SAMPLING FOR COBALT AT BORNITE, ALASKA

By Jeffrey Y. Foley

* Field Report - January, 1983

U. S. DEPARTMENT OF THE INTERIOR

James G. Watt, Secretary

BUREAU OF MINES

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INTRODUCTION

Carrollite ($CuCo_2S_4$), an ore mineral of cobalt, is known to occur in the Ruby Creek Cu-Zn deposit at Bornite (fig. 1), in northwest Alaska (5, 9). [2] The events leading to mineralization of dolomite and argillite units and the distribution of these rocks in the Bornite district are among the topics covered in a PhD discertation by M. W. Hitzman of Stanford University (in progress). Hitzman has identified carrollite and cobaltiferous pyrite at numerous intersections in diamond drill core belonging to Bear Creek Mining Corporation, the present operator of the property. A brief visit to collect bulk samples was made by a Bureau geologist in July, 1981, as part of the Alaska Critical Metals program.

ECONOMIC GEOLOGY

Hitzman summarizes the distribution of cobalt as occurring:

1) "...as late cobaltiferous pyrite rims on earlier formed pyrite grains in pyritiferous, ferroan dolomite with disseminated sphalerite and massive siderite"
2) "...as carrollite in high-grade bornite, chalcocite, chalcopyrite, and sphalerite ore at higher levels in the deposit."

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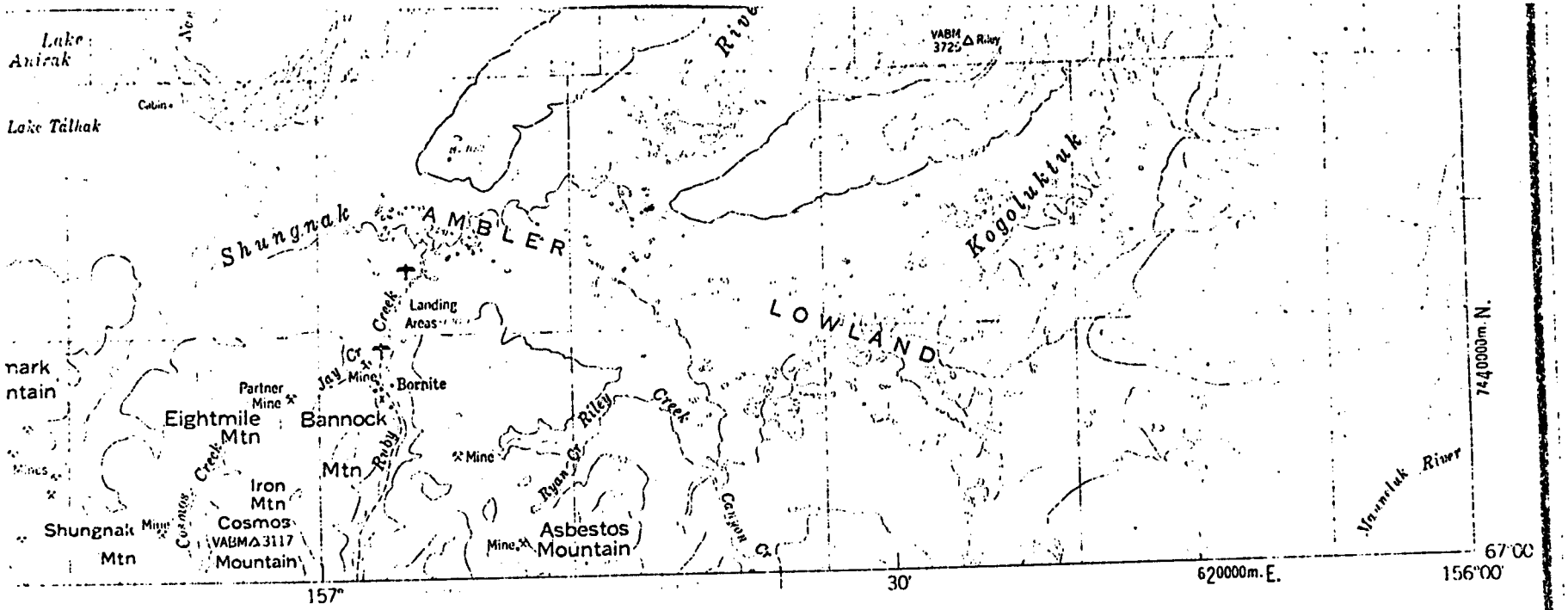
[1] Geologist, U.S. Bureau of Mines, Alaska Field Operations Center, Fairbanks.

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



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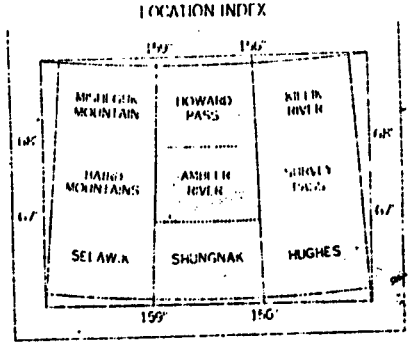
LOCATION INDEX



20 25 MILES

KILOMETERS

ROAD CLASSIFICATION

UNIMPROVED DIRT ... TRAIL ...

AMBLER RIVER, ALASKA

N6700—W15600/60X180

1956

EAST

S

TON, D.C. 20242
REQUEST

Figure 1.— Location of Bornite in the Ambler River area.

