UNCLASSIFIED

Geology - Mineralogy

This document consists of 16 pages, plus 1 figure.
Series A

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

RECONNAISSANCE FOR RADIOACTIVE DEPOSITS IN THE ILIAMNA LAKE-LAKE CLARK REGION, SOUTHWESTERN ALASKA*

By

R. M. Moxham and A. E. Nelson

April 1952

Trace Elements Investigations Report 190

This preliminary report is distributed without editorial and technical review for conformity with official standards and nomenclature. It is not for public inspection or quotation.

*This report concerns work done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission

USGS - TEI Report 190

GEOLOGY - MINERALOGY

Distribution (Series A)	No. of copies
American Cyanamid Company, Watertown	1
Argonne National Laboratory	1
Atomic Energy Commission, Washington	2
Carbide and Carbon Chemicals Company, Y-12 Area	1
Colorado Raw Materials Office (T. W. Oster)	6
Division of Raw Materials, Denver	1
Division of Raw Materials, New York	6
Division of Raw Materials, Salt Lake City	1
Division of Raw Materials, Washington	3
Dow Chemical Company, Pittsburg	1
Technical Information Service, Oak Ridge	6
Terr. Dept. Mines, Juneau (L. H. Saarela)	1
Terr. Dept. Mines, Ketchikan (A. E. Glover)	1
Terr. Dept. Mines, Anchorage (P. O. Sandvik)	1
Terr. Dept. Mines, College (D. J. Cook)	1
Terr. Dept. Mines, Nome (D. Jones)	1
U. S. Geological Survey:	
Mineral Deposits Branch, Washington	1
Geochemistry and Petrology Branch, Washington	1
Geophysics Branch, Washington	1
Alaskan Geology Branch, Washington	6
W. E. McKelvey, Washington	1
L. R. Page, Denver	1
R. P. Fischer, Grand Junction	1
A. E. Weissenborn, Spokane	1
G. O. Gates, San Francisco	1
W. S. Twenhofel, Juneau	1
R. M. Chapman, Fairbanks	1
TEPCO, Washington (Including master)	5
	55

CONTENTS

ILLUSTRATIONS

TABLES

RECONNAISSANCE FOR RADIOACTIVE DEPOSITS IN THE ILIAMNA LAKE-LAKE CLARK REGION, SOUTHWESTERN ALASKA

By

R. M. Moxham and A. E. Nelson

ABSTRACT

The technical files of the Geological Survey contain a reference to a mineral questionably identified as a uranium compound in samples from a prospect in the Iliamna Lake-Lake Clark region, one of the principal mineralized areas of southwestern Alaska. Other metalliferous deposits in this area are known to contain significant quantities of silver and hematite, which in some instances have been indicative of the presence of uranium. A field investigation of the region, undertaken in 1949, included the study of two silver-lead and five copper prospects, the radiometric testing of numerous concentrates from gravels of streams draining the more inaccessible areas, and approximately 310 miles of radiometric traversing with portable survey meters. The maximum equivalent uranium content of any material tested did not exceed 0.009 percent.

INTRODUCTION

One of the principal mineralized areas in southwestern Alaska is in the Alaska Range south of Lake Clark. Mining exploration and development flourished until about 1925 but gradually dwindled chiefly because of transportation difficulties. However, in recent years, roads connecting Iliamna Lake with tidewater and with Lake Clark have been built and two new airfields constructed. The improved transportation facilities have resulted in renewed

interest in mining in this area. Exploration and development is being undertaken at several prospects by both private interests and the U. S. Bureau of Mines.

Most of the mining properties in this region are valued for their copper content, although some contain silver, lead, gold, or hematite or combinations of these metals in commercial quantities.

The technical files of the Alaskan Branch of the Geological Survey contain records of a study of a yellow mineral, identified as a possible uranium compound, from the McNeil prospect, 30 miles south of Iliamna Lake.

