COBALT CONTENT IN SAMPLES FROM THE OMAR COPPER PROSPECT, BAIRD MOUNTAINS, ALASKA

by:

Uldis Jansons
Alaska Field Operations Center, Anchorage, Alaska

************************************** Open File Report MLA 109-82

UNITED STATES DEPARTMENT OF THE INTERIOR

James G. Watt, Secretary

BUREAU OF MINES

Robert C. Horton, Director

CONTENTS

TABLES

ILLUSTRATIONS

COBALT CONTENT IN SAMPLES FROM THE OMAR COPPER PROSPECT,
BAIRD MOUNTAINS, ALASKA

by

Uldis Jansons[1/]

ABSTRACT

The cobalt content of rock, soil, and stream silt was determined for samples from the Omar copper prospect, located near the Omar River in the Baird Mountains, northwestern Alaska. Anomalously high values were detected in all three types of materials collected near the area of copper mineralization. The highest cobalt values were: rock - 545 ppm, soil - 66 ppm, and stream silt - 47 ppm. Samples with high cobalt content generally also had high base metal contents. Cobalt values in stream silt samples were highest in materials collected near copper mineralization and lowest in sediments away from mineralization. A cobalt association with the copper mineralization is indicated.

INTRODUCTION

The presence of cobalt in carbonate-hosted copper deposits, principally Ruby Creek, in the Western Brooks Range in Alaska, has been recognized since at least the early 1960's.

High grade (1%+) cobalt zones occur in the Ruby Creek deposit at Bornite, Alaska (1)[2/]. Recent work at that deposit shows that several tenths of one percent cobalt may be associated with large tonnages of this copper mineralization. The mineralization at Ruby Creek is undergoing re-evaluation by the mineral industry. Copper in the Omar River area was recognized in the early 1960's. The property was subsequently

1/ Supervisory Physical Scientist, Alaska Field Operation Center, Anchorage
2/ Underlined numbers in parentheses refer to references at back of report.

staked and a limited amount of drilling was done following various surface studies. Subsequently the claims were allowed to lapse.

Because of geological similarities between the Ruby Creek and Omar deposits, the potential of a cobalt resource at Omar seemed possible. Previously collected rock, soil, and stream silt samples from the Omar area were analysed to determine their cobalt content. The analytical results are presented in this report.

ACKNOWLEDGEMENTS

The description of the Omar area and samples from the Omar prospect used in this report were provided by WGM Inc. of Anchorage, Alaska, as part of a contract mineral resource study of the western Brooks Range for the Bureau of Mines (2). Samples were analysed for cobalt at a commercial laboratory at Spokane, Washington using standard analytical techniques.

LOCATION AND ACCESS

The Omar prospect is located in T24N, R10W, Kateel River Baseline and Meridian, in the Baird Mountains, approximately 65 miles northeast of Kotzebue (figures 1 and 2).

Access to the area is by helicopter. Fixed wing aircraft have been landed at extensive terraces located about 8 miles to the southwest from the property.

PHYSICAL SETTING

The Omar prospect is in the Baird Mountains Physiographic Division of Alaska (3). The general topography of this division consists of moderately rugged mountains having rounded to sharp summits which rise

