



THE KATHLEEN-MARGARET (K-M)
COPPER PROSPECT ON THE
UPPER MACLAREN RIVER
ALASKA

PROPERTY OF
U. S. GEOLOGICAL SURVEY
PUBLIC INQUIRIES OFFICE
SAN FRANCISCO, CALIFORNIA

Prepared in cooperation with the
Department of Mines, Territory of
Alaska.

UNITED STATES DEPARTMENT OF THE INTERIOR

Douglas McKay, Secretary

GEOLOGICAL SURVEY

W. E. Wrather, Director

GEOLOGICAL SURVEY CIRCULAR 332

THE KATHLEEN-MARGARET (K-M) COPPER PROSPECT ON THE
UPPER MACLAREN RIVER, ALASKA

By Robert M. Chapman and Robert H. Saunders

Prepared in cooperation with the
Department of Mines, Territory of
Alaska.

Washington, D. C., 1954

Free on application to the Geological Survey, Washington 25, D. C.

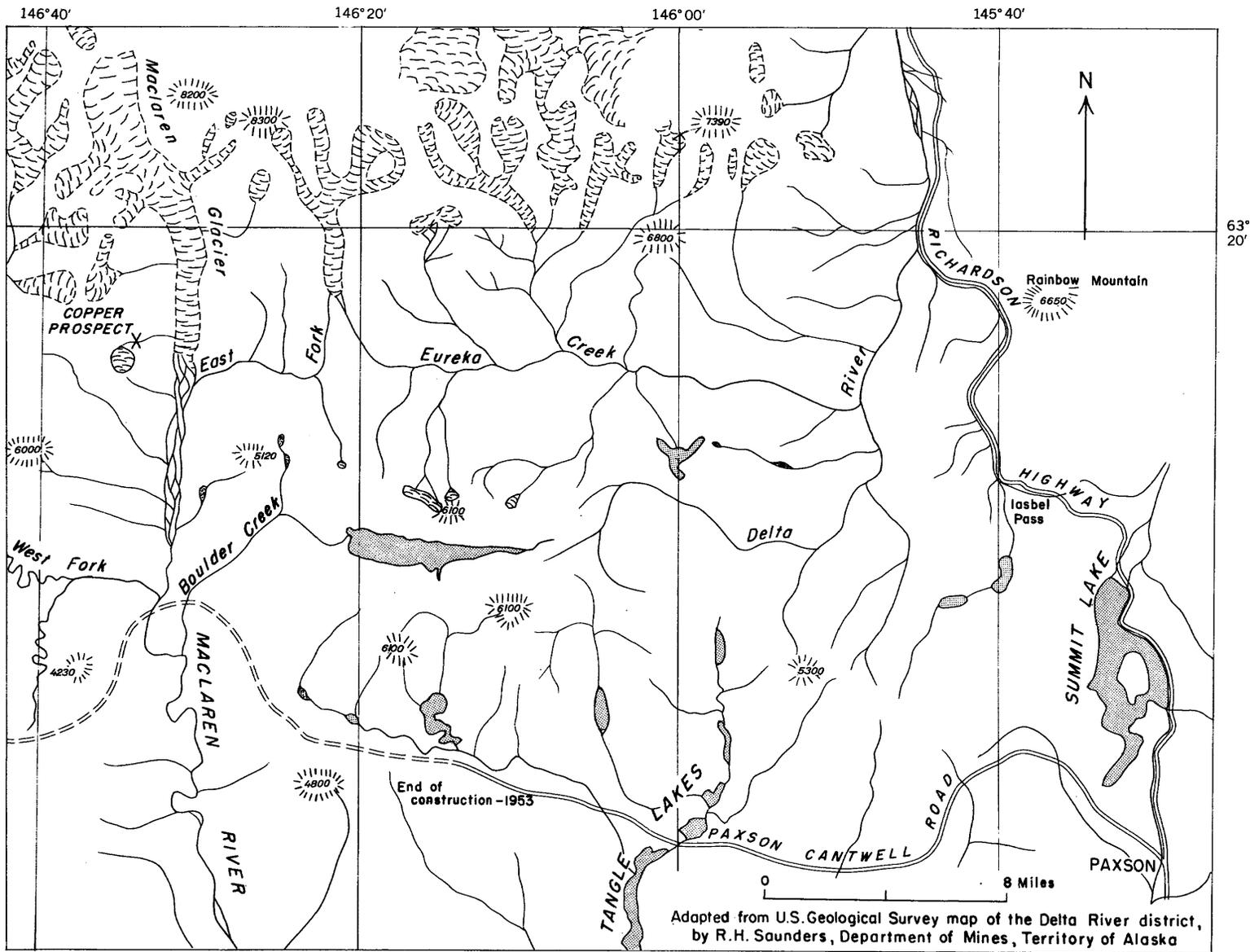


Figure 1.—Map of upper Maclaren River, Alaska.

THE KATHLEEN-MARGARET (K-M) COPPER PROSPECT ON THE UPPER MACLAREN RIVER, ALASKA

By Robert M. Chapman and Robert H. Saunders

CONTENTS

	Page		Page
Abstract.....	1	Geology and mineral deposits.....	2
Introduction.....	1	Geology.....	2
Location and accessibility.....	1	Mineral deposits.....	4
Physical features		Sampling and assays.....	5
and climate.....	2	Conclusion and recommendations.....	5
Property and ownership.....	2	Literature cited.....	5

ILLUSTRATIONS

	Page
Figure 1. Map of upper Maclaren River, Alaska.....	Faces page 1
2. Sketch map of claims showing Albertson-Pettyjohn copper prospect, Maclaren River.....	3

TABLE

	Page
Table 1. Analyses of six samples assayed by the Department of Mines Assay Office at College, Alaska.....	5

ABSTRACT

The Kathleen-Margaret (K-M) prospect is in the Mount Hayes quadrangle on the west side of the Maclaren Glacier about 25 miles south of the peak of Mount Hayes. The proposed route of the Denali Highway is about 9 miles south of the prospect.

