O. C. McKelvey

PRELIMINARY SUMMARY OF RECONNAISSANCE FOR URANIUM ON THE SEWARD PENINSULA, ALASKA, DURING 1951

Trace Elements Memorandum Report 322

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

FEB 12 1952

AEC-569/2

Dr. Phillip L. Merritt, Assistant Director
Division of Raw Materials
U. S. Atomic Energy Commission
P. O. Box 30, Ansonia Station
New York 23, New York

Dear Phil:

Transmitted herewith for your information are **six** copies of Trace Elements Memorandum Report 322, "Preliminary summary of reconnaissance for uranium on the Seward Peninsula, Alaska, during 1951" by M. G. White and W. S. West, January 1952.

Zeunerite-bearing deposits averaging from 0.05 to 0.07 percent equivalent uranium occur at Brooks Mountain, the most promising area examined during 1951. Tin-bearing dikes in the Lost River area, containing 0.01 percent equivalent uranium locally, average 0.005 percent equivalent uranium. Although no further detailed investigations of the Brooks Mountain and Lost River areas are being proposed for fiscal year 1953, we are planning to maintain a routine check on private activities at both localities through a regular Survey party which will probably conduct tin investigations in the York district during the summer of 1952.

The bedrock source of the uranothorianite and gummite, associated with various sulfides, bismuth, silver, and iron oxide minerals, collected by the Survey in 1947 from placers at the head of Peace River, could not be located, largely because of permafrost conditions in the tundra cover. We are planning to publish a report summarizing our knowledge of the occurrence of radioactive materials in the eastern Seward Peninsula, to encourage private prospecting.

We plan to publish this report as part of a Survey Circular which will include the other summary reports on Alaskan reconnaissance during 1951 (Trace Elements Memorandum Reports 319, 320, 321, and 323). We are asking Mr. Hosted, by a copy of this letter, whether the Commission has any objection to such publication.

Sincerely yours,

O.E. McKelvey

for W. H. Bradley
Chief Geologist

UNCLASSIFIED

Geology - Mineralogy

This document consists of 14 pages,
plus 1 figure.
Series A

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

PRELIMINARY SUMMARY OF RECONNAISSANCE FOR URANIUM ON THE SEWARD PENINSULA, ALASKA, DURING 1951 _/

By

M. G. White and W. S. West

January 1952

Trace Elements Memorandum Report 322

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

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By

M. G. White and W. S. West

ABSTRACT

Reconnaissance examinations for uranium were made at nine localities in the York, Nome, and Koyuk districts of the Seward Peninsula, Alaska, during the 1951 field season. In addition carborne radiometric traverses were made of four roads in the Nome and Council districts. Only at Brooks Mountain in the York district are uranium-bearing deposits that required detailed study.

On the southwest flank of Brooks Mountain, zeunerite occurs as a surface coating on quartz-tourmaline veins occupying joint fractures in granite; at a second locality, also on the southwest flank of the mountain, zeunerite is disseminated in a highly-weathered, altered zone of granite near a contact with limestone. Preliminary radiometric analyses show an average of about 0.05 percent equivalent uranium in the vein material and about 0.07 percent equivalent uranium in the weathered, altered granitic zone.

INTRODUCTION

Appraisal of Alaskan uranium possibilities in fiscal year 1951 (see Trace Elements Memorandum Report 235) suggested that a number of localities on the Seward Peninsula (fig. 1) were favorable for the occurrence of uranium. Several of these localities were proposed for examination in fiscal year 1952. (See Trace Elements Work Plan and Operating Budget,

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TRACE ELEMENTS MEMORANDUM REPORT 322
FIGURE 1