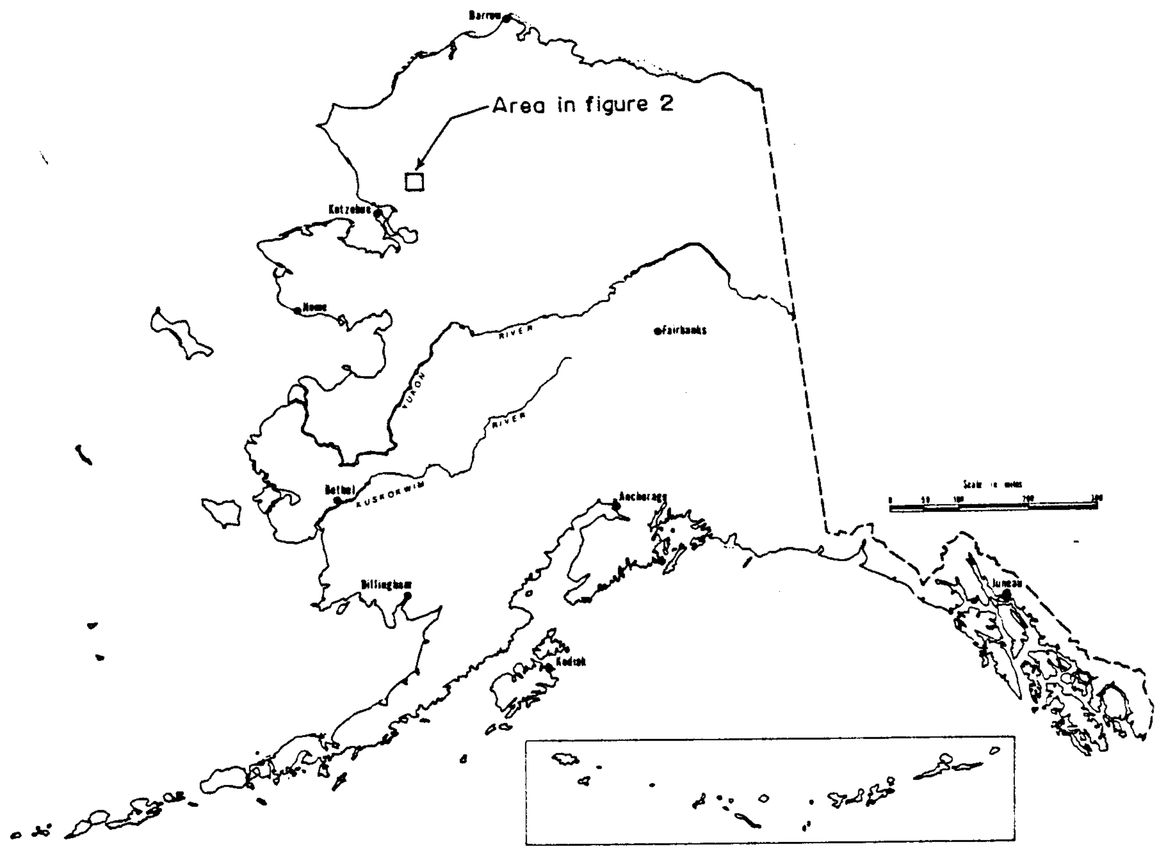

FIGURE 1. - Location of Omar prospect area in Alaska

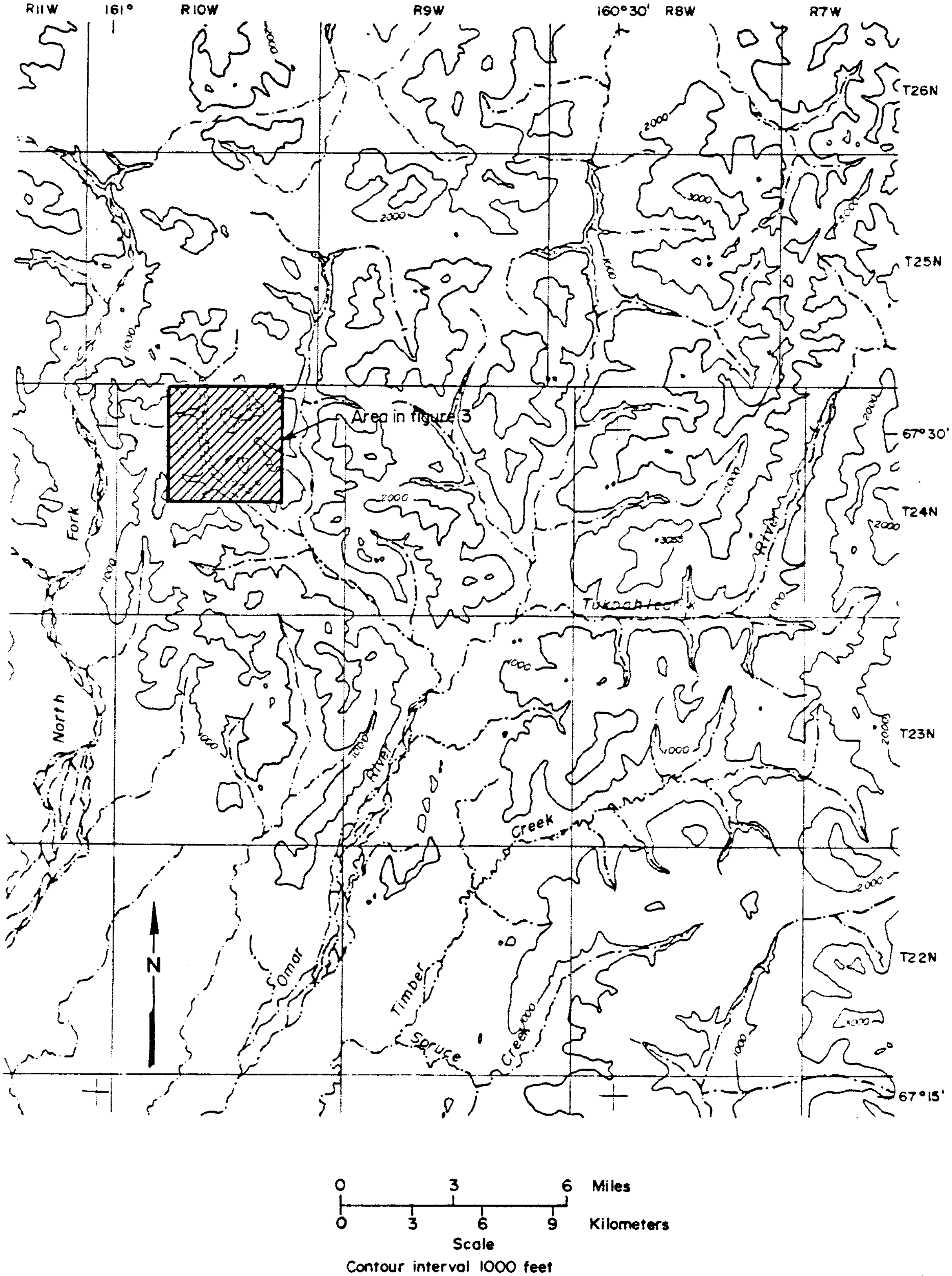

FIGURE 2. - Location of the Omar prospect, Baird Mountains, Alaska

abruptly from lowlands. The summits generally have 2,500 to 3,000-foot altitudes. The Baird Mountains are drained by streams that flow north to the Noatak River and south to the Kobuk River. The south-flowing streams head in narrow ravines having steep headwalls, several hundred feet high. The Omar River is one of these south-flowing streams. The prospect area is drained by two southerly-flowing forks of the Omar River, which is a tributary of the easterly-flowing Squirrel River (figure 2).

GEOLOGICAL SETTING

The following discussion is abstracted from the geologic map on the Omar prospect and an accompanying geologic report on mineral evaluations of the Western Brooks Range provided by a contractor to the Bureau of Mines (2).

The preliminary geologic work in the Baird Mountains Quadrangle (4-5) makes it possible to describe the regional setting only in a general way. The prospect is underlain by Devonian carbonate rocks which cover an area of about 550 square miles. The strata consist predominately of limestone and/or marble, and shale of the Baird Group.

Local Geological Setting

Carbonate sequences, both dolomite and limestone, at the Omar prospect have been folded into broad anticlines and synclines of variable attitudes. Detailed mapping indicates the presence of a series of steeplydipping north northwest-trending fracture systems. The fracture zones are not always apparent in individual exposures although the presence of highly fractured rocks along a NNW alignment strongly suggests their existence.