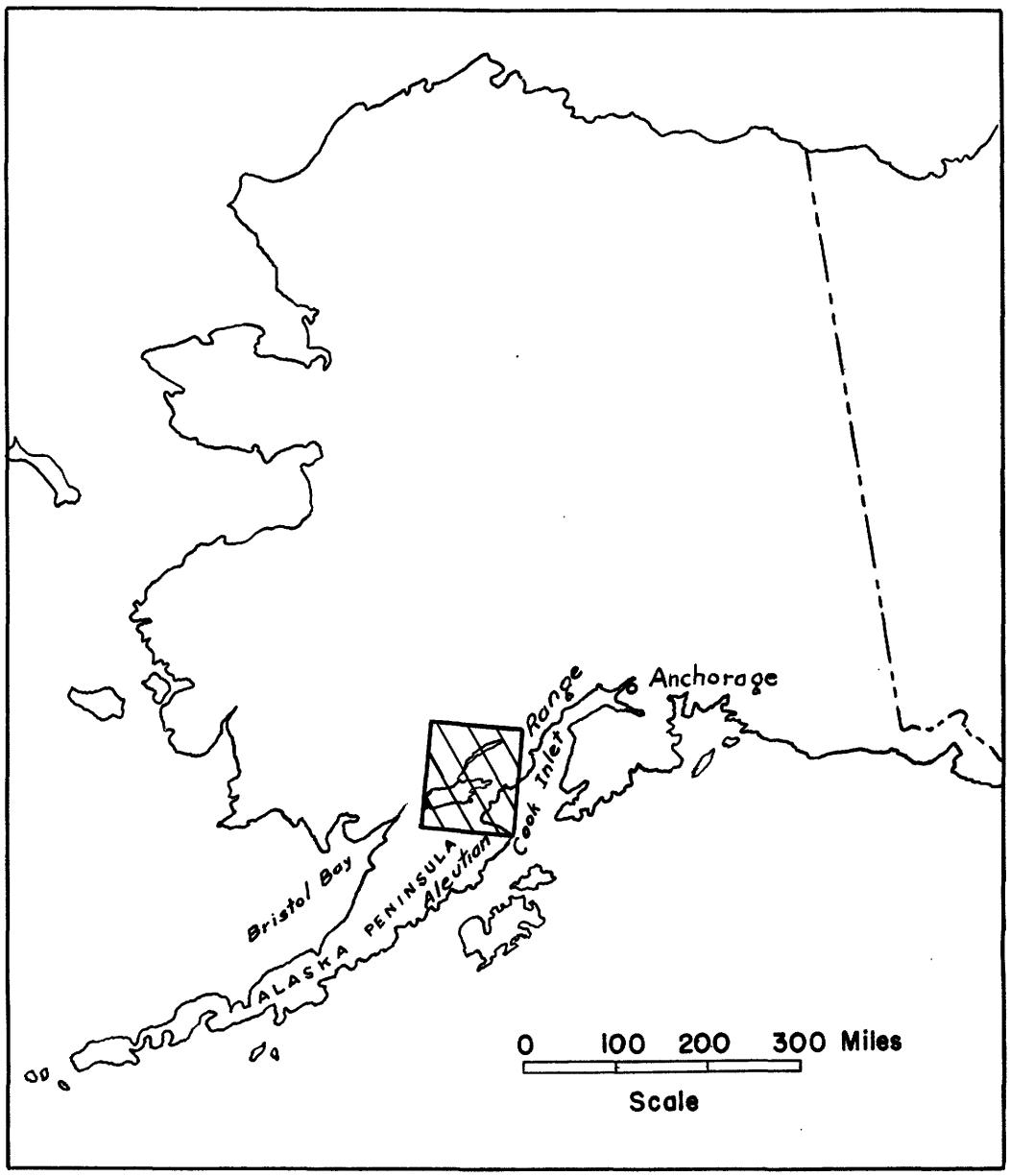
The information on the McNeil property as well as the occurrence of silver, lead, molybdenum, and hematite at other prospects in this region seemed to warrant a field investigation of the metalliferous deposits of the Iliamna Lake-Lake Clark region, because these metals and minerals are commonly associated with high-grade uranium ores elsewhere in the world. The party conducting this investigation was in the field from mid-July through August 1949, and consisted of R. M. Moxham and A. E. Nelson, geologists, J. C. Whitaker, field assistant, and Henry Bender, cook. This work was done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

GEOGRAPHY

The Iliamna Lake-Lake Clark region of southwestern Alaska is situated at the northern extremity of the Alaska Peninsula (fig. 1). The center of the area is about 200 miles southwest of Anchorage. Iliamna, on the north shore of Iliamna Lake near the mouth of the Newhalen River (fig. 2), is the principal center of population and source of supplies. Transportation in the region is chiefly by air. One bush pilot, located at Tanalian Point

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

TRACE ELEMENTS INVESTIGATIONS
REPORT 190
FIGURE 1



INDEX MAP OF ALASKA SHOWING THE LOCATION OF FIGURE 2

on Lake Clark, has a permanent base in the area, and transient planes are usually available for local transportation from Iliamna. Three commercial airlines offer service to Iliamna from Anchorage and the Bristol Bay area. Most light freight is brought in by air; heavier items are either transported by barge from Bristol Bay or shipped to Iliamna Bay and trucked across the mountains to Pile Bay at the east end of Iliamna Lake. Two airstrips are located in the region, one at Iliamna, the other at Tanalian Point. Both will accomodate multi-engine aircraft.

