a Cretaceous concentrically zoned ultramafic complex (unit Kkdu, plate 1) intrude both intrusive rocks of gabbro and diorite (unit Kkgu) and metasedimentary rocks of phyllitic mudstone, siltstone, grit, conglomerate, and minor limestone (unit cgms). Hornfels is adjacent to the intrusive bodies. The ultramafic complex is a concentrically zoned pipe and lopolith, 3–5 mi (4.8–8.1 km) in diameter, that grades from a core of dunite and peridotite to a border of hornblende clinopyroxenite. The Union Bay anomalous area of the complex is delineated by an extreme, intense aeromagnetic anomaly (J. Wynn, unpub. data, 1990).

The known mineral occurrence (A of area 17, table 7, plate 1) consists of magmatic segregations of titanium-rich magnetite and chromite in the ultramafic complex. Magnetite is a primary constituent of the pyroxenite and is present with chromite as disseminated crystals in dunite. Chromite also is present in discontinuous stringers in dunite. Anomalous amounts of platinum-group element metals are present with magnetite and chromite in dunite; assays of handpicked chromite average 0.093 ppm Pt, 0.200 ppm Pd, 0.062 ppm Rh, and 0.215 ppm Ir (Berg, 1984). The Union Bay deposit is estimated to contain about a billion tons of material containing 18–20 percent Fe and significant amounts of vanadium (Nokleberg and others, 1987).

Anomalous amounts of gold at sites 1, 2, and 3 of area A (table 7) suggest that there may be two areas of gold-mineralized rock and possibly two separate sources. Sites 1 and 2 receive their source material from streams that have headwaters in the Ketchikan quadrangle to the east. The unnamed southeast-trending fault that extends from Etolin Island through Vixen Inlet into the drainage basins of sites 1 and 2 is a plausible source for mineralization. Site 3 receives its source material from a north-flowing stream that has its headwaters in the Craig quadrangle and drains metasedimentary rocks (unit cgms, plate 1) intruded by gabbro and diorite (unit Kkgu) that in turn is intruded by dunite, pyroxenite, and peridotite (unit Kkdu).

The geologic units, the aeromagnetic anomaly, the anomalous amounts of copper, lead, gold, silver, arsenic, and antimony, and the high concentrations of chromium (1,000–5,000 ppm), vanadium (500–1,000 ppm), and iron (15–20 percent), as well as the known occurrences of platinum-group element metals associated with magnetite and chromite, suggest a potential for Alaskan platinum-group element deposits (model 9). Other Alaska platinum-group element deposits in southeast Alaska are Duke Island (lat 54°55′ N., long 131°21′ W.; Prince Rupert quadrangle), Klukwan (lat 59°26′ N., long 134°54′ W.; Skagway quadrangle), and Salt Chuck mine (lat 55°38′ N., long 132°34′ W.; Craig quadrangle). These deposits, and the Union Bay area, have a similar geochemical signature, geological environment, and aeromagnetic signature. Alluvial, beach, and offshore sediments have potential for placer deposits of gold, titanium, platinum-group elements, magnetite, and chromite (models 39a, 39b, 39c).

AREA 18, HELM BAY AND CAAMANO POINT

In the Helm Bay and Caamano Point area, quartz diorite and granodiorite in sills, dikes, stocks, and diapirs (unit Krtn, plate 1) intrude metasedimentary rocks and volcanic rocks. Stocks commonly are zoned from a garnet-bearing porphyritic quartz diorite border to a granodiorite core. The metasedimentary rocks consist of thinly bedded phyllitic mudstone, siltstone, grit, conglomerate, and minor limestone. Phyllitic rocks grade northeastward into schist. The volcanic rocks are andesitic and basaltic metatuff and agglomerate. The northeast boundary of this area is an unnamed high-angle fault of unknown displacement. The fault, which appears as a topographic low or lineament, runs northwest through Helm Bay to Union Bay.

Numerous gold mines (A–E of area 18, table 7, plate 1) and prospects (F–M of area 18) containing gold, silver, copper, lead, bismuth, and antimony resources are reported within this area (table 2) (Berg, 1984). Gold, pyrite, and chalcopyrite and lesser amounts of galena, sphalerite, and tetrahedrite are present as disseminations and individual veins, veinlets, stringers, stockworks, fissure veins, and fracture fillings within granodiorite, metamorphosed upper Paleozoic to Mesozoic phyllitic flysch, and andesitic tuff (Berg, 1984; Nokleberg and others, 1987). With few exceptions, epigenetic base- or precious-metal-bearing vein deposits in southeast Alaska are in or near major high-angle faults or topographic lineaments presumed to be faults (Twenhofel and Sainsbury, 1958). The other principal geological processes favoring the formation of the epigenetic base- or precious-metal-bearing vein deposits in southeast Alaska are regional metamorphism and intrusive activity (Berg, 1984).

Comparison of geology and structures within this area with the anomalous suite of elements and known occurrences listed in table 7 suggests that this area has a potential for epigenetic base- or precious-metal-bearing vein deposits (models 22c, 36a), disseminated antimony and sulfide deposits (model 27e), and stibnite quartz veins (model 27d). In the Helm Bay area, alluvial, beach, and offshore sediments have a potential for placer gold deposits (model 39a).

AREA 19, BARRIER ISLANDS AND NICHOLS BAY

The Barrier Islands and Nichols Bay area consists of granitic rocks (units Odi, Ogd, plate 1), lower Paleozoic clastic sedimentary rocks of the Karheen Formation (units Dkkt, Dkcg), and lower Paleozoic volcanic rocks of the Descon Formation (units SOdr, SOdb).

The reported occurrences (A–I of area 19, table 7, plate 1) (Gehrels, Berg, and Saleeby, 1983; Berg, 1984; Nokleberg and others, 1987) contain disseminated to massive pyrite and minor sphalerite, galena, and arsenopyrite in zones as much as a few meters in width and 3 m in thickness in Ordovician and Silurian fragmental volcanic rocks and siliceous black shale. The Ranger prospect (J of area 19) consists of altered volcanic rocks cut by granitic dikes and by quartz veins that contain irregular bunches of magnetite, chalcopyrite, and pyrrhotite (Berg, 1984).

