RADIOMETRIC TRAVERSE ALONG THE YUKON RIVER FROM FORT YUKON TO RUBY, ALASKA, 1949

By Max G. White, John M. Stevens, and John J. Matzko

Trace Elements Memorandum Report 357

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

IN REPLY REFER TO:

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

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June 1, 1956

Mr. Robert D. Nininger
Assistant Director for Exploration
Division of Raw Materials
U. S. Atomic Energy Commission
Washington 25, D. C.

Dear Bob:

Transmitted herewith are three copies of TEM-357, "Radiometric traverse along the Yukon River from Fort Yukon to Ruby, Alaska, 1949," by Max G. White, John M. Stevens, and John J. Matzko, May 1956.

We are asking Mr. Hosted to approve our plan to publish this report as a chapter in a Geological Survey bulletin.

Sincerely yours,

for J. Smith Eric

for W. H. Bradley
Chief Geologist

Geology and Mineralogy

This document consists of 14 pages,
Series A

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

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Max G. White, John M. Stevens, and John J. Matzko

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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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ABSTRACT

In 1949, a radiometric traverse was made of rocks exposed along the banks of and near the Yukon River from about Fort Yukon to Ruby, Alaska.

Granitic rocks of Tertiary age and of Devonian or Carboniferous age and sandstone beds of Cretaceous age gave the highest readings obtained in the field. Other rock types examined were greenstone of Devonian or Carboniferous age and metamorphic rocks of Devonian and pre-Devonian age, sedimentary rocks, and lignite of Tertiary age, and alluvial deposits of Quaternary age. The most radioactive sample, from Melozitna River canyon, contained only 0.017 percent equivalent uranium.

INTRODUCTION

A large variety of material, including alluvial deposits, and sedimentary, metamorphic, greenstone, and granitic rocks, ranging in age from Quaternary to Devonian and pre-Devonian, are exposed along the Yukon River or within easy access of the river. An argentiferous galena prospect occurs on Quartz Creek, and gold-bearing placers occur in the Grant Creek area and Morelock Creek area.

For the investigation, a 35-foot poling boat was used with a 22-horsepower outboard motor. The party conducting the investigation along the Yukon River, from Fort Yukon to Ruby, Alaska, consisted of

M. G. White and J. M. Stevens, geologists, and Egil Salvesen and R. D. Olson, camphands. The work was done in June 1949, on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission. The geologists who made this investigation were transferred to other work, and this report was prepared by John J. Matzko from their field notes.