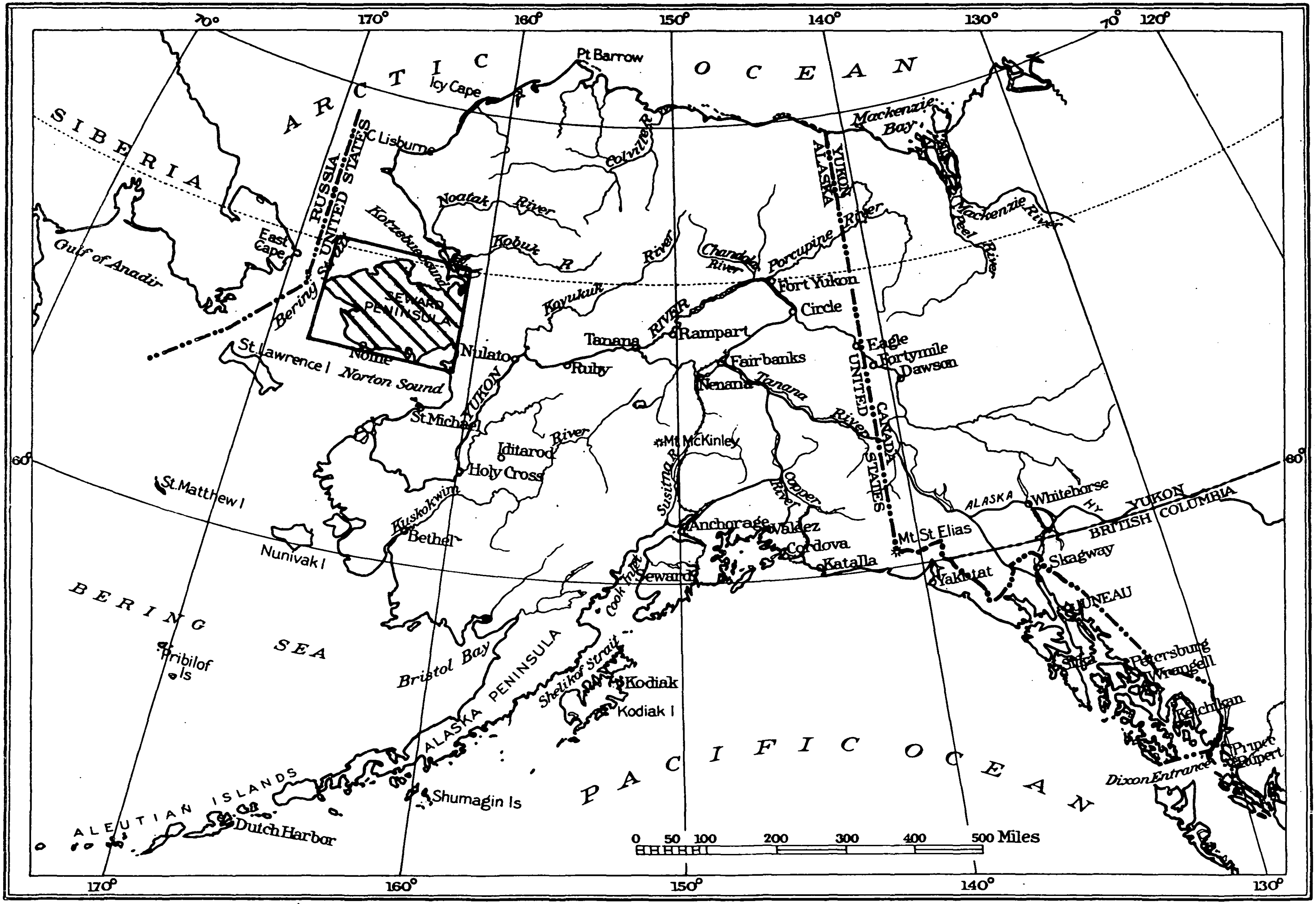

FIGURE 1. MAP OF ALASKA SHOWING LOCATION OF SEWARD PENINSULA

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Fiscal Year 1952.) The localities examined during the 1951 field season were as follows:

	Locality	District	Project designation on figure 2
1.	Brooks Mountain area	York	BK
2.	Lost River area	York	BK
3.	Peace River area	Koyuk	BO
4.	Potato Mountain area	York	CJ
5.	Charley Creek bismuth prospect	Nome	CK
6.	Sinuk River iron area	Nome	CL
7.	Hed and Strand antimony mine	Nome	CM
8.	Big Hurrah gold mine	Nome	CY
9.	Quiggley (Gray Eagle) antimony prospect	Nome	CZ

In addition to examination of the above localities, carborne radiometric traverses were made along the Penny River, Snake River, Osborn, and Nome-Council roads (fig. 2) in the Nome and Council districts.