Selected grab samples from the occurrences contain as much as 10 percent Zn, 1,500 ppm Pb, 30 ppm Ag, >5,000 ppm Ba, 1,000 ppm Cu, and 0.25 ppm Au. The anomalous suite of lead, zinc, cadmium, barium, and silver detected in sediments and the geological environment suggest that this area has potential for massive sulfide deposits (model 28a).

AREA 20, MALLARD BAY

The Mallard Bay area contains quartz monzonite and granite (438±4 Ma; unit SOqm, plate 1), quartz syenite and granite (438±5 Ma; unit SOsy), and associated small intrusive bodies of pyroxenite and gabbro (440–400 Ma; unit SOpx) (Brew, in press). These rocks have intruded Middle and Late Ordovician hornblende quartz diorite, diorite, and quartz monzonite (445±5 Ma; unit Oqd) and Middle(?) and Late Ordovician foliated and layered hornblende diorite, quartz diorite, and heterogeneous diorite and gabbro (446±5 Ma and 480–460 Ma; unit Odi) (Brew, in press).

One mine and several prospects have been reported within the Mallard Bay area. The Nelson and Tift mine (A of area 20, table 7, plate 1) contains massive and disseminated pyrite, chalcopyrite, and bornite lenses in a septum of marble and other calcareous rocks in quartz diorite (Berg, 1984). The Gardner Bay, McLean Arm, Mallard Bay, and Stonerock Bay prospects (B, C, G, and H of area 20) contain radioactive minerals in pegmatite, quartz diorite, and quartz-hematite veins (Berg, 1984). The Spik and Polson-Ickis prospects (D and E of area 20) contain bornite, chalcopyrite, pyrrhotite, hematite, and gold as irregular masses in greenstone (D) and in quartz-calcite veins in faults in monzonite (E) (Berg, 1984). The Feickert prospects (I and J of area 20) consist of chalcopyrite-bearing quartz veins in andesitic greenstone at one prospect (I) and in granite and quartz diorite at the other prospect (J).

The suite of anomalous elements uranium, thorium, lanthanum, niobium, yttrium, molybdenum, and beryllium in sediments collected during AMRAP and NURE surveys associated with the numerous prospects containing radioactive minerals suggests a potential for uranium, thorium, and rare earth elements in deposits in felsic igneous rocks and in related veins (model X). The near-surface fractures and numerous faults in the thermal aureole of the intrusive rocks, together with the anomalous amounts of copper, lead, zinc, cadmium, silver, bismuth, and molybdenum (table 7), suggest potential for polymetallic vein (model 22c) and possibly porphyry molybdenum (model 21b) deposits.

The small intrusive bodies of pyroxenite and gabbro (unit SOpx, plate 1) in this area and in the southern part of the Dall Island–Long Island and Sukkwan Island areas (areas 13 and 15, table 7, plate 1) of the Dixon Entrance quadrangle contain sulfide minerals and as much as 10 percent magnetite. These intrusive rocks and the intrusive rocks (unit SOpx) in the Salt Chuck area (36) host deposits of copper, gold, silver, and platinum-group elements and have similar geochemical suites. Thus, the pyroxenite and gabbro intrusive bodies in the Dixon Entrance quadrangle may have potential for magmatic oxide or sulfide deposits (model Y) accompanied by trace platinum-group elements, gold, and silver. Placers containing traces of platinum-group elements, gold, and silver (model 39b) could be expected to form from the erosion of the pyroxenite and gabbro within the study area. Onshore alluvial placers and coastal offshore marine placers of uranium, thorium, and rare earth elements could form from erosion of radioactive minerals and rare earth elements associated with the felsic plutonic rocks in the area (model W). Similar placers could be present in the Sukkwan Island (15), Hessa Lake (21), Bokan Mountain (23), Kassa Inlet (26), Dora Bay (31), and Sunny Hay Mountain (40) areas (table 7, plate 1).

AREA 21, HESSA LAKE

The Hessa Lake area contains Middle Ordovician granitic rocks (unit Ogd, plate 1) and Late Ordovician granitic rocks (Oqd) that have been intruded by Late Ordovician and Early Silurian quartz monzonite and granite (SOqm).

The suites (table 7) uranium, thorium, lanthanum, niobium, beryllium, and yttrium; molybdenum, tin, and tungsten; and copper, lead, zinc, cadmium, gold, arsenic, antimony, and bismuth suggest that this area may contain felsic plutonic-related uranium-thorium and rare earth element deposits and related veins (model X), skarn-related deposits (model Z), porphyry molybdenum deposits (model 21b), and polymetallic vein deposits (model 22c).

AREA 22, HUNTER BAY

Of the eight geochemically anomalous sites for the Hunter Bay area shown on plate 1 and listed in table 7, three contain gold. The gold anomalies, together with anomalous amounts of zinc, cadmium, silver, and arsenic and uranium, thorium, and rare earth elements, suggest polymetallic deposits (model 22c) associated with felsic plutonic-related uranium-thorium-rare earth element deposits and related vein deposits (model X) within the Ordovician granitic rocks (units Odi, Ogd, plate 1).

AREA 23, BOKAN MOUNTAIN

Plutonic rocks consisting primarily of quartz granodiorite (unit Ogd, plate 1) and quartz monzonite (unit SOqm) are exposed in the Bokan Mountain area. A stock of coarse-grained peralkaline granite (unit Jbgr) has intruded these older plutonic rocks and Paleozoic sedimentary (unit SOdg) and volcanic (unit SOdb) rocks.

