INVESTIGATION OF REPORTED NICKEL - BEARING ALUM NEAR OLD RAMPART, PORCUPINE RIVER, NORTHEAST ALASKA

By James C. Barker

Critical and Strategic Minerals in Alaska -

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* 1982 Field Report

U. S. DEPARTMENT OF THE INTERIOR

James G. Watt, Secretary

BUREAU OF MINES

Robert C. Horton, Director

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INVESTIGATION OF REPORTED NICKEL-BEARING ALUM NEAR OLD RAMPART, PROCUPINE RIVER, NORTHEAST ALASKA

By James C. Barker[1]

INTRODUCTION

Old Rampart is the site of several abandoned cabins situated on the north bank of the Porcupine River in northeast Alaska (fig. 1). The location of the reported alum-precipitating springs occurs downstream of Old Rampart, opposite the mouth of the Salmon Trout River at latitude 67°10', longitude 141°40'.

In 1941, a USGS field party headed by J. B. Mertie (3)[2/] collected a sample containing nickel-bearing alum. No specific location was given other than that it was opposite the mouth of the Salmon Trout River. There was no follow-up investigation nor was a published account of the occurrences made.

Since nickel mineralization is frequently associated with platinum group metals, cobalt and copper, the U. S. Bureau of Mines conducted a very brief investigation to determine if the reported nickel values were due to mineralization or were instead derived by normal leaching of nickel silicates contained within the mafic extrusive rocks which are known to occur in the area. During the 1982 field season a series of samples and field observations were collected. This report also includes geochemical survey data collected by the Bureau in 1977 (1).

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2 Underlined numbers in parentheses refer to items in the list of references at the end of this report.