Radiometric traversing on the ground was accomplished with NICC Model 2610A, El-Tronics Model SGM-18A, and Beckman Model MX-5 portable survey meters mounted on packboards. Each instrument was equipped with interchangeable 2- x 20-inch gamma and 6-inch beta-gamma probes. For all road traverses a gang of six 2- x 40-inch gamma tubes, connected in parallel, was mounted on top of a jeep and connected to a NICC Model 2610A portable survey meter inside of the vehicle. The latter type of equipment was also used for airborne traversing over the Sinuk River iron area with the gang of probes lashed to the stretcher struts of a helicopter.

Helicopter support for the investigation of the Sinuk River iron area and the Hed and Strand mine was furnished by the 30th Engineer Base Topographic Battalion, U. S. Army. Daniel Jones, Territorial Department of Mines, and Robert Thorne, U. S. Bureau of Mines, accompanied the Geological Survey party in these two investigations as well as the examination of the Quiggley antimony prospect and the Big Hurrah mine.

Most of the investigations during the 1951 season were of short duration and made in the course of a few hours or, at the most, two or three days. The contiguous Brooks Mountain and Lost River areas, were investigated jointly during the latter part of July and in August. At the time of the investigation of the uranium prospect at Brooks Mountain, the United States Smelting, Refining, and Mining Company was prospecting the site under a lease from the owners, Mr. Hellerich of Fairbanks and Dr. Kennedy of Nome. Uranium prospecting was not encountered at any of the other locations examined, nor was prospecting for uranium reported from elsewhere on the Seward Peninsula.

SUMMARY OF DATA

Information regarding the geology, mineralogy and radioactivity of the various locations investigated is summarized in table 1.

Radioactivity in excess of 0.004 percent equivalent uranium was found at only three of the places examined on the Seward Peninsula: (1) in the Peace River area, Koyuk district; (2) the Lost River area, York district; and (3) the Brooks Mountain area, York district (fig. 2).

Peace River area

At the extreme head of Peace River (project BO, fig. 2) uranothorianite, gummite and thorite are associated with chalcopyrite, pyrite, hematite, bismuth, and silver in a stream concentrate collected by the Geological Survey in 1947 (Trace Elements Memorandum Report 235, 1951, pp. 44, 45). Radiometric reconnaissance of the area and a limited amount of trenching during late June and early July 1951 failed to reveal a bedrock source of the

Table 1.--Data on localities examined on the Seward Peninsula, Alaska, during 1951

Locality	Geology	Significant minerals	Radioactivity
York district:			
Potato Mountain area (project CJ, fig. 2)	Early Paleozoic black slate intruded by a large granite porphyry dike and numerous quartz veins of Mesozoic age	Bedrock: Pyrite, cassiterite tourmaline, zoisite, hedenbergite, and fluorite Concentrate from Northern Tin Co. placer operation on Birch Creek: Cassiterite with minor amounts of hematite, magnetite pyrite, tourmaline, and rutile	<0.001 percent eU
Brooks Mountain area (project BK, fig. 2) (see also TEMR 235, pp. 26-28)	Early Paleozoic black shale and white limestone intruded by Mesozoic granite	Mineralized, oxidized granite near contact with limestone: Hematite, tourmaline, purple fluorite, and zeunerite	Overall average about 0.07 percent eU; best grade may average 0.3 percent eU; scattered float specimens contain up to 2.1 percent eU
		Marmorized limestone near granite contact: sulfide veinlets	<0.001 percent eU
		Quartz-tourmaline veins in granite: hematite and zeunerite	Average 0.05 percent eU; scattered pieces as high as 1.0 percent eU
		Granite mass as a whole: accessory monazite, zircon, tourmaline, and vesuvianite	Averages 0.003 percent eU