The uranium-thorium deposits and rare earth element-bearing minerals in the Bokan Mountain area (B–H of area 23) are mainly in or near a 3-mi^2 (4.8 km^2) boss of Jurassic peralkaline granite (unit Jbgr; peralkaline granite of Bokan Mountain, plate 1). Most of the uranium-thorium deposits that have been mined were hydrothermal veins or replacement bodies in or near fractures; a few were concentrations of accessory minerals in the granite or in dikes; and some consisted of hydrothermal minerals in the interstitial fractures of the country rock. The peralkaline granite of Bokan Mountain has received considerable research attention because of its uranium-thorium and rare earth element mineralization and anomalous peralkaline composition (MacKevett, 1963; Thompson and others, 1982; Saint-Andre and others, 1983; Thompson, 1988; Warner and Barker, 1989).

Geochemical sampling (table 7, plate 1) detected the known uranium-thorium and rare earth element deposits within this area. The geochemical sampling programs also add credence to MacKevett's (1963) findings that lead, zinc, gold, silver, bismuth, arsenic, antimony, molybdenum, tin, and tungsten are associated with the uranium-thorium- and rare earth element-mineralized rock.

AREA 24, HIDDEN BAY

In the Hidden Bay area felsic plutonic rocks (unit SOqm, Kwqo, plate 1) intrude graywacke (unit SOdg) and volcanic rocks (units SOdr, SOda) of the Descon Formation.

Anomalies for lanthanum, niobium, yttrium, beryllium, uranium, molybdenum, tin, and tungsten verify the presence of felsic plutons and suggest potential for plutonic-related uranium-thorium and rare earth element vein deposits (model X). The suite of copper, lead, silver, arsenic, bismuth, and antimony suggests a potential for polymetallic vein deposits (model 22c) within the thermal aureole of the felsic intrusions.

AREA 25, WEST ARM OF MOIRA SOUND

The West Arm of Moira Sound contains Paleozoic granitic rocks (units Ogd, Oqd, plate 1), graywacke (units SOdg, SOdb) of the Descon Formation, and clastic rocks (unit Dkkt) of the Karheen Formation. These units have been intruded by intrusive rocks (units Kwgd, Kwqo) of the Chilkat–Prince of Wales plutonic belt. The suites of zinc, lead, copper, silver, arsenic, and antimony and molybdenum, tin, tungsten, and beryllium (table 7) suggest the potential for zinc-lead skarn (model 18c), polymetallic vein (model 22c), and porphyry molybdenum (model 21b) deposits within and adjacent to the thermal aureoles of the intrusive rocks.

AREA 26, KASSA INLET

In the Kassa Inlet area, rocks of the Late Proterozoic and Lower Cambrian Wales Group (units eZwg, eZwgb, plate 1) have been thrust under Paleozoic metasedimentary and metavolcanic rocks. The Paleozoic rocks have been intruded by small leucodiorite plutons (unit Sld) and intrusive rocks (units Kwgd, Kwgb) of the Chilkat–Prince of Wales plutonic belt.

The anomalous suite of lanthanum, yttium, niobium, beryllium, uranium, and thorium at sites 18–22 of area 26 (table 7, plate 1) delineates the known small leucodiorite plutons and suggests a potential for felsic plutonic-related uranium-thorium and rare earth element deposits and related vein deposits (model X). The anomalous suites of copper, lead, zinc, silver, antimony, bismuth, and gold and molybdenum, tin, and tungsten suggest a potential for polymetallic vein (model 22c), porphyry molybdenum (model 21b), and possible skarn-related (model Z) deposits within and adjacent to the thermal aureoles of the felsic intrusions (units Ogd, Sld, Kwgb, Kwgd). The suite of copper, zinc, cadmium, barium, silver, and antimony associated with rocks of the Wales Group, which contain sulfide lenses, suggests a potential for kuroko-type massive sulfide deposits (model 28a).

AREAS 27 AND 28, MOUNT JUMBO AND NUTKWA LAGOON

The Mount Jumbo (27) and Nutkwa Lagoon (28) areas are underlain by rocks of the Late Proterozoic and Lower Cambrian Wales Group (units eZwg, eZwm, plate 1) and Lower Ordovician through Lower Silurian Descon Formation (unit SOdg) that are cut by Cretaceous granitic rocks (units Kwqo, Kwgd).

The Craig A–2 quadrangle, in which these two areas are located, has undergone extensive geochemical and mineral appraisal studies by the State of Alaska (Herreid and others, 1973, 1978). The areas contain numerous mines and prospects, some of which have reported production of copper, gold, and silver (table 7, plate 1). The known mineral deposits are in metasomatic skarns, massive sulfide lenses, dolomitic replacement, and polymetallic veins that cut bedded rocks. Most of the massive sulfide occurrences are hosted in the Wales Group (Herreid and others, 1978). The geology, geochemistry, mines, and prospects of the Craig A–2 quadrangle are discussed in detail by Herreid and others (1978).

AREA 29, NIBLACK ANCHORAGE

In the Niblack Anchorage area, greenstone, greenschist, black phyllite, quartz-sericite schist, metakeratrophyre, and minor marble of the upper part (unit eZwg, plate 1) of the Wales Group are a window within the Descon Formation (unit SOdg) and have been cut by an intrusive body (unit Kwqo).

The Niblack Mine and six prospects (A–F of area 29) contain resources of silver, gold, copper, lead, and zinc (table 7). The Niblack mine (A) contains disseminations of lenticular masses of chalcopyrite and pyrite accompanied by lesser amounts of sphalerite, galena, hematite, and magnetite (Berg, 1984). The sulfide minerals are mainly in layers of quartz-sericite rocks derived from felsic volcanic or other volcanic-related rocks. These rocks, in turn, are intercalated with intermediate or mafic metavolcanic rocks (Nokleberg and others, 1987).

The Navaho (Hope) and Westlake prospects (B and C of area 29) contain quartz veins in silicified porphyritic diorite and chloritic schist, near contacts between granite and schist, and in quartz-sericite schist. These veins contain pyrite, chalcopyrite, sphalerite, galena, and free gold (Berg, 1984; Nokleberg and others, 1987). The Wakefield and Dama prospects (D and F of area 29) contain lenticular masses of chalcopyrite in a belt of mineralized schist and lenticular bodies of massive sulfides in quartz-sericite schist (Berg, 1984; Nokleberg, 1987).