Most of the dolomites are fine-grained dark-gray massive bodies that display very few sedimentary features. A Devonian age has been assigned to these rocks based on the abundance and variety of favositid corals. The distribution and general character of the fossils suggests they probably formed in a paleo-reef environment. Associated local breccia-cones may represent clastic reef breccia aprons.

Limestone units, which are widespread along the western portion of the study area, are typically finely banded and commonly interbedded with light or dark-gray dolomites.

Fracturing has resulted in a stockwork of very narrow, white-colored, dolomite-filled fractures in dark-gray, generally massive, dolomite host rocks. Dolomite breccias commonly feature rounded or angular clasts in a finer-grained matrix. A tectonic origin for the breccias is suggested. Exposures at the prospect display many examples of fracturing that are gradational between the two extremes. The variation in intensity of fracturing apparently reflects structural extremes between mild, incipient fracturing and complete rupturing and dislocation.

Mineralization

Mineralized bedrock exposures are of limited areal extent, crop out in windows in pervasive talus in some areas, and are more or less surrounded by barren to very weakly mineralized rock in other areas. Occurrences of copper and iron mineralization at the prospect are shown on figure 3.

Surface copper mineralization occurs locally along several NNW trending fractures over a distance of about 9,000 feet. The fracture zones, which are up to 100 feet wide, are confined to a 1,000 to 3,500-