Table 1.--Data on localities examined on the Seward Peninsula, Alaska, during 1951 (continued)

Locality	Geology	Significant minerals	Radioactivity
York district (continued):			
Lost River area (project BK, fig. 2) (see also TEMR 235, pp. 22-25)	Early Paleozoic limestone and Mesozoic granite cut by rhyolitic and basaltic dikes	Mineralized limestone: pyrite, arsenopyrite, fluorite, cassiterite, and various copper minerals	<0.001 percent eU
		Iron replacement zones in limestone: limonite, hematite, goethite, and mimetite	Average 0.06 percent eU
		Rhyolitic dikes: cassiterite, wolframite, topaz, and minor amounts of sulfides	Average 0.005 percent eU; locally up to 0.01 percent eU
		Granite: common accessory minerals	0.003 percent eU
Nome district:			
Sinuk River iron area (project CL, fig. 2) (see also TEMR 235, pp. 33, 34)	Veins and stockworks of limonite with hematite in Early Paleozoic limestone; some residual concentration locally	Limonite, hematite, magnetite, siderite, pyrolusite, galena, sphalerite, and gold; some limonite is botryoidal	<0.001 percent eU
Charley Creek bismuth prospect (project CK, fig. 2) (see also TEMR 235, p.34)	Hydrothermal enrichment of early Paleozoic schist and white quartz veins	Native bismuth, bismuthinite, and small amounts of iron sulfides	<0.002 percent eU

Table 1.--Data on localities examined on the Seward Peninsula, Alaska, during 1951 (continued)

Locality	Geology	Significant minerals	Radioactivity
Nome district (continued):			
Hed and Strand mine (project CM, fig. 2) (see also TEMR 235, table 3, no. 16)	Quartz veins in early Paleozoic schist	Stibnite, pyrite, and arsenopyrite	0.001 percent eU
Radiometric traverse, Penny River Road (see fig. 2)	Coastal plain gravels and Paleozoic schist	Stibnite, pyrite, and arsenopyrite	Schist: 17-20 divisions on 2.0 scale 1/ Gravels: 13-15 divisions on 2.0 1/
Radiometric traverse, Snake River Road (see fig. 2)	Paleozoic limestone and schist, and coastal plain and river gravels	Not determined	All rock types: 12-14 divisions on 2.0 scale 1/
Radiometric traverse, Osborn Road	do	Not determined	do
Quiggley (Gray Eagle) antimony prospect (project CZ, fig. 2)	Quartz veins in Carboniferous slate	Stibnite	<0.001 percent eU
Big Hurrah mine (project CY, fig. 2) (see also TEMR 235, table 3, no. 24)	Carboniferous black slate intruded by quartz vein	Gold, chalcopyrite, pyrrhotite, and stibnite	<0.001 percent eU

1/ Using gang of six 2- x 40-inch gamma tubes connected in parallel, and attached to a NICC Model 2610A portable survey meter; basic response of this instrument is about 8-10 divisions on 2.0 scale and 2-3 divisions on 20.0 scale

Table 1.--Data on localities examined on the Seward Peninsula, Alaska, during 1951 (continued)

Locality	Geology	Significant minerals	Radioactivity
Nome and Council districts:			
Radiometric traverse, Nome-Council Road (see fig. 2)	Cape Nome granitic complex, Paleozoic(?) schist, and coastal plain and river gravels	Not determined	Coastal plain gravel: 3-4 divisions on 20.0 scale 1/ Granitic complex: 6-8 divisions on 20.0 scale 1/ Schist: 5-7 divisions on 20.0 scale 1/ River gravels: 5-11 divisions on 20.0 scale 1/
Koyuk district:			
Peace River area (project BO, fig. 2) (see also TEMR 235, pp. 44, 45)	Weathered granitic rock containing decomposed iron-rich zones	Granite: accessory sphene, zircon, pyrite and magnetite Concentrate from stream gravels: pyrite, chalcopyrite, hematite, ilmenite, uranothorianite, bismuth, bornite, gold, silver, chromite, thorite, gummite, and common accessory minerals from granite	Granite: up to 0.003 percent eU Iron-rich zones: up to 0.005 percent eU Concentrate from stream gravels: 0.25 percent eU