Nokleberg and others (1987) classified this area as having a potential for kuroko-type massive sulfide deposits (model 28a). The suite of copper, lead, zine, gold, silver, and arsenic and the descriptions of the Niblack mine (table 7) (Herreid, 1964; Berg, 1984) and the Wakefield, Edith M, Lookout, and Dama prospects (table 7) support this conclusion.

The suite of copper, lead, zinc, gold, silver, and arsenic and the descriptions of the Navaho and Westlake prospects suggest potential for polymetallic vein (model 22c) and low-sulfide gold-quartz vein (model 36a) deposits.

AREA 30, DOLOMI–DUTCH HARBOR

Greenstone, greenschist, black phyllite, quartz sericite schist, metakeratophyre, marble, and minor calc-silicate rocks (units eZwg, eZwm, plate 1) of the Late Proterozoic and Lower Cambrian Wales Group underlie the Dolomi–Dutch Harbor area. Four mines (Cymru, Valpariso, Golden Fleece, and Fortune; A–D of area 30, table 7, plate 1) produced gold and silver (some assays of 81–341 g/t Ag and 1.7–143 g/t Au) (Nokleberg and others, 1987). Other resources from these mines are copper, lead, and zinc. Approximately two dozen prospects in the area contain gold, silver, copper, and lead (E–R of area 30).

Prospects E–I consist of quartz-calcite-graphite veins in limestone containing pyrite, chalcopyrite, gold, and silver (Berg, 1984). Prospects J–M consist of irregular quartz fissure veins containing pyrite, tetrahedrite, and gold in silicified and dolomitized marble cut by postmineralization diabase dikes (Berg, 1984). Many of these veins are localized along a conjugate(?) system of Cenozoic(?) faults subsidiary to the Clarence Strait fault zone (Nokleberg and others, 1987). Prospects N–R consist of quartz veins, quartz-calcite-breccia veins, and quartz-calcite-graphite veins in greenstone, schist, limestone, and marble that contain native copper and gold, sphalerite, galena, chalcopyrite, pyrite, and gold and silver minerals.

The suites of gold, silver, copper, and arsenic; gold, silver, copper, lead, and zinc; and molybdenum, tin, and rare earth elements and the descriptions of the form and controls of the known occurrences and their reported resources suggest polymetallic vein (model 22c), low sulfide-gold-quartz vein (model 36a), and possibly polymetallic replacement (model 19a) deposits.

AREA 31, DORA BAY

Syenite plutons (unit Jbsy, plate 1) in the Dora Bay area cut metasedimentary (unit eZwm) and metavolcanic rocks (unit eZwg) of the Late Proterozoic and Lower Cambrian Wales Group. Eudialyte-bearing nepheline syenite and associated pegmatites containing rare earth element minerals (A of area 31) have been reported between Dora Bay and Cholmondeley Sound (Eberlein and others, 1983), and rare earth element- and yttrium-bearing pegmatite dikes have also been reported (Barker and Mordock, 1990). Quartz-calcite breccia veins in limestone and schist contain sphalerite, galena, chalcopyrite, pyrite, gold, and silver at the Lucky Boy prospect (B of area 31).

The presence of syenite, the known rare earth element occurrences, and the favorable geochemistry (table 7, sites 1–3 of area 31) suggest the potential for felsic plutonic-related uranium-thorium and rare earth element deposits and related vein deposits (model X). The suite of silver, lead, bismuth, arsenic, zinc, and cadmium and the mineral occurrences at the Lucky Boy prospect suggest the potential for polymetallic vein deposits (model 22c).

AREA 32, SOUTH ARM OF CHOLMONDELEY SOUND

The South Arm of Cholmondeley Sound is underlain by Late Proterozoic and Lower Cambrian rocks of the Wales Group. The group comprises an assemblage of greenstone, greenschist, black phyllite (locally containing sulfide-rich horizons), quartz-sericite schist, metakeratophyre, marble, and minor calc-silicate rocks (units eZwg, eZwm, plate 1).

The Moonshine mine (A of area 32) contains lenses as much as a few meters in width of galena, sphalerite, minor chalcopyrite, and accessory pyrite and siderite in dolomitized veins cutting marble and metasedimentary rocks (Berg, 1984). The Friendship and Research prospects (B of area 32) contain irregularly distributed bunches of chalcopyrite and bornite along a fault contact between schistose greenstone and marble (Berg, 1984). The suite of copper, lead, zinc, silver, and antimony and these occurrences suggest the potential for polymetallic replacement deposits (model 19a). Pyrite-bearing schist at the Ketchikan Copper Co. prospect (C of area 32) contains zones of chalcopyrite and gold, silver, and possible galena (Berg, 1984). The Wales Group rocks (locally containing sulfide-rich horizons), the pyrite- and metal-rich schists at the Ketchikan Copper Co. prospect, and the anomalous amounts of copper, lead, zinc, barium, silver, and gold suggest the potential for massive sulfide deposits (model 28a).

Antimony deposits (models 27d, 27e) may be present along a fault zone extending from the mouth of the South Arm of Cholmondeley Sound to the mouth of Kassa Inlet that is marked by a linear array of antimony anomalies.

AREA 33, McKENZIE INLET

The McKenzie Inlet area is underlain by greenstone, greenschist, black phyllite (locally containing sulfide-rich horizons), quartz-sericite schist, metakeratophyre, and minor marble (unit eZwg, plate 1) of the Wales Group.

The Khayyam and Stumble On mines and several prospects (A–E of area 33) outline one of the most significant areas for metalliferous lode deposits in Alaska (Nokleberg and others, 1987). Tables 2 and 7 summarize the deposit descriptions. Fosse (1946), Barrie (1984a, b), Berg (1984), and Nokleberg and others (1987) suggested that deposits in this area are kuroko-type massive sulfide (model 28a).