Several veins have been discovered on the prospect, but only one appears to be minable. The vein is about 10.5 feet thick; it strikes N. 3°-4° E. and dips 70°-90° W. Along its east wall there is a zone of nearly barren quartz 1.5 to 2 feet thick. The richest ore, samples from which have assayed 30 to 45 percent copper, is confined to a zone about 1.5 to 2 feet thick adjacent to the nearly barren zone. Assays of samples from the remainder of the vein, about 7 feet thick, have ranged from 3.5 to 12.5 percent copper.

INTRODUCTION

In 1950 E. O. Albertson and F. S. Pettyjohn, Jr., of Big Delta, Alaska, formed a partnership and prospected the vicinity of Chistochina, a gold-placer district on the south slope of the Alaska Range about 20 miles east of the Richardson Highway. From Chistochina they gradually worked westward until they reached the Maclaren River drainage. In 1952 Pettyjohn discovered an outcrop of a copper-bearing vein on the west side of the Maclaren Glacier.

From August 11 to 14, 1953, the copper-bearing outcrops and adjacent area were examined by R. M. Chapman of the U. S. Geological Survey and

R. H. Saunders of the Department of Mines, Territory of Alaska. This report is written from notes taken during that examination and from information furnished by Albertson and Pettyjohn.

LOCATION AND ACCESSIBILITY

The Kathleen-Margaret (K-M) copper prospect is in the Mount Hayes quadrangle at latitude 63°17' N. and longitude 146°35' W. By U. S. Geological Survey classification, it is in the upper Susitna valley district of the Cook Inlet region and by the U. S. Bureau of Mines classification, the prospect is in the Valdez Creek subdistrict of the Cook Inlet-Susitna region. The claims lie on the west side of the Maclaren Glacier about 25 miles south of the peak of Mount Hayes. A glacial stream flows along the lower part of the west side of the glacier; it is fed by eastward-flowing tributaries that head in icefields on the ridge west of the glacier. The main outcrop is in the north wall of the gulch that has been eroded by Discovery Creek, named by Albertson and Pettyjohn, the first tributary upstream from the terminus of the glacier. This outcrop is at an altitude of 4,100 feet.