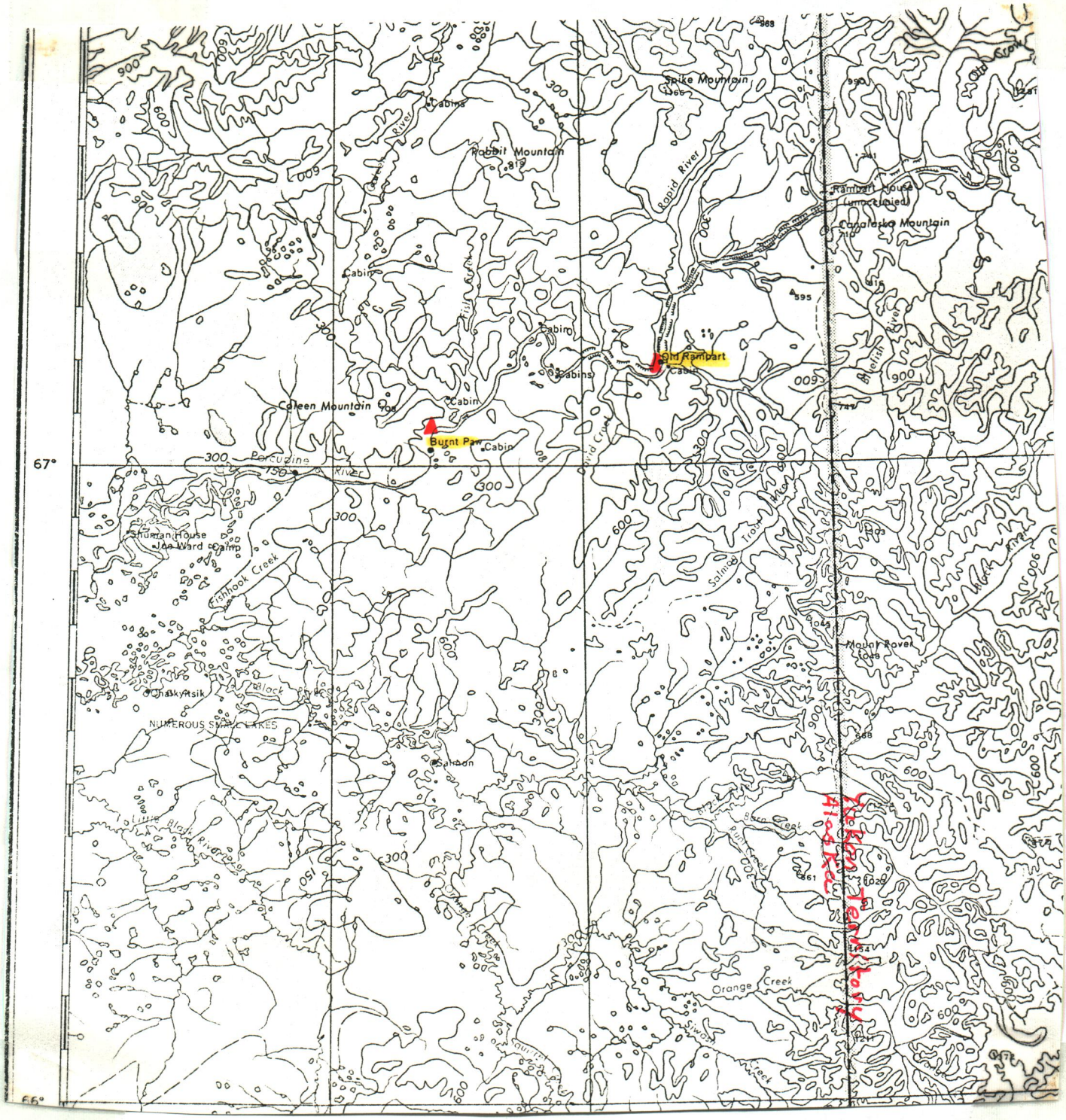


FIGURE 1. - Project Location, northeast Alaska.

GEOLOGY

The Old Rampart area is underlain by Paleozoic massive gray limestones, bioclastic limestones, black calcareous shales, cherts and dolomite. No intrusive rocks are reported in the area. Geologic mapping (1:63,360 scale) along the river canyon has been compiled by Brosge and others, 1966 (2). Except for the bedrock exposures in the river canyon, the entire region is covered by flood basalts of Quaternary or Late Tertiary age. As many as 10 individual flows of vesicular olivine basalts, totaling as much as 300 ft in thickness, have been distinguished in the canyon walls.

MINERAL INVESTIGATION

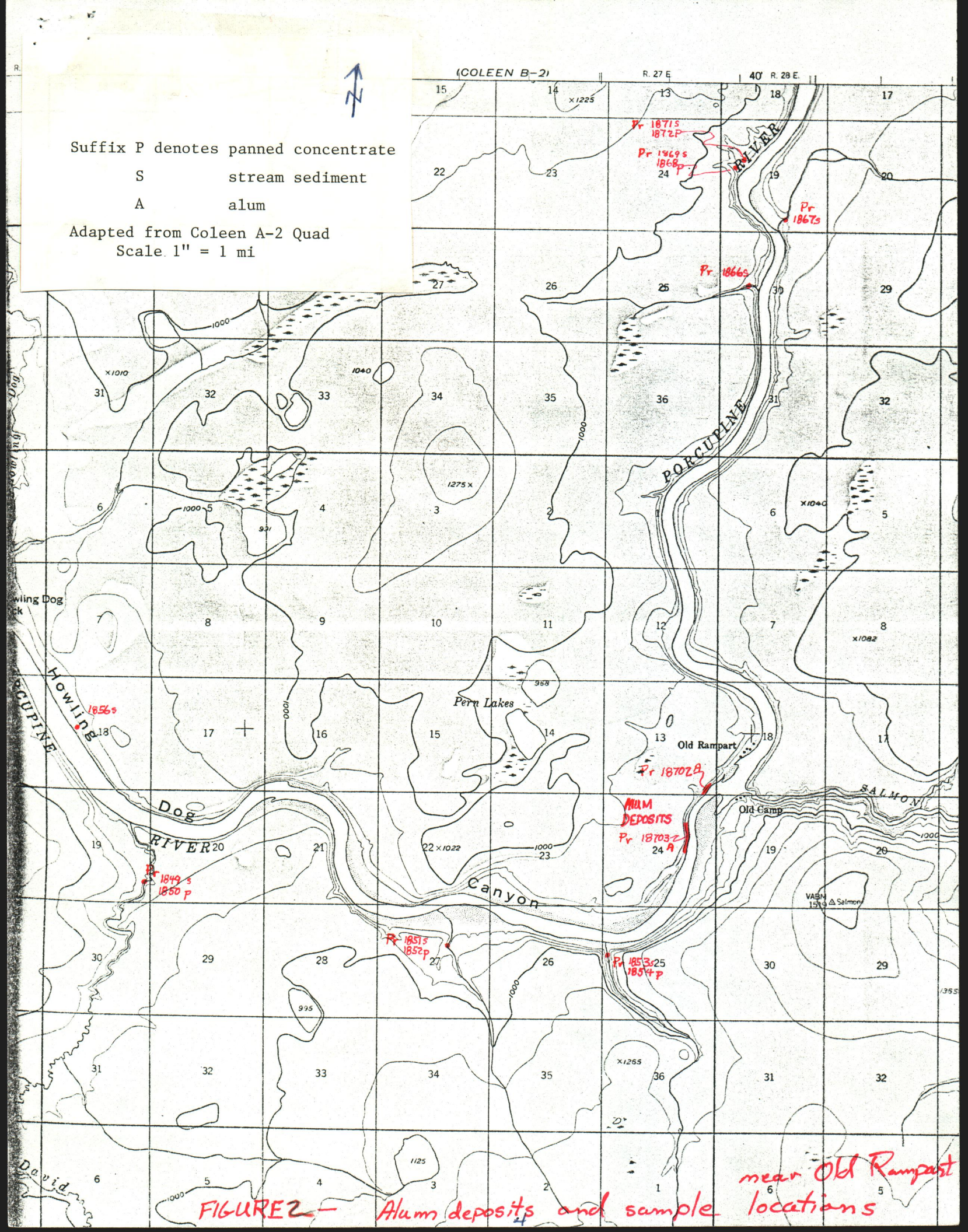
The occurrence of alum was located about 1/2 mi downstream of Old Rampart (fig. 2). An additional occurrence was also found 2-1/2 mi north of Burnt Paw (fig. 3).

