RADIOACTIVE MINERALS IN THE YAKATAGA BEACH PLACERS, SOUTHERN ALASKA

Trace Elements Memorandum Report 326

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

IN REPLY REFER TO:

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GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

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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 and distribution are 6 copies of Trace Elements Memorandum Report 326, "Radioactive minerals in the Yakataga beach placers, southern Alaska", by Robert M. Moxham, January 1952.

From available information, it is concluded that the Yakataga beach placers do not constitute a commercial source of radioactive raw materials. The Survey plans no further work on these placers in the near future.

We plan to publish this report as a Geological Survey Circular, and 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

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Geology - Mineralogy

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Series A

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

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By

Robert M. Moxham

January 1952

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

USGS - TEM REPORT 326

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By

Robert M. Moxham

ABSTRACT

Radioactivity of nine samples of beach placer deposits in the Yakataga area, southern Alaska, was studied in 1948. The samples were given to the Geological Survey by prospectors operating in the area. The heavy-mineral fractions from the concentrates average 0.044 percent equivalent uranium. Three minerals, all members of the zircon group, contain the radioactive material in the sample; one mineral is uranium-bearing, the other two are thorium-bearing.

Unless the concentration of radioactive minerals in the beach deposits is considerably higher than the present qualitative data indicate, the placers at Yakataga beach do not constitute a feasible source of supply of radioactive materials.

INTRODUCTION

Nine samples of placer material from beach deposits in the Yakataga area (fig. 1) were given to the Geological Survey several years prior to 1948; three were donated by Joe Meloy, a prospector, and six by Seymour Standish and Associates, a Chicago mining organization prospecting the beach placers. Preliminary radiometric examination of the concentrates showed them to be slightly radioactive. In 1948 the samples were studied in the laboratory to determine whether they contained sufficient uranium-bearing minerals to warrant a field investigation of the beach placers or a search for the bed-

rock source. This work was done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

The Yakataga area is on the coast of the Gulf of Alaska about 50 miles east-southeast of Cordova (fig. 1). It is virtually isolated from adjacent areas by glaciers on the east and west and by high mountains to the north. The coast line is unbroken and unprotected from the open sea except for two small reefs which offer little shelter. Transportation to the area is chiefly by air. A 5,000-foot long airstrip is located near the beach between the Duktoth and Yakataga Rivers. Two airlines offer flag-stop service to this field. Civil Aeronautics Authority personnel and a few miners living near Cape Yakataga are the area's only inhabitants.

GEOLOGY

About 20,000 feet of Eocene(?) sandstone, arkose, graywacke, shale and limestone, and Oligocene conglomerate underlie most of the area adjacent to the Yakataga beach. Unconsolidated Quaternary deposits overlie deformed Tertiary rocks in the valley bottoms and form a coastal plain extending from half a mile to a mile inland (Spieker et al, in preparation).

Between Cape Yakataga and Umbrella Reef, 18 miles, the beach is steep and not more than 300 feet wide; it is composed of well-packed, coarse sand and local concentrations of gravel. The gold in the beach sand is distributed erratically, the greatest concentrations being near the mouth of the White River. The quantity and size of the gold are reported (Maddren, 1913, p. 135) to diminish both east and west from this locality.

In general the gold and other heavy minerals are not concentrated on bedrock, but are irregularly disseminated vertically through the beach deposits.

The gold and at least part of the other heavy minerals in the Yakataga beach placers probably originated in the igneous rocks of the St. Elias Range east of the Yakataga area and were transported to the area mainly by a combination of glacial action and ocean currents.

MINING

Placer mining has been carried on sporadically in the Yakataga area since the discovery of gold in 1897. In recent years only a few small operations have been reported. In 1946 a company represented by Seymour Standish acquired a tract of beach between Cape Yakataga and the White River. The drilling operation, from which samples 3259 through 3264 were taken, was begun east of Cape Yakataga. According to Standish, the holes were drilled on 2,000-foot centers in two east-west lines, one at the high-tide line, the other a short distance north. The deepest hole reached bedrock at 15 feet. The six drill hole samples probably represent an area extending some 4,000 feet along the beach. Apparently insufficient gold was found, as the project was abandoned.

RADIOACTIVITY INVESTIGATIONS

The radioactivity of the Yakataga beach sands was first noted in 1945 when the Meloy samples were examined radiometrically, but a thorough examination of the material had to be postponed until other work had been completed.