The prospect is about 9 miles north of the proposed route of the Denali Highway between Paxson and Cantwell. The highway is now under construction. The extent of the road at the end of the 1953 working season is shown on figure 1. By the end of 1954 the road probably will be completed as far as the Maclaren River.

An access road from the prospect to the Denali Highway would be 9 to 10 miles long. The flood plain of the Maclaren River probably would provide the best route for the first 7 or 8 miles of the access road. The flood plain consists mostly of coarse well-drained gravel and it appears that the building of a road on the gravel would require little more than clearing boulders from the roadway. A mile or two south of the prospect the road would leave the flats and would be built on the lower slopes on the west side of the river. This part of the road would be more difficult to build, but there are no obstacles that would make the cost of construction prohibitive.

After the necessary roads are built, the prospect will be 50 miles from Paxson, 245 miles from Valdez, and 450 miles from Seward by road. Shipping over the Alaska Railroad would require a truck haul of 105 miles to Cantwell; the distance by rail from Cantwell to Seward is 320 miles.

There are only a few small lakes within 10 miles of the copper prospect, and the nearest lake that is suitable for use by small pontoon-equipped aircraft is situated near the west bank of the Maclaren River about 2.5 miles south of the terminus of the Maclaren Glacier and about 5 miles south of the prospect. Several large lakes, 12 to 20 miles southeast of the prospect area, would be suitable for larger pontoon aircraft.

A landing field large enough for multiengine aircraft could be constructed on the braided flood plain of the Maclaren River. Many stretches of the alluvial gravel between Cottonwood Creek and Maclaren Glacier are nearly smooth and clear enough in their natural state to serve as a landing strip. If a permanent strip is built on the flood plain, it will be necessary to raise the level of the runway surface and possibly to build protective dikes to prevent flooding during extreme high water stages, as channel shifting is frequent in the braided channel areas.

The prospect can be reached conveniently by small pontoon aircraft from one of the lakes along the Richardson Highway to the small lake on the west side of the Maclaren River. Pontoon planes are available for charter at Summit and Meier Lakes.

PHYSICAL FEATURES AND CLIMATE

The upper Maclaren River area is a part of the rugged glaciated south slope of the Alaska Range. The altitudes range from about 3,000 to 8,000 feet and the copper-bearing veins are exposed at altitudes of 3,800 to 4,100 feet. The mountain slopes are predominantly steep, and the average relief is about 2,000 feet. The main Maclaren River valley and the other large valleys are wide, flat floored, typical glacial valleys, and the smaller tributary valleys are either small glacial valleys with moderate gradients, or small, sharp postglacially eroded valleys with gradients steep enough to produce cascades and small waterfalls. Many of the small glacial hanging valleys are connected to the main valley by a postglacial notch in their lip. Discovery Creek is an example of this.

There are several glaciers in the vicinity of the copper prospect. The large Maclaren Glacier is about 10 miles long and occupies the head of the main Maclaren

valley. A number of cirque glaciers and small ice-fields, remnants of larger tributary glaciers, are present at altitudes of 5,000 feet and higher in the peaks between the Maclaren River and the West Fork.

A flow of water adequate for the needs of a camp and mining operations is available during the summer months from any of the small streams that are fed by snowfields and glaciers. In addition to the melt water, precipitation is frequent in this area during the summer, according to Pettyjohn's report and the writers' experience during the field examination. The Maclaren River carries a large volume of water, but much of its upper course is braided, and fordings with tractors and other equipment can be made in the braided stretches if reasonable care is used.