AREAS INVESTIGATED

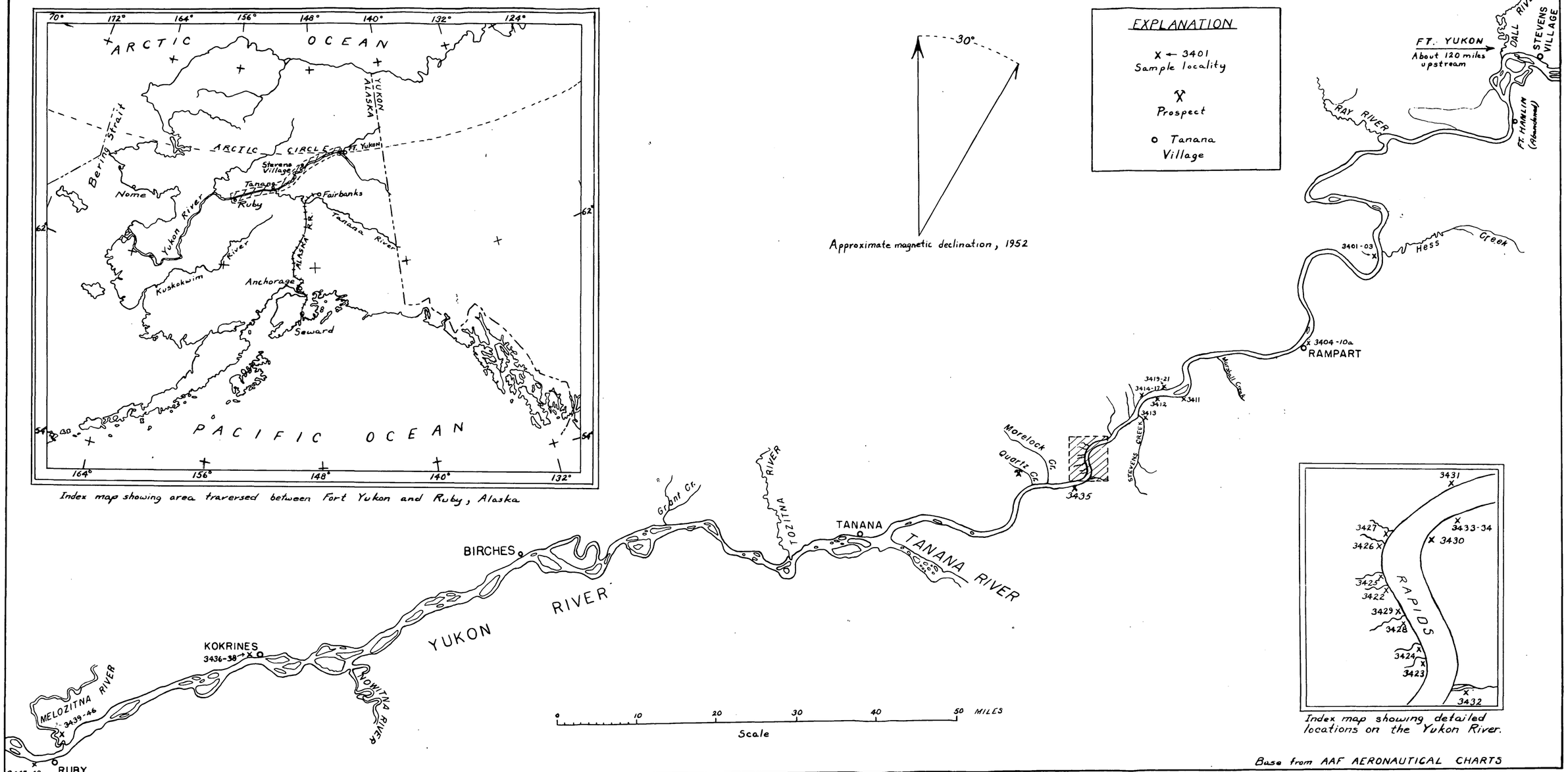
Areas contiguous to the Yukon River and to tributary streams up which the 35-foot poling boat could ascend, were examined for radioactivity content. The investigation was begun at Fort Yukon and terminated near Ruby, Alaska (fig. 1).

Concentrates for heavy mineral study were obtained from selected areas by panning gravels in the field. Radiometric results of these and other samples collected during the course of the investigation are tabulated in table 1.

Fort Yukon to Stevens Village

Quaternary deposits

Deposits of Quaternary age were traversed from Fort Yukon (not shown on fig. 1) to Stevens Village. No anomalous radioactivity was detected in any of these detrital deposits, which include silt, sand, and gravels but consist principally of gravels (Mertie, 1937).



Index map showing area traversed between Fort Yukon and Ruby, Alaska

Index map showing detailed locations on the Yukon River.

FIGURE 1.--YUKON RIVER, SHOWING LOCALITIES SAMPLED BETWEEN STEVENS VILLAGE AND RUBY, ALASKA

Devonian or Carboniferous deposits

Greenstone of Devonian or Carboniferous age is exposed near Fort Hamlin in the bend of the Yukon River. The greenstone on the north and west bank of the river was examined but no anomalous radioactivity was noted.