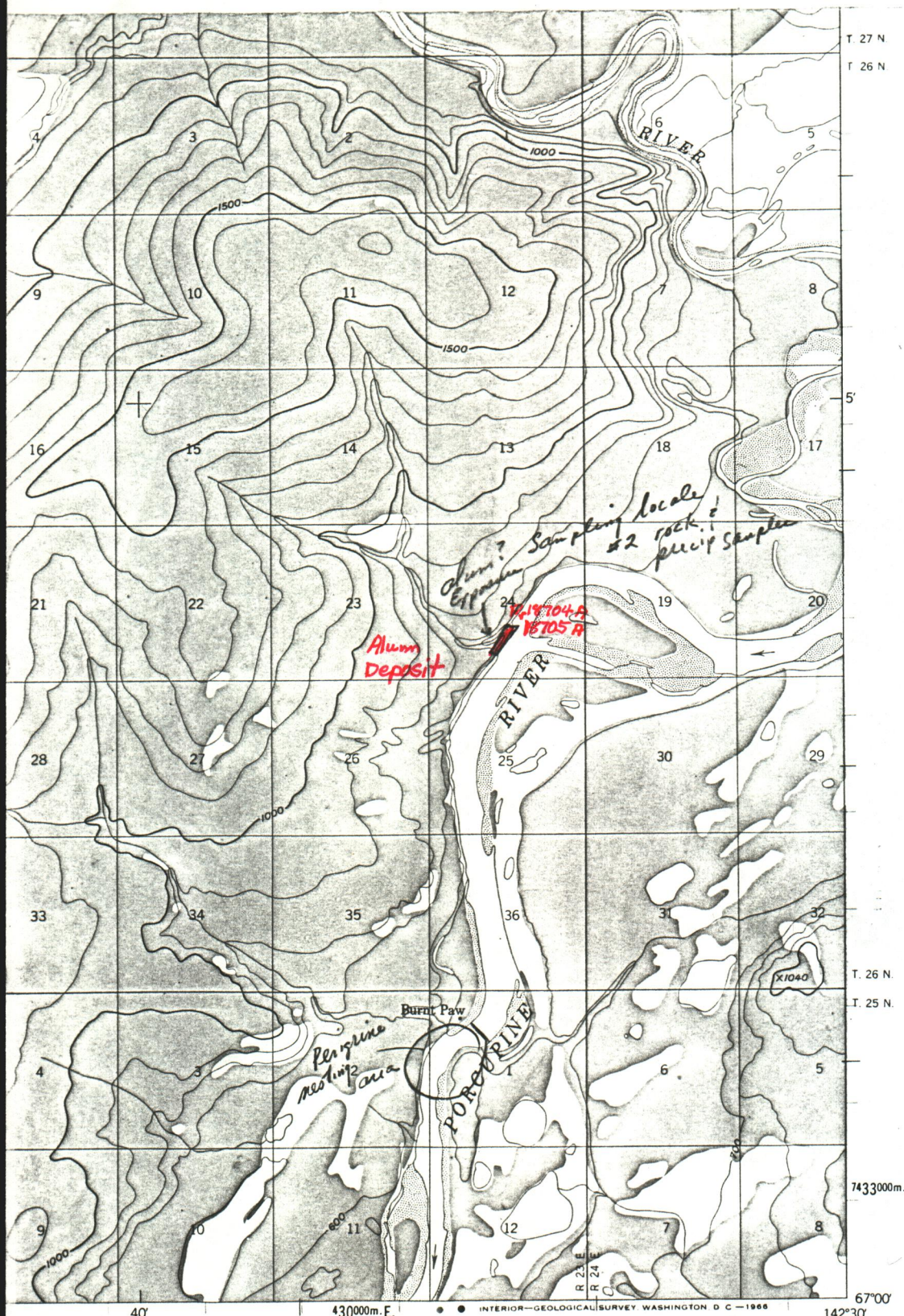
Alum [$KAI\ (SO_4)_2 \cdot 12H_2O$] deposition was found to be the result of precipitation from ground water seeps, as shown on figures 4 and 5. The mineral forms as spotty coatings and encrustations on sheared the calcareous and carbonaceous black shale bedrock exposed in the near-vertical river banks. Atomic absorption analyses performed on scrapings of the alum coatings are given in table 1 as follows:

TABLE 1. - Analyses of alum samples

Sample no.	Co	Cu	Ni	Description
PR18702	11	63	244	White precipitate forming on a carbonaceous black shale over an area approximately 100 x 30 ft.
PR18703	8	73	151	White precipitate forming on a black shale approximately 600 ft downstream of first location.
PR18704	14	35	209	White precipitate location approximately 2.5 mi north of Burnt Paw. Forms on a highly carbonaceous black shale.
PR18705	10	88	55	Do

NOTE: All analyses in parts per million.
Analyses by TSL Laboratories, Spokane, Washington.


Suffix P denotes panned concentrate
S stream sediment
A alum
Adapted from Coleen A-2 Quad
Scale 1" = 1 mi
(COLEEN B-2)
R. 27 E.
R. 28 E.
PORCUPINE RIVER
Howling Dog
Dog RIVER
Canyon
Pern Lakes
Old Rampart
Old Camp
SALMON
ALUM DEPOSITS
Pr 1871S 1872P
Pr 1869S 1868P
Pr 1867S
Pr 1866S
Pr 1856S
Pr 1849S 1850P
Pr 1851S 1852P
Pr 1853S 1854P
Pr 1870Z
Pr 1870-2 A
FIGURE 2 — Alum deposits and sample locations near Old Rampart



3 4 MILES

18000 21000 FEET

5 KILOMETERS

ROAD CLASSIFICATION

Trails .....

(BLACK RIVER D-3)

ALASKA

QUADRANGLE LOCATION

COLEEN (A-4), ALASKA

N6700—W14230/15X30

1956

MINOR REVISIONS 1965

ON, D. C. 20242
ON REQUEST

FIGURE 3 — alum occurrence near Burnt Paw

FIGURE 4. - Alum precipitating on black shale in river bank. Additional localities also occur to both the left and right sides of photograph.

FIGURE 5. -Close-up view of alum encrustations and coatings on black shale bedrock.

Normal Ni content of shales is cited by Levinson (4, p. 43) to be 70 ppm and 12 ppm Ni normal for limestone. While the Ni values listed in table 1 might be considered slightly above background, the lack of significant Co and/or Cu values tend to argue against the source of Ni being a mineralized sulfide structure. A more likely explanation is that the Ni is being leached by ground water from the olivine basalts.

Stream sediment sample analyses shown on table 2 also indicate Ni enrichment in the general region of Old Rampart. Slightly elevated Co, Cr and Cu values were also detected but were considered still too low to be indicative of mineralization. The Co and Cu values are representative of elemental levels typical of basalts. At sample site PR1856 it was possible to examine the bedrock of the entire water shed of the small gulch located there. All rock exposed was composed of olivine basalt. The elemental analyses of this sample indicate Ni content of 500 ppm, Co of 100 ppm, and Cu of 150 ppm. These levels are therefore considered typical of the basalt flows.

Similarly, analyses of panned heavy mineral (non-magnetic) concentrates, shown on table 3, indicate the moderate Ni and Cr enhancement typical of a mafic terrane. Meanwhile relatively low Ag, Co, Cu, Pb and Zn values for panned concentrates suggest that the source is not sulfides.