AREA 34, KINA COVE

In the Kina Cove area, Paleozoic volcaniclastic graywacke, mudstone turbidites, minor sedimentary breccia, limestone, and polymictic conglomerate (unit SOdg, plate 1) have been intruded by diorite and related rocks (unit SOdi) and intrusive rocks (unit Kwgd) of the Chilkat–Prince of Wales plutonic belt. The anomalous amounts of copper, lead, barium, gold, silver, arsenic, bismuth, molybdenum, tungsten, and beryllium at sites 1–13 (table 7, plate 1) and the possible copper, gold, and silver resources reported from the five known occurrences in the area suggest potential for copper and iron skarn (models 18b, 18d) and polymetallic vein (model 22c) deposits.

AREA 35, KASAAN PENINSULA

The Kasaan Peninsula area is underlined by a mafic metaigneous complex (unit SOdi, plate 1) that intrudes volcanic and associated volcaniclastic rocks of the andesitic breccia of Luck Creek (unit SObl) and sedimentary rocks (unit SOdg) of the Descon Formation. The igneous complex consists of diorite migmatite, irregular intrusive bodies of hornblende and (or) quartz diorite containing chlorite and magnetite, trondhjemite, and minor pyroxenite, all cut by mafic and felsic dike swarms (Eberlein and others, 1983). The andesitic breccia of Luck Creek consists of andesitic breccia and andesite porphyry fragments in an indurated matrix of andesite tuff.

Numerous mines (A–K of area 35) and prospects (L–Z) in the area have recorded production of 245,000 metric tons of ore containing 5.81 million kilograms of copper, 215,800g gold, and 1.74 million grams of silver, and an estimated 2.7 million metric tons of ore remains (Nokleberg and others, 1987). Many contorted tabular masses of magnetite, chalcopyrite, and pyrite are along a 13-mile-long (21 km) belt. These masses are along contacts between lower Paleozoic calcareous sedimentary rocks and in mafic metavolcanic rocks adjacent to irregular dikes, sills, and plugs of Ordovician or Silurian diorite, quartz monzodiorite, and mafic dikes. Skarns contain magnetite, chalcopyrite, and pyrite, all containing gold and silver (Warner and others, 1961; Myers, 1984). Nokleberg and others (1987) reported that the Kasaan Peninsula area is one of 262 significant metalliferous districts of Alaska. A summary description of the district is given in table 2, and its location is shown in figure 4.

Stream-sediment and concentrate samples collected throughout the Kasaan Peninsula contain highly anomalous amounts of copper; many of the concentrates contain more than 2 percent Cu (McDanal and others, 1991 Cathrall, Arbogast, and others, 1993; Cathrall, McDanal, and others, 1993). At some sites where copper is anomalous, gold (0.35–5.3 ppm), silver (5–200 ppm), and iron (>20 percent) are also anomalous. Table 7 lists other anomalous elements in the area.

The combination of the geological environment, known occurrences, and tectonic setting, together with the geochemical signature (copper, gold, silver, iron) and a strong aeromagnetic anomaly, suggests that this area has a potential for iron and copper skarn deposits (models 18d, 18b).

AREA 36, SALT CHUCK

The Salt Chuck area is underlain by a discordant pipe-like intrusion (unit SOpx, plate 1) of variably textured olivine-bearing pyroxenite and gabbro transitional into diorite. This intrusion, the dioritic rocks (unit SOdi), and the hornblende granodiorite intrusion (unit Kwgd) cut volcaniclastic graywacke and mudstone turbidites (unit SOdg) of the Descon Formation.

Several mines and prospects are in the area (A–F of area 36). Nokleberg and others (1987) reported that the Salt Chuck mine area is one of the most significant lode deposit areas of southeast Alaska. A summary description is given in table 2, and its location is shown on figure 4. The mafic intrusion hosts copper, gold, silver, and platinum-group metals of the Salt Chuck mine (B of area 36), as discussed in detail by Howard (1935) and Gault (1945). The North Pole Hill prospect and other prospects in the Salt Chuck area are discussed in detail by Sainsbury (1961). The Rush Brown mine is discussed in detail by Wright and Wright (1908), Wright (1909), and Warner and others (1961). All mines and prospects listed in table 7 for the Salt Chuck area are discussed by Berg (1984).

A comparison of the geochemically anomalous locations in this area (plate 1) with the anomalous suites of elements at the known occurrences (plate 1) and their reported resources (table 7) suggests potential for copper and iron skarn (models 18b, 18d), polymetallic vein (model 22c), synorogenic-synvolcanic nickel-copper (model 7a), and magmatic oxide or sulfide copper-gold-platinum group element (model Y) and (or) Alaskan platinum-group element (model 9) deposits.

AREA 37, SWEETWATER LAKE–THORNE BAY

The Sweetwater Lake–Thorne Bay area is underlain by volcanic and associated volcaniclastic rocks of the andesitic breccia of Luck Creek (unit SObl, plate 1) and by the sedimentary turbidite sequence (unit SOdg) of the Descon Formation. These rocks are intruded by granitic plutons (unit Kwqo) and, in places, by small isolated eruptive centers of basaltic to rhyolitic breccia and tuff (unit QTvb) (Eberlein and others, 1983). Aeromagnetic highs (J. Wynn, unpub. data, 1990) delineate the exposed granitic rocks and suggest that granitic rocks may be buried beneath the Descon Formation in the vicinity of Sweetwater Lake and beneath the volcanic rocks (unit SObl) in the vicinity of Salamander Lake. Together these suggest a linear belt of plutons from Tolstoi Mountain on the south to Sweetwater Lake on the north.

The McCullough mine (A of area 37) near Gold and Galligan Lagoon is the only known occurrence in the area. Within the mine, quartz breccia veins in banded argillite and graywacke contain chalcopyrite, sphalerite, pyrite, and secondary copper minerals (Berg, 1984).