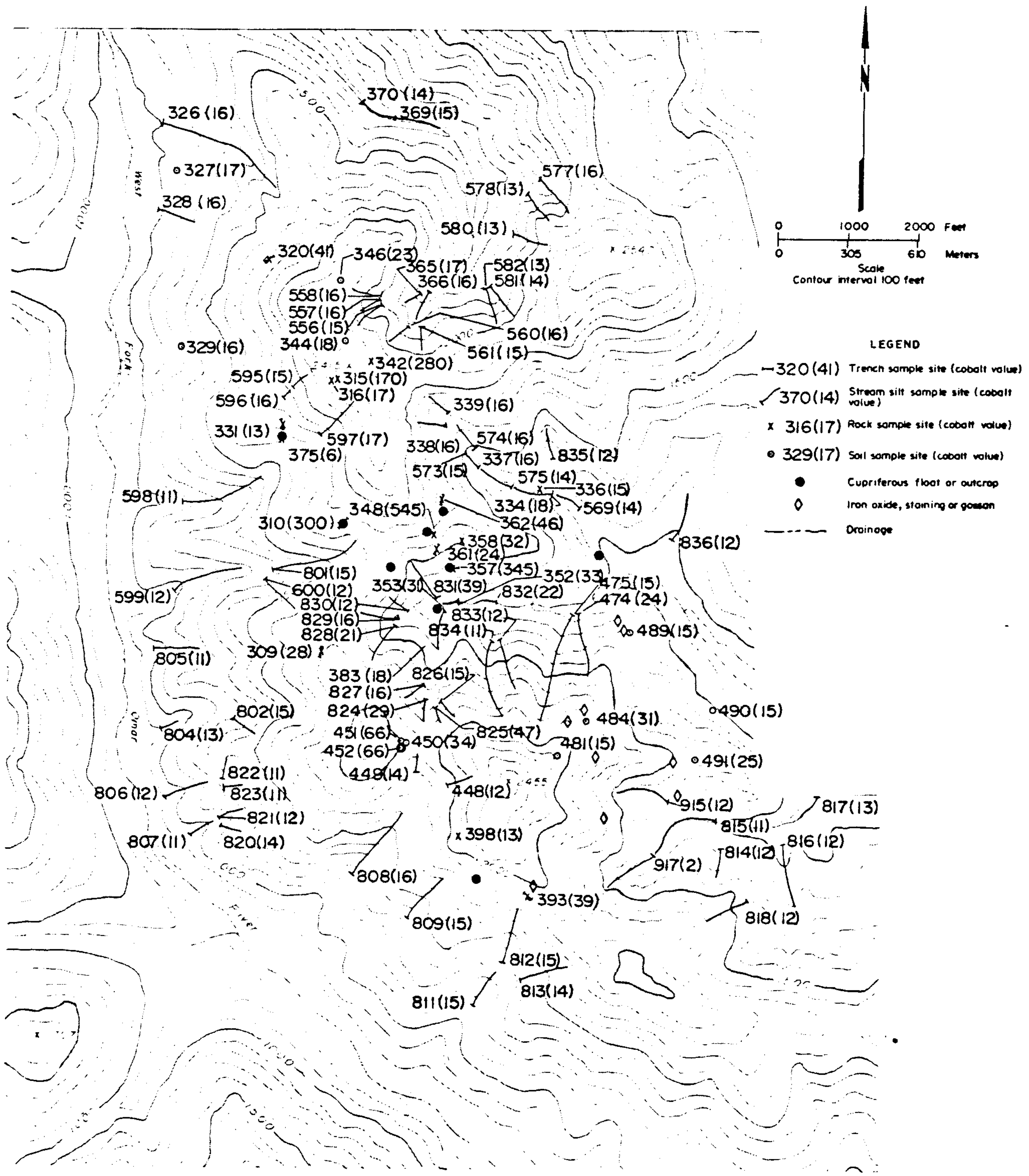

FIGURE 3. - Cobalt content in Omar prospect area samples, Alaska

foot wide north-south trending zone. Surface indications of copper mineralization occur only along the fracture zones confined to the west side of the prospect area. The individual surface shows located along the NNW fractures are separated by barren rubble zones that are up to several hundred feet long. Samples collected at occasional exposures along the intervening 9,000-foot length, contain from 0.1% copper to more than 2% copper. High-grade samples were collected from talus.

Numerous small pits and trenches, dug at the time of the initial exploration in the southern and central area of the property, contain highly leached gossan showing minor to conspicuous amounts of malachite. Samples BM 450, BM 451, and BM 452 which contains 1,070 ppm, >20,000 ppm, and 13,400 ppm copper respectively, were collected from gossan in three 30 to 40-foot long trenches across the width of a zone of fractured dolomite.

Hand specimens of mineralized samples often consist of medium gray, massive dolomite displaying considerable malachite, as well as substantial amounts of bornite, chalcopyrite, and covellite. The sulfides occur in irregular masses from 3 to 7 inches long, and as fracture fillings less than 2 mm wide. Randomly sampled rubble often contains several percent copper.

Polished Section Study

Study of polished surfaces of mineralized rock specimens from the Omar prospect reveals a simple sulfide mineralogy dominated by bornite, with considerable chalcopyrite and covellite. Pyrite and tennantite are present in minor amounts. Bornite occurs as large irregular masses in well-defined fractures and as extremely fine-grained (<0.1

mm) intergranular blebs. Chalcopyrite commonly occurs as large, anhedral inclusions (usually between 0.1-2.0 mm) in the bornite masses, although a considerable amount occurs also as tiny needle-like inclusions (usually <0.2 mm long) in the bornite. Covellite typically occurs as very narrow, inconspicuous envelopes along the margins of bornite grains and around the tiny chalcopyrite needles. It has also been observed as larger irregular inclusions in coarser bornite masses and as fine-grained disseminations (<0.1mm long) in dolomite.

Inclusions of pyrite, usually less than 1 mm long, are common in both chalcopyrite and bornite. Most of the observed pyrite occurs as very fine-grained (approximately 0.01 to 0.05 mm) framboids in carbonate host rock. The framboidal pyrite grains probably formed syngenetically, and appear to be only coincidently related to the copper mineralization. A few grains of tennantite were observed in both chalcopyrite and bornite masses.