The area within several miles of the copper prospect and the Maclaren Glacier is devoid of timber. The vegetation consists of scrub willows and alders in the main valley floor and in a few protected valleys, and low brush and small tundra plants, mosses, and lichens on the slopes and mountains. Timberline in this part of the Alaska Range is at an altitude of 2,500 to 3,000 feet. It is reported that some spruce timber of usable size can be obtained on the Maclaren River about 9 miles south of the terminus of the Maclaren Glacier, but most of the timber would have to be hauled from greater distances.

The climate in this area is moderately severe. Weather records for 7 years between 1914 and 1944 taken at Paxson, about 36 airline miles east-southeast of the copper prospect, show 18.36 inches mean annual precipitation, most of which falls during the period of June through September. The snowfall ranges from about 10 to 22 inches per month during the period from October through April. Written records, and personal observations indicate that cloudy skies and strong winds are common. The mean temperature at Paxson is 25.3° F. The mean maximum temperature during June, July, and August is about 65° F, and during December and January is about 8 degrees. The mean minimum temperature is about 37° F during June, July, and August, and about -12° F during December and January.

PROPERTY AND OWNERSHIP

The two owners have staked 10 claims to cover the veins that they have discovered. The claims are designated Kathleen-Margaret Nos. 1 to 10. The locations of the claims are shown on figure 2. Each claim is owned jointly by the two partners. The location certificates are recorded in the records of the U. S. Commissioner at Talkeetna, Alaska.

GEOLOGY AND MINERAL DEPOSITS

Geology

Little time was available for general study of the rock formation during the visit to the copper prospect, and only the rock exposed in the immediate area of the prospect was examined. The formations have been generally defined and mapped by Moffit (1912) and distant observations and examination of aerial photographs confirm his reconnaissance mapping.

The country rock in which the copper-bearing quartz veins occur is chiefly a green diabasic lava.