1/ Using gang of six 2- x 40-inch gamma tubes connected in parallel, and attached to a NICC Model 2610A portable survey meter; basic response of this instrument is about 8-10 divisions on 2.0 scale and 2-3 divisions on 20.0 scale radioactive minerals. Detailed mineralogical examination of the samples from this locality is being made in the hope that a clue to the origin of the radioactive minerals will be found.

Lost River area

In the Lost River area (project BK, fig. 2) minor amounts of radioactive material occur in mineralized portions of rhyolitic dikes and in an iron-enriched or replacement zone in limestone. The dikes contain up to 0.01 percent equivalent uranium locally and average 0.005 percent equivalent uranium. The radioactive material is mostly in a secondary hematite coating of the dike rock formed from the weathering of sulphide minerals. An iron-enriched zone in a prospect on the west side of Lost River valley has an average content of about 0.06 percent equivalent uranium with the radioactive material occurring in limonite, hematite, goethite and mimetite. At this prospect the radioactivity is restricted to a zone or pocket about 3 feet wide. No extension of this radioactive iron-enriched zone could be found.

Brooks Mountain area

Zeunerite, a hydrous copper-uranium arsenate, is the principal radioactive mineral at Brooks Mountain (project BK, fig. 2). It has been found at two places on the southwest flank of the mountain:

1) Zeunerite is associated with quartz-tourmaline veins filling joint fractures in granite on the southwest side of the mountain. The zeunerite occurs as a coating on both the vein surface and the fracture walls. In many places the space between the vein and the wall is filled with a mixture of hematite and finely divided zeunerite. The average radioactivity of the veins is about 0.05 percent equivalent uranium, although some pieces of high-grade float contain up to 1.0 percent equivalent uranium.

2) In granite near a granite-limestone contact the zeunerite is associated with deep-purple fluorite, bright-red hematite and black tourmaline, in a 6-foot wide zone of highly-weathered, porous, oxidized granite. Preliminary radiometric data indicate that the richest portion of this deposit is across a 4-foot wide central portion of the zone. Readings here average about 0.3 percent equivalent uranium. Overall average content of the entire weathered, oxidized zone is probably about 0.07 percent equivalent uranium.

Radiometric traversing of the granite and its borders failed to locate any primary uranium minerals disseminated in that rock. Accessory zircon and monazite are the only radioactive minerals found in the relatively unaltered granite.

CONCLUSIONS

It is concluded that possibilities for high-grade uranium ore in the areas investigated on the Seward Peninsula during 1951 occur mainly at Brooks Mountain, where zeunerite is found in quartz-tourmaline veins and disseminated in an altered granitic zone. Continued routine check, however, will be made in the Lost River area where underground exploration of tin-bearing deposits will expose at depth mineralized dikes which at the surface contain 0.01 percent equivalent uranium locally and average 0.005 percent equivalent uranium. Although radiometric traversing in the Peace River area failed to locate a possible high-grade source of uranothorianite found in placers, this lead to a high-grade possibility is by no means exhausted and private prospecting will be encouraged.

The source of the uranium in the zeunerite at Brooks Mountain is problematical. The mineral has been found at only two places, and although other sites on the mountain are geologically similar to the zeunerite-bearing sites in almost every respect, they were devoid of zeunerite. Most of the many quartz-tourmaline veins on the mountain contain only a very small amount of radioactive material, and no other red oxidized zones are more than moderately radioactive. The restriction of the zeunerite to two localities indicates that the uranium may have been derived from one or two local primary sources within the granite. Routine checks will be made of any private prospecting that may be conducted during the 1952 field season on these occurrences.