The textural features of the coarse bornite and chalcopyrite grains suggest the minerals are probably coeval. The chalcopyrite needle structures are very likely the result of exsolution, although local concentration adjacent to fractures suggests that they may be related to secondary (supergene?) processes. The relationship between the sulfides and dolomite host rock suggests that much of the sulfide was probably deposited in secondary fractures and primary pore spaces rather than by extensive replacement of host material.

SAMPLING

Rock, mineral, soil, and stream silt samples were collected by WGM Inc. (2). The sample site locations are shown on figure 3. Rock samples, some including sulfide minerals, were collected from various locations. Extensive rubble cover and rapid downslope migration of the rubble on steep slopes militate against development of soil horizons at the prospect. The so-called soil samples are probably fine-grain sand and perhaps represent an incipient "C" soil horizon. Silt samples were collected from streams which drain the prospect area. The silt samples may be enriched by physically transported copper sulfide and oxide minerals. Malachite is visible in the silt fraction of the stream sediments.

DATA PRESENTATION

The cobalt content of the samples as well as the previously determined base and precious metal contents are shown on table 1. Only the cobalt values are shown on figure 3.

Cobalt values in 17 rock samples range from 6 ppm to 545 ppm, and average 82 ppm. Twelve soil samples contain from 15 ppm to 66 ppm cobalt and have an average value of 28.4 ppm cobalt. Stream silt samples from various parts of the study area contain from 2 ppm to 47 ppm cobalt and average 15.7 ppm cobalt.

INTERPRETATION

High cobalt values are present in rock, soil, and stream silt samples collected from a generally N-S trending zone that is closely related to areas of copper mineralization (figure 3). Observation of the analytical results (table 1) suggests that the highest cobalt values are from samples that contain high concentrations of other base metals.

The lateral dispersion of cobalt away from the main zone of copper mineralization is shown on figure 3. The cobalt content in stream silt samples in the area of the Omar prospect are rather specific to the area of mineralization. The highest cobalt values in stream silt samples are found in drainages that appear to be collecting materials from the area of base metal mineralization. The stream silt samples furthest away from out-and sub-cropping mineralization contain generally less than 14 ppm cobalt. The cobalt values seem to decrease progressively away from the zone of known copper mineralization.

TABLE 1. - Chemical analyses of rock, soil, and stream silt samples from the Omar copper prospect area, Baird Mountains, Alaska (Values in parts per million)

Rock Samples

Sample No.	Co	Cu	Pb	Zn	Ag
BM 309	28	180	220	109	0.6
310	300	18,500	400	1,200	2.6
315	170	4,600	1,150	5,300	2.4
316	17	60	70	400	0.2
320	41	>20,000	139	152	2.0
331	13	1,130	44	28	0.3
336	15	430	56	10	0.2
342	280	580	1,160	9,400	2.8
348	545	12,900	1,440	9,500	10.0
357	345	16,000	1,330	2,900	3.4
358	32	400	66	103	2.4
361	24	108	58	84	2.6
362	46	>20,000	75	300	3.1
375	6	9,200	-	-	0.5
383	18	250	-	-	0.3
393	39	200	59	25	0.5
398	13	26	44	93	0.4

Soil Samples

Sample No.	Co	Cu	Pb	Zn	Ag
BM 327	17	154	36	153	2.1
329	16	30	33	80	1.7
344	18	120	33	100	1.5
346	23	180	52	250	0.8
450	34	1,070	76	500	-
451	66	>20,000	280	840	-
452	66	13,400	166	1,260	-
481	15	13	60	23	-
484	31	210	64	203	-
489	15	9	56	12	-
490	15	18	38	12	-
491	25	90	58	62	-

TABLE 1. - Chemical analyses of rock, soil, and stream silt samples from the Omar copper prospect area, Baird Mountains, Alaska.- Continued
(Values in parts per million)