Table 1.--Radioactivity of samples collected during the traverse of the Yukon River from Fort Yukon to Ruby, Alaska

File No.	Description	Equivalent uranium (percent)
	Quaternary deposits	
3413	Stevens Creek, about 1.5 miles from mouth	0.004
3422	From first creek upstream from camp in middle of Yukon River rapids, 2-pan concentrate	.005
3424	From second creek downstream from camp, 1-pan concentrate	.014
3425	From second creek upstream from camp, 3-pan concentrate	.002
3426	From third creek upstream from camp, immediately above rapids, 3-pan concentrate	.015
3427	From fourth creek upstream from camp, 2-pan concentrate	.007
3428	First creek downstream from camp, 2-pan concentrate	.005
3429	Just below camp, north bank of Yukon River, a natural concentrate	.004
3431	Dried creek bed downstream from camp, about 1-pan concentrate	.007
3432	Southeast bank of Yukon River, a large creek coming in on bend below camp, about 0.5 mile from mouth, 2-pan concentrate	.015

Table 1.--Radioactivity of samples collected during the traverse of the Yukon River from Fort Yukon to Ruby, Alaska--Continued

File No.	Description	Equivalent uranium (percent)
	Quaternary deposits--Continued	
3436	North bank of Yukon River, below Kokrines, and downstream from exposures of gneissic granite, 3-pan concentrate	0.010
3439	From Melozitna River canyon, 7-pan concentrate	.01
3447	Wash from granitic dikes below Ruby, on Yukon River, 2½-pan concentrate	.015
	Cretaceous deposits	
3440	Grit, of Cretaceous age, from Melozitna River canyon	.017
3441	do.	.002
3442	do.	.003
3443	do.	.002
3444	do.	.001
3445	Shale with limestone, from Melozitna River canyon	.001
3446	Black carbonaceous material, from Melozitna River canyon	.002
	Tertiary deposits	
3401	Conglomerate across from mouth of Hess Creek, on Yukon River	.001
3402	do.	.001
3403	do.	.001
3404	Conglomerate, south bank of Yukon River, upstream from Rampart	.002

Table 1.--Radioactivity of samples collected during the traverse of the Yukon River from Fort Yukon to Ruby, Alaska--Continued

File No.	Description	Equivalent uranium (percent)
	Tertiary deposits--Continued	
3405	Conglomerate, south bank of Yukon River, upstream from Rampart	0.007
3406	do.	.010
3407	do.	.014
3408	do.	.009
3409	do.	.004
3410	do.	.007
3410a	do.	.005
	Devonian or Carboniferous deposits	
3411	About 20 miles below Rampart, mafic gneissic rock interbedded with schist and slates	.002
3414	Monzonite, across from mouth of Stevens Creek on Yukon River	.006
3415	do.	.003
3416	do.	.003
3417	do.	.003
3419	do.	.008
3420	do.	.003
3421	do.	.003
3430	Monzonite in Yukon River rapids	.003

Table 1.--Radioactivity of samples collected during the traverse of the Yukon River from Fort Yukon to Ruby, Alaska--Continued

File No.	Description	Equivalent uranium (percent)
	Devonian or Carboniferous deposits--Continued	
3433	Dark coarse grained monzonite, just above Rapids	0.002
3434	Finer grained dark monzonite, just above Rapids	.005
3437	Granite from near Kokrines on northwest bank of Yukon River	.001
3438	do.	.001
3448	Granitic dike intruding schist, below Ruby	.004
	Devonian and pre-Devonian deposits	
3412	About 20 miles below Rampart, phyllite or slate	.001
3435	Mineralized zone in black schist just below Rapids	.001

Stevens Village to Tanana

Quaternary deposits

The large areas of alluvial gravels of Quaternary age, exposed along the Yukon River, were tested. No radioactivity was detected.

Tertiary deposits

Three exposures of sedimentary rocks of Tertiary age were examined. In addition, an exposure of quartz monzonite was tested. In an area along the banks of the Yukon River, opposite the mouth of Hess Creek,

lignite is interbedded with thin-bedded shales and sandstone. The lignite has been mined locally and contains fossils determined to be of Eocene age (Eakin, 1916, p. 52). Conglomerate and grit tested in the area gave essentially background readings that indicated about 0.001 percent equivalent uranium or less; slightly higher readings were obtained on the lignite (table 1).