GEOLOGY

The brief description of the geology of the Iliamna Lake-Lake Clark region given below has been summarized from a report by Capps (1935, pp. 35-97).

A group of highly metamorphosed gneisses, schists, and quartzites which crop out east of Pile Bay and near the north end of Lake Clark are thought to be the oldest rocks in this region. They are undoubtedly pre-Triassic and are believed to be mainly early Paleozoic and in part pre-Cambrian in age. Crystalline limestone and calcareous schists overlie the early Paleozoic rocks, and, although they are non-fossiliferous, they are probably of Paleozoic age. Late Paleozoic or Mesozoic slates, locally interbedded with chert, crop out at the head of Iliamna Bay and northeast of Lake Clark. Late Paleozoic or Triassic greenstones occur in the area extending from the east end of Iliamna Lake to the head of Lake Clark. The greenstones include tuff, porphyry, banded aphanitic rock, amphibolite, and pyroxenite. Limestones of Upper Triassic age crop out in two small areas; one on the north shore of Iliamna Lake at Chekok Bay, the other east of Pile Bay. A group of lavas, tuffs, and associated sedimentary rocks

probably of Lower Jurassic age occur throughout the Iliamna Lake-Lake Clark region. The composition of the lavas ranges from basalt to rhyolite. They are interbedded with tuffs and a few beds of argillite, graywacke, and limestone. A narrow belt of argillite, slate, and graywacke, probably of Cretaceous age, crops out in the vicinity of Kontrashibuna Lake. Lava flows and tuffs of Tertiary age occur along the south shores of Iliamna Lake and near the south end of Lake Clark. Mesozoic granitic rocks of the Coast Range batholith form the core of the Aleutian Range. They crop out in a belt trending southwesterly and lying between Lakes Iliamna and Clark and Cook Inlet to the east. In general the rock is a gray coarse-grained granite; in some localities a gneissic character is exhibited. Vast areas, particularly in the western part of the region, are covered by Pleistocene and Recent glacial deposits and outwash and alluvial deposits of present streams.

RADIOACTIVITY INVESTIGATIONS

The field studies made during 1949 included the investigation of four copper prospects, one copper-iron prospect, two silver-lead prospects, ore from a molybdenum prospect, and one placer-gold mine; 14 placer samples were collected; and about 240 miles of radiometric survey were made by boat, 40 miles by truck, and 30 miles on foot.

Standard makes of portable survey meters, modified to accept probes consisting of four 1 by 18-inch gamma tubes connected in parallel, were used in all radiometric traversing. Individual tests at outcrops were made with 6-inch beta tubes. At some localities, rock and ore samples were taken for laboratory checks against field observations. Concentrates were made of surface gravels on streams draining several different areas to

determine if radioactive minerals are being eroded from the different rock types known to occur in the more inaccessible parts of watersheds for which time was not available to permit direct observation.

The rock and ore samples taken for study were crushed, and the equivalent uranium content of the unconcentrated material determined in the laboratory; the equivalent uranium content of the heavy mineral fractions (those greater than 3.3 specific gravity) of both rock and placer samples was also determined. Results of these studies are shown in tables 1 and 2; table 1 gives the data on rock and ore samples collected; table 2 gives the data on concentrates from surface gravels of streams draining the relatively more inaccessible areas of the region.

Copper prospects

McNeil claims

Claims staked by Charles McNeil are located near the mouth of Crevice Creek, a western tributary of the middle fork of Paint River (sample locality 15, fig. 2). The prospect is about 15 miles west of McNeil Cove on Kamishak Bay and was accessible by wagon road in former years. Copper sulfides with calcite and epidote gangue have been deposited along the contact between the Paleozoic gneiss and schist and granitic intrusive rocks.

A number of prospect pits and a tunnel have been dug but insufficient development work has taken place to determine the size of the ore body. Approximately 10 tons of ore was shipped to the Tacoma smelter about 1922. Assay returns gave $2.50 in gold, 15 ounces of silver, and 17.55 percent copper per ton (Mather, 1925, p. 174).