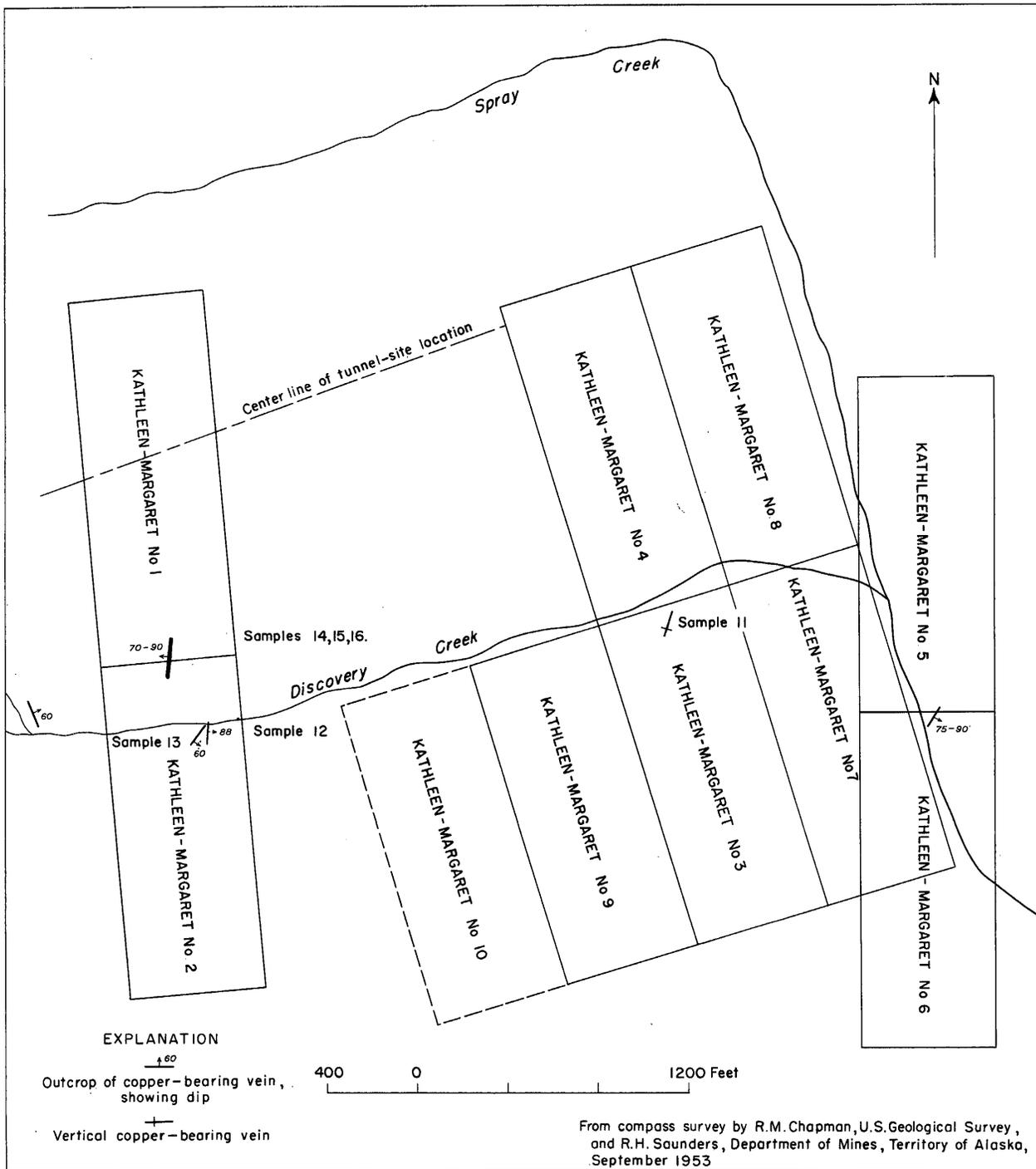


Figure 2. —Sketch map of claims showing Albertson-Pettyjohn copper prospect, Maclaren River, Alaska.

Moffit assigned a late Carboniferous or early or middle Triassic age to this unit, which is exposed in a west-trending range of low mountains that lies between Summit Lake and the Susitna River. Capps (1940, pl. 2) shows the same unit as pre-Cretaceous (Mesozoic). As described by Moffit (1912, p. 29-30):

"The rocks consist largely of diabase and locally are amygdaloidal. They are associated with argillites, tuffs, and tuffaceous conglomerates in a number of places and are intruded by diabases and by dikes of less basic, light-colored porphyritic rock. Intrusions of peridotite have taken place in the Tangle Lakes vicinity, and probably also in other places, for boulders of this character were found in some of the younger conglomerates near the glacier at the head of the east fork of Maclaren River. The lava flows have been deformed in the general folding of the region so that steep dips are common, and schistosity is occasionally developed."

Apparently the oldest rocks in the area lie east of the Maclaren Glacier and northeast of the copper prospect. These rocks, correlated by Moffit with the Chisna formation of Mendenhall (1905), lie in a west-trending belt on the south side of the Alaska Range. This formation extends eastward from the Maclaren Glacier to the Summit Lake area, but has not been recognized west of the Maclaren valley. The Chisna formation was not examined in the field, but Pettyjohn reports that he found no mineralization in the parts of it that he prospected. As described by Moffit (1912, p. 27-28), the formation consists of quartzite, tuffaceous beds, and metamorphosed limestone containing associated granular intrusives. Many of the weathered surfaces of this formation have a rusty red color that is particularly conspicuous.

Rocks of probable Triassic age include limestone, conglomerate, and thick units of slate having intercalated basic igneous flows or intrusives, all of which are cut by granular intrusives of dioritic or related compositions. These rocks are exposed on the west side of Maclaren valley about 2.5 miles north of Discovery Creek, and they form an outcrop belt that extends west-southwestward from this point. Triassic rocks apparently are not exposed in the area between the Maclaren River and the Richardson Highway.