The northern part of the Sweetwater Lake–Thorne Bay area may be continuous with the Coffman Cove–Stevenson Island area in the Petersburg quadrangle where Brew and others (1989) described a volcanogenic massive sulfide mineral resource tract. The Ordovician and Silurian turbidites and volcaniclastic rock formations, mineral occurrences, and anomalous amounts of copper, zinc, cadmium, gold, silver, and arsenic in the Sweetwater Lake–Thorne Bay area are similar to those in the Coffman Cove–Stevenson Island area.

In the vicinity of Gold and Galligan Lagoon and south of Baird Peak, anomalous amounts of gold, silver, antimony, and mercury are within the thermal aureole of the exposed and inferred granitic intrusions (unit Kwqo, plate 1) and the near-surface fractures and breccias that are in the Silurian and Ordovician host rocks (units SOdg, SObl) suggest potential for polymetallic vein (model 22c) and skarn-related (models 18c, 18d, Z) deposits.

Sediments collected by USGS and NURE in Lava Creek, Slide Creek, Sal Creek, and Deer Creek, both north and south of Salamander Lake, contain anomalous amounts of rare earth elements, uranium, and thorium. The southern part of the exposed pluton (unit Kwqo, plate 1) near Baird Peak and the concealed cupola inferred from aeromagnetic data in the Salamander Lake area are possibly alkalic and may be a permissive environment for felsic plutonic-related uranium-thorium and rare earth element deposits (model X). The anomalous uranium, thorium, rare earth elements, base-metal elements, and traces of precious-metal elements in this area are similar to the geochemical signature of the known Bokan Mountain uranium-thorium-rare earth element deposits (Denny, 1962; MacKevett, 1963).

AREA 38, CONTROL LAKE

In the Control Lake area, the sedimentary rocks of the Staney Creek and Tuxekan Passage area (unit DSs, plate 1) overlie the andesitic breccia of Luck Creek (unit SObl) and the Descon Formation (unit SOdg). No mineral occurrences are reported in this area; however, Silurian rocks (parts of units SObl and SOdg) that are present in the Alexander terrane in the Petersburg quadrangle to the north contain volcanogenic massive sulfide deposits (model 24b).

AREA 39, STANEY CONE–KOGISH MOUNTAIN

In the Staney Cone–Kogish Mountain area, an interbedded sequence of limestone, sandstone, mudstone, and polymictic conglomerate (unit DSs, plate 1) overlies massive andesitic to basaltic tuff and breccia (unit SObl), turbidites (unit SOdg) of the Descon Formation, and pyroclastic volcanic rocks (unit SOdb) of the Descon Formation.

No mineral occurrences are reported in this area. Silurian turbidites (unit SOdg, plate 1) and volcanic rocks (unit SObl) present elsewhere in the Alexander terrane in southeast Alaska contain volcanogenic massive sulfide deposits. Anomalous amounts of copper, zinc, cadmium, barium, and silver (table 7) and high values for cobalt, nickel, chromium, and vanadium (McDanal and others, 1991) suggest that volcanogenic massive sulfide deposits (model 24b) are permissive. Anomalous rare earth elements, copper, silver, antimony, bismuth, molybdenum, and tungsten associated with an inferred buried pluton (J. Wynn, unpub. data, 1990) suggest a potential for polymetallic vein (model 22c) and, possibly, porphyry skarn-related (model 18a) deposits.

AREA 40, SUNNY HAY MOUNTAIN

In the Sunny Hay Mountain area, hypidiomorphic granular leucosyenite (unit Phsy, plate 1) consisting of as much as 75 percent alkalic feldspar and plutonic granitic rocks (unit Kwqo) intrude volcaniclastic rocks (unit SOdg) and graywacke, mudstone turbidites, minor sedimentary breccia limestone, and polymictic conglomerate (unit SOdg) of the Descon Formation, andesitic breccia of Luck Creek (unit SObl), limestone and bedded chert of the Peratrovich Formation (unit Mp), and sandstone, siltstone, minor limestone, and conglomerate of the Klawak Formation (unit hk).

Anomalous amounts of lanthanum, niobium, beryllium, molybdenum, zinc, silver, and antimony at a majority of the sites sampled in this area (table 7, plate 1) suggest that the Sunny Hay Mountain area has more felsic rocks than is indicated on the geologic map. Potential for felsic plutonic-related uranium-thorium and rare earth element deposits (model X) is indicated by disseminated uranium, thorium, and rare earth elements in fissure veins, in alkalic dikes in or along the margins of alkalic plutons, or in the plutons.

Anomalous amounts of copper, lead, zinc, cadmium, barium, silver, arsenic, and antimony associated with the rare earth elements and with molybdenum suggest potential for porphyry molybdenum (model 21b) and polymetallic vein (model 22c) deposits within and adjacent to the thermal aureole of the felsic pluton(s).

AREA 41, BLACK BEAR–WOLF–ST. NICHOLAS LAKES

The Black Bear–Wolf–St. Nicholas Lakes area contains outcrops of intrusive rocks of the Chilkat–Prince of Wales plutonic belt. The plutonic units are hornblende quartz monzonite, tonalite, granodiorite, quartz diorite, diorite, quartz monzonite, and monzodiorite (unit Kwqo, plate 1) and hornblende granodiorite, diorite, and hornblende monzodiorite (unit Kwgd). The rocks intrude Paleozoic andesitic breccia (unit SObl), Paleozoic sedimentary clastic rocks (unit SOdg), and Paleozoic volcaniclastic rocks (unit SOdb). Aeromagnetic highs (U.S. Geological Survey, 1984; J. Wynn, unpub. data, 1990) delineate the exposed granitic rocks within the area and suggest that granitic rocks are buried south of Harris River and in the headwaters area of Indian Creek.

There are 8 mines, 26 prospects, and 11 mineral occurrences (table 7, plate 1) reported in the area. Most are polymetallic vein deposits (model 22c). Some are low-sulfide gold-quartz vein (model 36a) and porphyry molybdenum (model 21b) deposits (Berg, 1984; Brew and others, 1991).