Three mineralized zones on the McNeil property in the valley of Crevice Creek were examined. No radiation anomalies were noted. The yellow color

Table 1.--Data on rock and ore samples from the Iliamna Lake-Lake Clark region, southwestern Alaska

Sample no.		Percent equivalent uranium			
Field	File	Unconcentrated	Heavy-mineral fraction 1/	Concentration ratio	Description and location
49AMx7	3773-L	0.002	0.001	2:1	Thompson claims, Kijik River, south prospect; vein material, arsenopyrite, galena, sphalerite
8	3773-L	0.000	0.000	1:1	Thompson claims, Kijik River, north prospect; vein material, arsenopyrite, galena, sphalerite
9	3774-L	0.001	0.003	60:1	South shore Iliamna Lake; tuff
14	3779-L	0.000	0.000	5:1	Millet claims, north shore Iliamna Lake; copper ore
15	3780-L	0.001	0.003	400:1	McNeil claims, Paint River; copper ore
16	3781-L	0.002	0.009	6,100:1	do
20	3785	0.000	0.000	2:1	Kasna Creek; copper ore, float
21	3786-L	0.000	0.000	2:1	do
22	3787-L	0.000	0.000	1:1	do
25	3790-L	0.002	0.003	45:1	Thompson claims, Kijik River, upper prospect; molybdenite-bearing granite
27	3792-L	0.000	0.000	1:1	Duryea claims, Silver Creek; silver ore
28	3793-L	0.000	0.000	1:1	Dutton claims, Silver Creek; copper ore

1/ that greater than 3.3 specific gravity

Table 2.--Data on concentrates obtained from gravels of streams in the Iliamna Lake-Lake Clark region, southwestern Alaska

Sample no. Field	File	Percent equivalent uranium Heavy-mineral fraction[1]	Location and description
49AMx10	3775	0.001	Dennis Creek; placer sample
11	3776	0.000	Pile Bay tributary; placer sample
12	3777	0.002	Pile River; placer sample
13	3778	0.001	Pile Bay tributary; placer sample
17	3782	0.007	East shore, Lake Clark; placer sample
18	3783	0.004	Kijik River; placer sample
19	3784	0.001	Lake Clark tributary near Tanalian Point; placer sample
26	3791	0.001	Tanalian River; placer sample
29	3794	0.001	Little Lake Clark, south tributary; placer sample
30	3795	0.003	do
31	3796	0.005	Chokotonk River; placer sample
32	3797	0.000	Hatchet Creek; placer sample
33	3798	0.003	Portage Creek; placer sample

1/ that greater than 3.3 specific gravity

of the altered limestones, which apparently was the material McNeil thought to be uranium-bearing, is due to epidote. Two representative samples of the mineralized rock from the northernmost (sample 15) and southernmost (sample 16) outcrops contain 0.001 and 0.002 percent equivalent uranium respectively. The heavy mineral fraction in sample 16 contains 0.009 percent equivalent uranium; as sodium fluoride bead tests for uranium were negative, this radioactivity is ascribed to thorium.

Dutton claims

The claims of the Dutton Mining and Development Company are located in the valley of Silver Creek (sample location 28, fig. 2), about 8 miles southwest of the village of Pile Bay. The veins have been injected along the contact between the Triassic limestone and a greenstone. The mineralized zone, about 200 feet in width, consists of an aggregate of epidote and calcite interlaced with quartz veinlets. Chalcopyrite was the only copper mineral observed. Extensive development work was carried out from 1902 to 1905, but no ore is known to have been shipped, and no development work has been undertaken since that time.

Only 30 feet of the adit at the Dutton copper property was accessible, but dump material from the underground workings was examined. No radioactivity was detected. A caved tunnel a short distance north and prospect pits south of the Dutton adit were also checked, with negative results.

Copper King claims

Another area of copper minerals has been found near the head of Iliamna Bay. Several trenches and pits have been excavated on the Copper King claim, located a few hundred yards south of the Iliamna Bay-Pile

Bay road, about 1½ miles west of the head of Iliamna Bay. Small masses of garnet- and magnetite-bearing rock impregnated with chalcopyrite occur along the contact between the granite and greenstone. The claims have been abandoned for many years.

No radiation anomalies were detected at or in the immediate vicinity of the Copper King claims.