The Jurassic rocks, as described by Moffit, consist of gray quartz diorite and hornblende diorite that in part show well developed cleavage and schistosity. They occur as dikes, sills, and large, irregular, intrusive masses. Several small masses of Jurassic rocks were mapped by Moffit (1912, pl. 11) on both sides of the Maclaren valley in the area just north of the copper prospect. An igneous mass of batholithic size lies in the Susitna River drainage about 5 to 12 miles west of the Maclaren Glacier.

The geologic mapping of this region is of the general reconnaissance type. Additional reconnaissance and semidetalled geologic mapping of the south slope of the Alaska Range between the Richardson Highway and the Alaska Railroad should be done to provide basic geologic and economic data.

Mineral deposits

Several quartz veins bearing bornite and chalcocopyrite with malachite surface alteration occur in the vicinity of Discovery Creek, a western tributary of the Maclaren River near the terminus of the Maclaren Glacier (fig. 2). The largest and richest vein is located on the steep north slope of Discovery Creek about 3,200 feet upstream from the mouth. This vein is about 10.5 feet thick, strikes N. 3°-4° E., and dips 70°-90° W. Mineralized talus from this vein can be traced down the slope to Discovery Creek and downstream in the creek gravel. The best exposure of the vein is near the top of the slope about 180 feet above the bottom of the valley. It is from this outcrop, which had been dug out for sampling and examination, that the authors obtained samples. The vein crops out at several places down the slope within a vertical distance of about 80 feet, and the width and mineralization appear to be fairly uniform throughout this distance. The richest ore, samples from which have assayed 30 to 45 percent copper, is confined to a zone about 1.5 to 2 feet thick within the vein. Assays of samples from an adjacent zone about 7 feet thick have ranged from 3.5 to 12.5 percent copper. Appreciable amounts of silver and traces of gold also are present in the samples from both zones. The gold content seems to be higher in the lower grade copper bearing material than in the rich zone.

Two small quartz veins about 30 feet apart containing bornite and chalcocopyrite with malachite surface alteration crop out on the south side of Discovery Creek about 200 feet downstream from the 10.5-foot thick vein. These veins are 0.75 to 1.0 foot thick. Several barren quartz veinlets associated with them are 1 to 2 inches thick. One vein strikes N. 35° E. and dips 60° south. Samples taken from widths of 0.75 foot in these veins assayed 1.58 percent copper (sample 12) and 2.95 percent copper (sample 13) with only traces of gold and silver. The bedrock in this zone is a highly fractured, dark grayish-green flow(?) rock and includes light apple-green pods and small dikes that are composed largely of epidote(?). Thin, sheared zones of blackish-green serpentine and/or chlorite are associated with the quartz veins. Some brick-red iron staining is present in this fractured zone.

A small quartz vein, banded with bornite and calcite, crops out on the south side of Discovery Creek about 1,000 feet above the mouth. Chalcocite, chalcocopyrite, and epidote have been identified in other specimens from this vein. This vein, which is 0.4 foot thick, strikes N. 15°-20° E., and is vertical, apparently continues northeastward for at least 100 feet to another small vein outcrop. Sample 11, taken across the width of the vein, assayed 1.33 percent copper, a trace of gold, and no silver or nickel. Albertson and Pettyjohn reported that their sample from this vein showed 2 percent copper and a trace of nickel.

Another small quartz vein is exposed on a rock knob on the east side of Spray Creek about 600 feet downstream from Discovery Creek. This vein strikes N. 30° E. and dips 75°-90° southeast. It contains traces of copper minerals and has some greenish-black serpentine streaks and pockets and some epidote within the quartz.

A quartz vein bearing some chalcocopyrite and bornite with malachite surface staining is exposed in

a small gully tributary to Discovery Creek about 600 feet upstream from the 10.5-foot vein. The quartz vein is 3 to 5 inches thick and can be traced laterally for at least 20 feet. The rock exposed in the gully has slumped, but the vein appears to strike N. 20° W. and to dip 60° north.

Minor amounts of malachite are found on weathered exposures of the copper-bearing veins, but azurite occurs only rarely. Chrysocolla has been identified in at least one sample that was collected by the owners.