TABLE 2. - Stream sediment sample analyses

Element	PR1856	PR1849	PR1851	PR1853	PR1871	PR1869	PR1867	PR1866
Fe%	15	10.0	1.5	15.0	5	10	10	15
Mg%	7	7.0	5.0	7.0	3	3	7	7
Ca%	15	15.0	7.0	7.0	1	5	15	15
Na%	G	G	G	G	1.2	1.6	G	G
K%	--	--	--	--	--	--	--	--
Ti%	G	0.3	G	0.5	1	1	0.7	G
Mn	3000	1000	300	1500	2000	3000	3000	3000
Ag	3	3	3	2	L	I	2	2
As	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N
B	100	50	150	150	300	200	100	50
Ba	2000	N	3000	2000	N	L	N	1000
Be	3	L	2	3	3	N	L	N
Bi	20	20	20	20	N	N	N	L
Cd	N	N	N	N	N	N	N	N
Co	100	50	N	70	N	N	50	100
Cr	1000	150	300	500	200	200	200	300
Cu	150	150	100	150	50	70	150	150
Ga	3	1	2	3	1.5	3	3	3
La	N	N	N	N	N	N	N	N
Li	N	N	N	N	N	N	N	N
Mo	N	N	N	N	N	N	N	N
Nb	1000	L	1000	L	L	N	L	1000
Ni	500	500	200	300	150	100	200	300
P	3000	1000	2000	2000	L	L	3000	3000
Pb	L	N	N	L	L	N	N	N
Pd	N	N	N	N	N	N	N	N
Pt	N	N	N	N	N	N	N	N
Sb	N	N	N	N	N	N	N	N
Sc	N	N	N	N	N	N	N	N
Se	--	--	--	--	--	--	--	--
Sn	N	N	N	N	N	N	N	N
Sr	N	N	N	N	N	N	N	N
Ta	N	N	N	N	N	N	N	N
Te	N	N	N	N	N	N	N	N
V	300	150	300	300	200	300	300	300
W	N	N	N	N	N	N	N	N
Y	N	N			N	N	N	N
Zn	N	N	N	N	N	N	N	N
Zr	1000	300	G	L	300	500	L	300

NOTE. - Sample analyses by semi-quantitative optical emission spectrography by Mineral Industry Research Laboratory, University of Alaska, Fairbanks, Alaska.

All values in parts per million unless otherwise noted.

-- Not analyzed for.

TABLE 3. - Panned concentrate sample analyses

Element	PR1868	PR1854	PR1852	PR1850	PR1872
Ag	10	10	5	5	10
As	N	N	N	N	N
Au	N	N	N	N	N
B	700	50	150	300	500
Ba	G	L	N	L	500
Be	N	L	L	L	2
Bi	L	N	L	L	L
Ce	N	N	N	N	N
Co	70	100	100	150	100
Cr	G	1500	1500	2000	200
Cu	150	150	70	150	150
La	N	N	N	N	N
Mo	20	N	N	30	50
Nb	L	L	L	L	L
Ni	300	1500	1500	1500	300
Pb	300	N	N	N	150
Pt	N	N	N	N	N
Sb	3000	N	L	L	L
Sn	L	N	L	2	L
Th	--	--	--	--	--
U	--	--	--	--	--
V	1500	300	300	300	1500
W	N	N	N	N	N
Y	700	N	N	N	N
Zn	700	N	N	N	150
Zr	G	N	N	N	G

NOTE. - Sample analyses by semi-quantitative optical emission spectrography. Analyzed material was the non-magnetic, -2.85 specific gravity heavy mineral fraction. Only the minus 14 mesh size fraction was analyzed. Analysis by Mineral Industry Research Laboratory, University of Alaska, Fairbanks, Alaska.

-- Not analyzed for.

CONCLUSION

Alum deposits near Old Rampart, which have been reported to contain occurrences of nickel alum, were re-examined by the USBM. An additional occurrence was found to the west, near Burnt Paw. Data suggest that the nickel, which is present in trace amounts only, is probably being leached from unmineralized Quaternary/Tertiary basalt flows. No further investigation is recommended.

REFERENCES

1. Barker, J. C. Mineral Investigation in the Porcupine River Drainage, Alaska. U.S. BuMines OFR 27-81, 1981, 288 pp.

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3. Joesting, H. R. Strategic Mineral Occurrences in Interior Alaska. Territorial Dept. of Mines, Pamphlet No. 1, 1942, p. 19.

4. Levinson, A. A. Introduction to Exploration Geochemistry. Applied Publishing Ltd., Maywood, Ill., 1974.