Another outcrop of rocks of Tertiary age occurs on the east bank of the Yukon River and above Rampart. These beds include conglomerates, friable sandstones, clays, and thin seams of lignite and dark shales. They contain fossils identified as of Eocene age (Eakin, 1916, p. 52). No appreciable radioactivity was detected.

The exposure of quartz monzonite examined near Stevens Creek is of middle Tertiary age, possibly Eocene (Mertie, 1937). Granite on the opposite side (right bank) of the Yukon River, however, is mapped by Eakin (1916, pl. 2) as Paleozoic, probably Devonian or Carboniferous. No appreciable radioactivity was detected in either body.

Devonian or Carboniferous deposits

A very large area of greenstone of Devonian or Carboniferous age composed essentially of altered mafic flows and tuffs, diabase, and impure limestone, is exposed along the Yukon River from about Fort Hamlin to Rampart (Eakin, 1916, pl. 2). No abnormal amount of radioactivity was detected in the greenstone, and readings only slightly above background were noted in areas of movement where the rock was crushed and had a shaly appearance.

Granitic intrusive rocks of about Devonian age (Eakin, 1916) were examined in an area near the rapids about midway between Rampart and Tanana on the Yukon River (fig. 1). The radioactivity was about the same as for the monzonite that crops out along the Yukon River, opposite Stevens Creek; higher readings were noted on the finer-grained variety of monzonite.

Devonian and pre-Devonian deposits

Dark, tough schistose metamorphic rocks of pre-Devonian age crop out in sections along the Yukon River upstream from Stevens Creek. Readings slightly above background were obtained on the metamorphic rocks examined in the field, but results obtained from laboratory analyses show no appreciable radioactivity.

Prospect

Also examined was the argentiferous galena prospect reported by Eakin (1916, p. 82) on Quartz Creek (fig. 1). He noted that most of the veins occur as small stringers cutting limestone. Radiometric tests were made around the adit, tailings, dumps at prospect pits, ore in box at cabin, and on the nearby hills, but no anomalies were noted.

Tanana to Ruby

Quaternary deposits

Alluvial deposits of Quaternary age constitute most of the exposures in the banks of the Yukon River between Tanana and Ruby. No appreciable radioactivity was detected.

Cretaceous deposits

Sedimentary rocks of Cretaceous age are exposed in the Melozitna River canyon (fig. 1). Radiometric tests on conglomerate, sandstone, quartzose grit, black shale, and limestone, indicated about 3 times the radioactivity of other rock types tested farther upstream on the Yukon River. The grit gave the maximum reading in the field; however, tests made in the laboratory show a low radioactivity content (maximum of 0.017 percent eU) for all the various rock types examined (table 1).

Devonian or Carboniferous deposits

The gneissic intrusive rocks that crop out a few miles below Birches, along the right bank of the Yukon River, were examined (fig. 1). The gneiss is probably of Devonian age (Eakin, 1916, pl. 2), and may be divided into a light-colored, coarse-grained rock, and a dark-colored, fine-grained, somewhat schistose gneiss. The radioactivity of both types of rock was only slightly higher than the metamorphic complex tested in the immediate area (table 1). A gneissic tourmaline granite found as talus below Birches, contained no abnormal amount of radioactivity.

Downstream from Ruby for a distance of about $1\frac{1}{2}$ miles, the schist and metamorphic rocks are intruded by granitic dikes. The age of the dikes is not known and is listed here tentatively as Devonian or Carboniferous. None of the dikes are more than 10 feet thick. The radioactivity of the dikes is slightly above background, about 0.004 percent eU.

Devonian and pre-Devonian deposits

The schist and metamorphic complex of Devonian and pre-Devonian age that occurs near Ruby and Kokrines (fig. 1) was examined, but no anomalies were detected. Crystalline limestone in the bluff at Ruby also contained no appreciable radioactivity.

The metamorphic rocks in the Grant Creek area were examined in 1946 by Killeen and White (Wedow, Killeen, and others, 1954). No radioactive material was found.

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