Anomalous amounts of lanthanum, niobium, and yttrium, molybdenum, and tin signify granitic rocks in the area and suggest porphyry molybdenum deposits (model 21b). Anomalous amounts of copper, lead, zinc, gold, arsenic, antimony, and bismuth, known resources of copper, lead, zinc, gold, and silver, near-surface fractures and breccias in the thermal aureoles of the granitic intrusions, and numerous gold, silver, and base-metal sulfide veins in the area suggest potential for polymetallic vein (model 22c) and low-sulfide gold-quartz vein (model 36a) deposits.

The anomalous suite of elements listed for sample sites 80–83 (table 7) and the reported resources, minerals, and mine description from the Big Harbor mine (H of area 41, table 7, plate 1) suggest potential for massive sulfide deposits (model 28a) similar to those in other areas of the Late Proterozoic and Lower Cambrian rocks of the Wales Group. The rocks in this area thus may belong to the Wales Group rather than to the Descon Formation.

A potential for placer gold (model 39a) may exist in the Harris River, Maybeso Creek, McGilvery Creek, Indian Creek, Halfmile Creek, and Flagstaff Creek, all in the vicinity of Hollis.

AREA 42, TWELVEMILE CREEK

The Twelvemile Creek area is underlain by greenstone, greenschist, black phyllite (locally containing sulfide-rich horizons), quartz-sericite schist, metakeratophyre, marble, and minor calc-silicate rocks of the Late Proterozoic and Lower Cambrian Wales Group (units eZwg, eZwm, plate 1). Two prospects and three mineral occurrences (table 7, plate 1) have reported potential for copper in chalcopyrite associated with pyrite in greenstone, quartz–sericite schist, and crystalline limestone or marble.

Anomalous amounts of copper, lead, zinc, barium, arsenic, gold, silver, and antimony, the reported potential for copper, and the assemblage of greenstone and quartz-sericite schist locally containing sulfide-rich horizons suggest potential for massive sulfide deposits (model 28a).

OTHER OCCURRENCES

Two mines, Copper City and Lime Point (9 and 11, table 2, fig. 4) are in rocks of the Wales Group on the southern shoreline of Hetta Inlet. The Copper City mine contains recoverable resources of gold, silver, zinc, and copper in a massive sulfide body 0.5–4 ft (0.12 m–1.2 m) thick parallel to bedding in rocks that range from black slate to amphibolite schist. Ore is chalcopyrite, pyrite, and sphalerite (Berg, 1984). The Lime Point mine contains massive barite in limestone interbedded with talc (Berg, 1984).

SUMMARY AND CONCLUSIONS

The reconnaissance geochemical survey of the Craig area in southeast Alaska identified 42 areas of geochemically favorable ground for the presence of metallic occurrences and 22 mineral deposit types that are permissible within the study area. These geochemically favorable areas and deposit types were identified by integrating bedrock geology, economic geology, aeromagnetic surveys, and geochemical data.

The National Uranium Resource Evaluation Program (NURE) geochemical survey data proved useful in helping to identify favorable ground for the presence of uranium-, thorium-, and rare earth element-related occurrences. The NURE geochemical data thus supplement the Alaska Mineral Resource Assessment Program (AMRAP) data.

Sixty–four percent of the favorable areas could contain polymetallic vein deposits; 34 percent onshore alluvial placer and coastal and offshore marine placers; 31 percent massive sulfide deposits; 26 percent porphyry molybdenum and felsic plutonic-related uranium, thorium, and rare earth element deposits; 14 percent copper skarn; 12 percent lead-zinc skarn, skarn-related polymetallic replacement, and low-sulfide gold-quartz vein deposits; 9 percent magmatic oxide and (or) sulfide and iron skarn deposits; 5 percent tungsten skarn and (or) tungsten vein, Climax molybdenum porphyry, porphyry copper, porphyry skarn-related porphyry, and Alaskan platinum-group element deposits; and 2 percent bedded barite, porphyry copper-molybdenum, simple and (or) disseminated antimony, and synorogenic-synvolcanic nickel-copper deposits.

Polymetallic vein deposits are permissible where near-surface fractures and breccias are within the thermal aureoles of the many intrusions in the area. They are peripheral to porphyry systems. The numerous reported quartz-carbonate, gold-silver and base-metal sulfide veins in these areas and the anomalous amounts of gold, silver, copper, lead, zinc, arsenic, bismuth, and antimony in stream-sediment and rock samples support the potential for polymetallic deposits.

Onshore alluvial placer and coastal and offshore marine placer deposits could result from erosion of many of the deposit types expected in the area. Black sand deposits indicative of mafic sources (units SOpx, Kkgu, Kkdu, and Kku, plate 1) and containing elemental gold, platinum-group elements, silver, ilmenite, magnetite, or chromite are possible and could be present in the southern part of Dall Island–Long Island (13), Sukkwan (15), Union Bay (17), and Salt Chuck (36) areas (plate 1). Yellow-sand placer deposits indicative of felsic plutonic-related uranium-thorium and rare earth element sources and containing uranium, thorium, rare earth elements, eudialyte, and monazite could be present in the Sukkwan Island (15), Mallard Bay (20), Hessa Lake (21), Hunter Bay (22), Bokan Mountain (23), Hidden Bay (24), Kassa Inlet (26), Dora Bay (31), Sweetwater Lake–Thorne Bay (37), and Sunny Hay Mountain (40) areas (plate 1). The most favorable areas for gold placers derived from gold-vein-type deposits are in the vicinity of McLeod Bay in the southern part of Dall Island–Long Island (13), Helm Bay (18), and the Black Bear–Wolf–St. Nicholas (41) areas (plate 1).

Known occurrences and geochemical anomalies characteristic of massive sulfide deposits are present throughout the Late Proterozoic and Lower Cambrian rocks of the Wales Group. Geochemical anomalies characteristic of massive sulfide deposits also are present in the Ordovician and Silurian andesitic breccia of Luck Creek and in volcaniclastic rocks, graywacke, and turbidites of the Descon Formation in the Sukkwan Island (15), Barrier Island–Nichols Bay (19), Sweetwater Lake–Thorne Bay (37), Control Lake (38), and Staney Cone–Kogish Mountain (39) areas (plate 1).