Carbonate rocks including limestone, dolomites and ferroan dolomites are by far the most abundant lithologies in the district. These carbonates stratigraphically overlie a shale sequence and Devonian ages are inferred for both units on the basis of paleontological evidence (8). These units are aligned along a large symmetrical anticlinorium that strikes NNW in the western Brooks Range (9). Hitzman interprets the limestone and some of the dolomites as carbonate bank deposits approximately 1000 m thick which were deposited adjacent to a shale-filled graben (5). Both mineralized dolomite and ferroan dolomite are of hydrothermal origin, which resulted in a vertical zoning of metals within the deposit. Runnells further describes the presence of the supergene sulfides djurleite ($Cu_{1.96}S$) and covellite at Ruby Creek.

The Ruby Creek deposit has been drilled and Cu-Zn reserves have been calculated at 1 million tons of Cu in ore ranging from 4-12%. The old mine workings are currently flooded but drilling and assessment work continues annually by the Bear Creek Mining Co. Although cobalt has been identified at numerous intersections, no reserves for this commodity have yet been calculated. Discussions with Jay Hammit of Bear Creek Mining indicate the company is recalculating reserves based on a Cu-Co recovery.

WORK BY THE BUREAU

Permission to visit Bornite and sample the Ruby Creek ore dump was granted to the Bureau by Mr. Hammit. Three bulk samples weighing over 100 lb. each were collected by the writer on July 16, 1981. Numerous specimans of various sulfide assemblages were also collected. Analyses for 3 hand specimans and head analyses for 3 bulk samples are presented

below. M. W. Hitzman has advised us that it now appears from his data that higher cobalt values are present in lower-grade chalcopyrite-pyrite-bornite material. The Bureau's sample results below support this hypothesisi

TABLF 1. - Head analyses of Ruby Creek bulk samples*

Sample No.	Fe(%)	Cu(%)	Co(%)	S
SW 18806	11.2	36.4	0.10	19.8
SW 18807	10.3	36.4	0.08	18.9
SW 18808	12.5	34.7	0.10	20.0

* Samples collected from Ruby Creek ore dump. Material specifically selected for bornite-and chalcopyrite-rich specimens. Each sample weighed between 100 and 150 pounds.

TABLE 2. - Summary of preliminary cobalt analyses on grab samples from Ruby Creek ore dump

USBM sample	Co(ppm) [1] Cu	Description
SW 18811A	230	5-10% Bo(bornite) in carbonate rock.
SW 18811B	2950	Several % pyrite, with minor Cc(chalco-pyrite and Bo.
SW 18811C	43	Several % Bo with trace Cc.

[1] Atomic absorption analyses by Bondar-Clegg, Vancouver.

RECOMMENDATIONS

These preliminary analyses and statements by Hitzman indicate that samples of pyritiferous material should be specifically selected from the dump where the other bulk samples were collected. Permission has been requested and granted from Mr. Hammit to accomplish this goal in the summer of 1983.

The presence of cobalt in the Ruby Creek copper deposits suggests that copper showings along the Ruby anticlinorium to both the east

and west should also be examined for Co content. Most of these showings are presently included in restrictive land classifications which prevent evaluation by industry.

It is proposed that Jeff Foley and one other worker from AFOC-Fairbanks follow up with a 2-3 day visit to Bornite in the summer of 1983.

REFERENCES

1. Cobb, E. H. Summary of References to Mineral Occurrences (Other Than Mineral Fuels and Construction Materials) in Northern Alaska. U.S. Geol. Survey OFR 75-628, 1975, 106 pp.

2. Cobb, E. H. and C. F. Mayfield. Summaries of Data on and Lists of References to Metallic and Selected Nonmetallic Mineral Occurrences in the Ambler River Quadrangle, Alaska, Supplement to Open-File Report 75-628, Part A -- Summaries of Data to January 1, 1981. U.S. Geol. Survey OFR 81-570A, 1981.

3. _____. Summaries of Data on and Lists of References to Metallic and Selected Nonmetallic Mineral Occurrences in the Ambler River Quadrangle, Alaska, Supplement to Open-File Report 75-628, Part B -- Lists of References to January 1, 1981. U.S. Geol. Survey OFR 81-570B, 1981.

4. Ellersieck, I. Map showing Chromium, Nickel, and Cobalt Stream-Sediment Geochemical Anomalies, Ambler River Quadrangle, Alaska. U.S. Geol. Survey OF-Map 78-120-H, 1978.

5. Hitzman, M. W. The Ruby Creek Cu-Co-Zn Deposit, Southwestern Brooks Range, Alaska (abstract) presented at Alaska Miner's Association

Convention, Anchorage, Alaska Octover, 1981. Abstract published in Alaska Miner, Nov., 1981, pp. 14 and 22.

6. Mayfield, C. F. and I. L. Tailleur. Bedrock Geologic Map of the Ambler River Quadrangle, Alaska. U.S. Geol. Survey OF-Map 78-120-A, 1978.

7. Mulligan, J. J. Kobuk Copper Deposits Cosmos Hills Area, Northwestern Alaska. U.S. BuMines Examination Report, Nov. 1957.

8. Patton, W. W., Jr., T. P. Miller and I. L. Tallieur. Regional Geologic Map of the Shungnak and Southern Part of the Ambler River Quadrangles. U.S. Geol. Survey Misc. Geol. Invest. Map I-554, 1968.

9. Runnells, D. D. The Mineralogy and Sulfur Isotopes of the Ruby Creek Copper Prospect, Bornite, Alaska. Economic Geology, vol. 64, 1969, pp. 75-90.

10. U. S. Bureau of Mines. Mineral Appraisal of the Proposed Kobuk Valley National Park, Alaska: A Preliminary Comment. OFR 110-78, 1978.