Each of the nine samples available for study was processed according to a standard laboratory procedure for the extraction of the heavy minerals (those greater than 3.3 specific gravity). The equivalent uranium content of the heavy residue was determined by beta count. Fluorimetric methods

were used to determine the uranium content of the four most radioactive samples. The results of these tests are summarized in table 1. The heavy minerals of the three most radioactive samples were split into size and magnetic fractions to obtain a maximum concentration of radioactive minerals. The various fractions were then tested radiometrically. Data on these fractions are given in table 2. The chemical analyses and x-ray studies were made in the Trace Elements Section Washington Laboratory.

Radioactive minerals

Three radioactive minerals were isolated from the Yakataga samples. One has been identified definitely as zircon, but optical and x-ray studies of the other two were inconclusive except to show that they belong to the zircon group.

Zircon constitutes 95 percent of the non-magnetic fractions (fraction F) of the three samples listed in table 2. Radiometric tests indicate that the mineral contains 0.2 percent equivalent uranium. Sodium fluoride fluorescence tests for uranium were negative, although the high zirconium content may have had a quenching effect. It is likely, however, that the radioactive element is thorium.

Two unidentified radioactive minerals are found in the weakly magnetic fraction (fraction E, table 2). One is black and opaque with a metallic luster. It is highly radioactive and bead tests for uranium were strongly positive. The other unidentified mineral is reddish-brown, translucent, has a vitreous luster, and is only moderately radioactive. Bead tests for uranium were negative, so the radioactivity is ascribed to thorium.

Table 1.--Data on beach placer samples from the Yakataga area, southern Alaska

Sample no.	Type of material	Heavy fraction (percent eU)1/	Heavy fraction (percent U)	Concentration ratio (total sample: heavy fraction)2/
1355 3/	Natural beach concentrate	0.021	0.016	1.2:1
1356	Amalgamation residue	0.320	0.012	1.1:1
1357	Common beach sand	0.000	n.d. 4/	6.7:1
3259 5/	Drill-hole concentrate	0.026	0.014	1.2:1
3260	Drill-hole concentrate	0.018	0.006	1.8:1
3261	Drill-hole concentrate	0.000	n.d.	9.3:1
3262	Drill-hole concentrate	0.003	n.d.	3.8:1
3263	Drill-hole concentrate	0.004	n.d.	26.0:1
3264	Drill-hole concentrate	0.002	n.d.	4.7:1
Average		0.044		

1/ Equivalent uranium

2/ All samples except 1357 were concentrated to an unknown extent prior to their receipt by the Geological Survey. The concentration ratio given above refers to the heavy minerals in the sample as it was received.

3/ Samples 1355-1357 given by Joe Meloy

4/ n.d. - not determined

5/ Samples 3259-3264 given by Seymour Standish and Associates

Table 2.--Equivalent uranium (eU) content of various size and magnetic fractions of concentrates from beach placers in the Yakataga area, southern Alaska

Sample	+20-mesh	-20-mesh					
		Fractions of decreasing magnetic susceptibility					
		Strongly magnetic A	B	C	D	E +70-mesh	E -70-mesh	Non-magnetic F
1355							
percent eU	0.000	0.000	0.000	0.000	0.015	0.039	1.727	0.074
percent of total heavy fraction	4.4	1.4	4.8	67.7	5.8	1.4	2.3	12.1
1356	0.000	0.000	0.000	0.000	0.018	0.016	3.710	0.098
percent eU	2.5	14.8	7.1	25.3	8.1	3.3	1.8	17.1
percent of total heavy fraction								
3259	0.000	0.000	0.004	0.001	0.085	0.010	4.475	0.514
percent eU	5.2	22.2	10.3	39.4	9.9	2.9	1.3	8.8
percent of total heavy fraction								

CONCLUSIONS

The sedimentary rocks of the Yakataga region are probably not the original source of the radioactive minerals found in the beach placers. The gold and other heavy minerals may have been derived from the igneous rocks of the St. Elias Range to the northeast. After deposition in low concentration in the coastal plain sediments, they were reworked by wave action and deposited in higher concentration in the beach placers.

Unless the concentration is significantly greater than indicated by available information, the Yakataga beach placers do not constitute a feasible source of supply of radioactive materials. This could be determined with certainty only by detailed drilling. The possibility of locating the bedrock source of the material in the glacier-covered region from which it has probably been derived would seem remote.

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