In addition to the above-mentioned veins that were examined by the writers, Pettyjohn reports that there are several copper-bearing veins about 2.5 miles southwest of Discovery Creek on the slopes of Cottonwood Creek valley. Several specimens from veins are reported to assay 0.5 to 1.5 percent copper, and one piece of float assayed 40.85 percent copper. Samples from a 51-inch thick quartz vein near the high-grade float had copper assays ranging from nil to 1.43 percent. The 51-inch vein reportedly is cut off at one end by a fault. Pettyjohn plans further prospecting in the Cottonwood Creek and West Fork area. Pettyjohn also reports that he found no metallization on the east side of the Maclaren valley or on the west side north of Spray Creek.

SAMPLING AND ASSAYS

Six samples taken during the field examination were assayed by the Department of Mines Assay Office at College, Alaska, and the results of the assays are shown in table 1. The sampling points are shown on figure 2.

Table 1.—Analyses of six samples assayed by the Department of Mines Assay Office at College, Alaska

Sample no.	Width sampled (feet)	Ounces per ton		Copper (percent)
		gold	silver	
11	0.40	(1)	(2)	1.33
12	.75	(1)	(1)	1.58
13	.75	(1)	(1)	2.95
14	2.00	(1)	(2)	.27
15	1.75	(2)	2.55	30.45
16	7.00	0.18	1.20	8.99

¹Trace.

²Nil.

Samples 14, 15, and 16 are rough channel samples that were taken across the uppermost outcrop of the main 10.5-foot vein. Sample 14 represents a band of barren quartz 2 feet wide on the east side of the vein. Sample 15 represents a band of "high grade"

adjacent to the barren quartz; it ranges in width from 1.5 to 2 feet. The high-grade band consists mostly of bornite and contains minor amounts of chalcopyrite and quartz probably with a few other minerals. The remainder of the vein, represented by sample 16, ranges from 6.5 to 7.5 feet in width. It consists of quartz impregnated with bornite and chalcopyrite. The three bands in the vein appear to be consistent in width. The vein is exposed at several points over a distance of about 150 feet on the slope.

Samples 11, 12, and 13 were tested for nickel; none was present. The owners reported that there was a trace of nickel in a sample that they took from the vein from which sample 11 was taken. The owners have taken several samples across the high-grade band in the main vein. All have assayed more than 40 percent copper. Samples taken by the owners from the 7-foot band of quartz, bornite, and chalcopyrite on the west side of the vein have assayed from 3.5 to 12.5 percent copper.

CONCLUSION AND RECOMMENDATIONS

The 10.5-foot bornite-chalcopyrite-quartz vein on Discovery Creek is worthy of further exploration. The tenor and the apparent downdip continuity of the vein indicate a minable deposit if the vein has sufficient continuity along its strike. Unfortunately the ridge top to the north of Discovery Creek is completely covered by vegetation, and no surface indications of the vein or bedrock can be found without trenching or underground exploration.

In addition to exploration of the 10.5-foot vein, further prospecting is recommended in the Discovery Creek area and the westward extension of the outcrop belt of basaltic lavas. The headwaters of Cottonwood Creek and the West Fork are a virtually unknown area, and the basaltic lava formation continues westward to the Susitna River. Moffit (1915, p. 76) points out that a vein of chalcopyrite was found on Butte Creek, just west of the Susitna River, and that copper-bearing minerals have been found in the lava flows between Butte and Wachana Creeks and the Susitna River.

LITERATURE CITED

- Capps, S. R., 1940, Geology of the Alaska Railroad region: U. S. Geol. Survey Bull. 907.
Mendenhall, W. C., 1905, Geology of the central Copper River region, Alaska: U. S. Geol. Survey Prof. Paper 41.
Moffit, Fred H., 1912, Headwaters of the Gulkana and Susitna Rivers, Alaska: U. S. Geol. Survey Bull. 498.
_____, 1915, The Broad Pass region, Alaska: U. S. Geol. Survey Bull. 608.