Stream Silt Samples

Sample No.	Co	Cu	Pb	Zn	Ag
BM 326	16	13	54	22	4.2
328	16	9	53	17	4.2
334	18	25	53	59	4.1
337	16	26	53	108	4.0
338	16	21	51	65	4.0
339	16	39	50	192	3.6
352	33	560	50	400	1.8
353	31	640	48	380	2.0
365	17	20	50	25	4.0
366	16	20	53	60	4.1
369	15	4	52	28	3.4
370	14	4	48	12	3.7
448	12	15	58	80	-
449	14	810	83	660	-
474	24	11	68	148	-
475	15	9	50	36	-
556	15	22	56	40	-
557	16	40	38	52	-
558	16	47	29	97	-
560	16	30	-	-	-
561	15	20	-	-	-
569	14	32	52	72	-
573	15	35	52	163	-
574	16	34	46	149	-
575	14	13	57	21	-
577	16	26	34	45	-
578	13	6	56	10	-
580	13	10	56	17	-
581	14	25	54	8	-
582	13	6	53	6	-
595	15	72	39	190	-
596	16	18	40	198	-
597	17	91	62	140	-
598	11	12	54	37	-
599	12	25	54	39	-

TABLE 1. - Chemical analyses of rock, soil, and stream silt samples from the Omar copper prospect area, Baird Mountains, Alaska.- Continued
(Values in parts per million)

Stream Silt Samples

Sample No.	Co	Cu	Pb	Zn	Ag
BM 600	12	10	55	17	-
801	15	50	48	80	-
802	15	44	37	56	-
804	13	20	48	45	-
805	11	10	54	32	-
806	12	13	51	61	-
807	11	17	50	72	-
808	16	52	45	122	-
809	15	44	34	170	2.0
811	15	35	24	108	1.4
812	15	32	48	148	0.2
813	14	20	49	66	3.0
814	12	8	49	23	3.0
815	11	7	52	26	3.4
816	12	14	44	56	2.6
817	13	9	45	46	2.9
818	12	10	50	22	0.2
820	14	20	48	55	0.3
821	12	44	46	260	0.2
822	11	23	50	117	0.4
823	11	24	50	97	0.2
824	29	780	60	410	0.4
825	47	2,600	76	510	1.0
826	15	96	58	115	0.4
827	16	660	64	660	1.1
828	21	260	37	230	0.8
829	16	150	39	450	0.6
830	12	112	63	520	0.6
831	39	1,350	73	340	0.5
832	22	240	55	155	0.5
833	12	24	49	128	0.3
834	11	20	56	79	0.3
835	12	10	42	36	0.3
836	12	11	50	31	0.2
915	12	39	47	320	-
917	2	16	51	62	-

- = not analyzed
> = greater than

SUMMARY

Minor amounts of cobalt occur in rock, soil, and stream silt samples from the area of the Omar prospect in the Baird Mountains of the western Brooks Range. The areal distribution of high cobalt values in the area of the Omar prospect in general coincides with the copper distribution. Up to 545 ppm cobalt was detected in a mineralized rock sample. The highest cobalt values were found in samples having high base metal contents. The cobalt source is probably in the sulfide mineralization.

REFERENCES

1. Runnels, D. D. The Copper Deposits of Ruby Creek, Cosmos Hills, Alaska. PhD Dissertation, Harvard University, 1963, 274 pp.

2. Degenhart, C. E. Mineral Studies of the Western Brooks Range Performed Under Contract to the U.S. Bureau of Mines, Contract # J0155089, by C. E. Degenhart and others. WGM Inc., Consultants. OFR 10378, 1978, 529 pp., 32 figs.

3. Wahrhaftig, Clyde. Physiographic Divisions of Alaska. U.S. Geol. Survey Professional Paper 482, 1965, 52 pp.

4. Brosgé, W. P., H. N. Reiser, I. L. Tailleur. Copper Analysis of Selected Samples, Southwest Brooks Range, Alaska. U.S. Geol. Survey OFR 274, 1967, 1 sheet.

5. Beikman, H. M., and E. H. Lathram. Preliminary Geologic Map of Northern Alaska. U.S. Geol. Survey, Miscellaneous Field Studies, Map MF 789, 1976, 2 sheets.