Millet claims

The Millet copper claims (sample location 14, fig. 2) are located on the north shore of Iliamna Lake 13 miles east of Iliamna. Copper sulfides and calcite gangue have recemented a shattered limestone in a zone about 20 to 40 feet wide which has been traced some 3,500 feet horizontally. Development has been carried on sporadically since the discovery of the lode in about 1902, but no ore has been shipped. A drilling and trenching program was being conducted by the U. S. Bureau of Mines during 1949.

The Bureau of Mines prospect trenches and dump material at the head of a flooded shaft were examined radiometrically. A traverse also was made along the strike of the mineralized zone. No anomalous radiation was noted at any locality on this property.

Copper-iron prospect

Kasna Creek claims

A group of claims has been staked on the east side of Kasna Creek, about 2 miles from its mouth on Kontrashibuna Lake (sample locations 20-22, fig. 2). Several parallel mineralized zones carrying hematite, chalcopyrite, and gangue minerals have been found in the limestone country rock. Very little development work had been done prior to 1949, at which

time the U. S. Bureau of Mines began an exploration program. The Bureau of Mines trenches on the westernmost of three parallel zones of mineralization provided excellent exposures, and numerous outcrops of ore occur in the two more easterly zones. Radiometric tests gave negative results.

Silver-lead prospects

Duryea claims

The Duryea claims (sample location 27, fig. 2) are about 1 mile north of the Dutton prospect. The ore body, valued chiefly for its silver content, is located along the same limestone-greenstone contact as the Dutton copper deposit. Silver-bearing galena occurs with sphalerite and pyrite as fracture fillings in the brecciated limestone. In 1909, the owner reported assays up to 196 ounces of silver, $20.00 in gold, 35 to 50 percent lead, and 15 to 20 percent zinc per ton (Capps, 1935, pp. 93-94). Extensive underground and surface development work has been done in the past but no ore is believed to have been shipped. As underground workings are now caved and flooded, only dump material was tested. No radioactive material was found.

Thompson claims

A silver-lead prospect has been staked recently by Joe Thompson in the valleys of two parallel western tributaries of the Kijik River, about 7 miles northwest of Kijik (sample locations 7, 8, fig. 2). Arsenopyrite and a little galena, chalcopyrite, and pyrite, in a gangue of calcite and rhodochrosite have been deposited in a shear zone in the granite country rock. Very thin veinlets carrying pyrite and a few grains of chalcopyrite have been injected along numerous parallel joints in a

zone about 200 yards wide. Radiometric tests were made at several prospect pits on the silver-lead claims and radiometric surveys were made throughout the general area in which these claims are located. The radioactivity at this locality averages about double the normal background for the region. The detailed examination, however, of the silver-lead mineralization and other sulfide-bearing veinlets in the mineralized zone revealed no concentration of radioactive material. The higher readings are thought to have been caused by radioactive minerals very sparsely distributed through a large mass of granite country rock, rather than from local concentrations of radioactive minerals.

Molybdenite prospect

Thompson claim

Samples of molybdenite-bearing granitic float from a claim near the top of the mountain (sample location 25, fig. 2) above the silver-lead prospect were donated by Mr. Thompson. None gave any indication of radioactivity.

Placer and non-metalliferous rocks

With the exception of the Upper Cretaceous argillites and slates, some lithologic variety of every unit described under Geology (p. 7) was encountered at some point during the 310 miles of radiometric traversing. None are significantly radioactive and the placer samples in this area contain no radioactive minerals of interest.

SUMMARY AND CONCLUSIONS

In the course of the 1949 reconnaissance in the Iliamna Lake-Lake Clark region all the accessible lode prospects in the area were examined. These included 5 copper prospects, one of which contains considerable amounts of hematite, and 2 silver-lead prospects. No concentration of radioactive material was found at any of the prospects. In addition, samples of molybdenite-bearing granitic rock were tested radiometrically with negative results. Concentrates from gravels of streams draining the more inaccessible areas of the region were also tested and showed no appreciable radioactivity. From the data gathered in the course of this reconnaissance it is believed unlikely that deposits of high-grade uranium ores occur in association with the metalliferous lodes of the Iliamna Lake-Lake Clark region.

REFERENCES

Capps, S. R., 1935, The southern Alaska range: U. S. Geol. Survey Bull. 862, 101 pp.

Mather, K. F., 1925, Mineral resources of the Kamishak Bay region (Alaska): U. S. Geol. Survey Bull. 773-D, pp. 159-181.