Known uranium, thorium, and rare earth element mineral occurrences, geophysical anomalies, and anomalous values for uranium, thorium, and rare earth elements in stream sediments delineate exposed felsic plutonic rocks and suggest buried and (or) unmapped felsic intrusive rocks. Uranium-rare earth element deposits related to felsic intrusive rocks are permissible in 26 percent of the areas. Disseminated uranium, thorium, and rare earth element minerals are present in fissure veins and alkalic granitic dikes in or along the margins of epizonal to mesozonal felsic plutons.

Most of the known molybdenum occurrences within the study area are associated with intrusive rocks of the Chilkat–Prince of Wales plutonic belt (units Kwqo, Kwgd, plate 1) and adjacent country rock. These porphyritic rocks range in composition from tonalite to granodiorite to monzogranite and possibly leucosyenite. Geochemical signatures for porphyry molybdenum deposits are in the Noyes Island (5), Baker Island (9), Suemez Island (10), Forrester Island (11), northern part of Dall Island (12), Mallard Bay (20), Hidden Bay (24), West Arm of Moira Sound (25), Kassa Inlet (26), Sunny Hay Mountain (40), and Black Bear–Wolf–St. Nicholas Lake (41) areas (plate 1).

Skarn and polymetallic replacement deposits may be present in carbonate and calcareous rocks along or near the contacts of the Paleozoic, Cretaceous, or Tertiary intrusions. Geochemical signatures, geological environments, and known occurrences suggest copper skarn deposits in the Noyes Island (5), San Juan Bautista Island (8), Mount Jumbo (27), Kina Cove (34), Kasaan Peninsula (35), and Salt Chuck (36) areas; lead-zinc skarn deposits in the Kosciusko–Marble–Orr–Tukekan–Heceta Islands (3), Noyes Island (5), northern part of Dall Island (12), West Arm of Moira Sound (25), and Mount Jumbo (27) areas; iron skarn deposits in the Mount Jumbo (27), Kina Cove (34), Kasaan Peninsula (35), and Salt Chuck (36) areas; and polymetallic replacement deposits in the Coronation Island (1), northern part of Dall Island (12), Mount Jumbo (27), Dolomi–Dutch Harbor (30), and South Arm of Cholmondeley Sound (32) areas (plate 1).

Small intrusive bodies of pyroxenite and gabbro (unit SOpx, plate 1) and a concentrically zoned ultramafic complex of dunite, pyroxenite, and peridotite (unit Kku) may be the source for platinum-group element mineralization in the Craig area. The pyroxenite and gabbro intrusion in the Mallard Bay (20), southern part of Dall Island and Long Island (13), and Sukkwan Island (15) areas (plate 1) contains sulfide minerals and as much as 10 percent magnetite, and the geochemical suite is similar to that of the Salt Chuck area (36) where these intrusive rocks host deposits of copper, gold, silver, and platinum-group elements. Anomalous platinum-group elements, magnetite, and chromite are in dunite in the Union Bay (17) area (Berg, 1984).

Low-sulfide gold-quartz veins containing gold in massive quartz are in regionally metamorphosed volcanic rocks and metamorphosed graywacke, chert, and shale. The veins are late synmetamorphic to postmetamorphic and locally cut granitic rocks. Areas that contain low-sulfide gold quartz veins are anomalous for arsenic, silver, lead, zinc, and copper in rocks of the Gravina–Nutzotin overlap assemblage in the Helm Bay–Caamano Point area (18) and in black argillitic rocks in the vicinity of the Dawson and Puyallup mines in the Black Bear–Wolf Lake–St. Nicholas Lake (41) area (plate 1). Known occurrences and geochemical anomalies characteristic of gold-quartz-vein deposits are also in the vicinity of McLeod Bay and within the Niblack Anchorage (29) and Dolomi–Dutch Harbor (30) areas (plate 1).

Antimony deposits may be expected in the Caamano Point area (18, plate 1) where stibnite is present in veinlets and irregular masses in brecciated and partly dolomitized and silicified limestone. Antimony deposits may be present along a fault zone extending from the mouth of the South Arm of Cholmondeley Sound to the mouth of Kassa Inlet that is marked by a linear array of antimony anomalies.

Tungsten vein and (or) tungsten skarn deposits may be present in the Onslow, Etolin, and Brownson Islands area (16, plate 1) where anomalies for tungsten, molybdenum, tin, bismuth, and arsenic are associated with granitic rocks, hornfelsed sedimentary rocks, and metasedimentary rocks intruded by Tertiary granitic rocks.

Synorogenic and (or) synvolcanic nickel-copper deposits may be present in the Salt Chuck area (36, plate 1) where pipelike, possibly supergene-enriched, disseminated sulfide minerals are present in a gabbro and pyroxenite stock that intrudes Silurian graywacke. The prospects and mines in the area contain randomly distributed veinlets of bornite, chalcopyrite, native copper, and magnetite and recoverable copper, gold, silver, and platinum-group elements.

Small bedded barite occurrences have been described in the sandstone and conglomerates of the Descon Formation on Saint Ignance Island and in limestone and marble of the Late Proterozoic and Lower Cambrian Wales Group at Lime Point.

A southeast-trending mineral belt from Trocodero Bay to the South Arm of Cholmondeley Sound is suspected to be present in rocks of the Wales Group (units eZwg, eZwm, plate 1) cut by Cretaceous granitic rocks (unit Kwqo). The reported geochemical anomalies, known mineral occurrences, and sulfide-rich horizons locally present within rocks of the Wales Group support the existence of such a belt. The Cretaceous granitic rocks, which form Mount Jumbo, may have remobilized and redistributed mineral deposits within parts of the mineral belt.

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☆ U.S. GOVERNMENT PRINTING OFFICE: 1994–573–038/86046

U.S. DEPARTMENT OF THE INTERIOR

MARCH 3, 1849