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PRELIMINARY BEDROCK GEOLOGY AND MINERAL
RESOURCE POTENTIAL OF WEST-CENTRAL
LAKE CLARK QUADRANGLE, ALASKA

By G.R. Eakins, W.G. Gilbert, T.K. Bundtzen

INTRODUCTION

This report summarizes preliminary results of DGGs geological mapping and mineral resource investigations in the Lake Clark Quadrangle during 1977 and 1978. Forty days were spent in the field, 30 in 1977 and 10 in 1978. Approximately 1,285 square miles, including all of the Lake Clark B-5, B-6, and C-5 quadrangles and parts of the Lake Clark A-6, B-4, C-4, C-6, D-4, and D-5 quadrangles, were studied by a helicopter-supported geologic mapping and geochemical sampling program. Project geologists Gilbert Eakins, Wyatt Gilbert, and Thomas Bundtzen were assisted by Gregory Laird and Christopher Nye in 1977 and Laird and James Clough in 1978. DGGs geologist Jeff Kline, who was studying the Quaternary geology of the upper Mulchatna River area during this period, also contributed to the mapping. David C. Jones of the U.S. Geological Survey and Robert Blodgett of the University of Alaska provided information on Jurassic and Silurian fossil collections.

GEOLOGY

The bedrock geology of the west-central Lake Clark Quadrangle is summarized on plate 1. Rock units include Upper Silurian greenstone in the north-central part of the map area and pre-Cretaceous biotite schist in the southeast part of the map area. Northeast-trending, northwest-dipping, interbedded marine volcanoclastic sandstone, siltstone, and shale of probable Late Jurassic age is present throughout the map area. Late Cretaceous-Paleocene quartz monzonite, diorite, dacite porphyry, rhyolite, basalt, and pyroclastic rocks intrude and overlie older rocks. The northern part of the map area contains a conjugate system of northeast and northwest-trending high-angle faults (one of which shows evidence of Holocene displacement). The geologic map and explanation is preliminary and generally reports only field data, but also includes 8 K/Ar ages (see Table 1 for analytical data). Further petrographic and geochemical studies are planned and will be included in subsequent reports on the area.

GEOCHEMISTRY

A geochemical sampling program was carried out in the study area to aid in evaluating the mineral resource potential. One hundred thirty pan concentrates, 325 stream sediment samples, and 81 rock chip samples were collected (plate 2; tables 2-6). Most of the stream sediments and all of the pan concentrates were analyzed by the U.S. Geological Survey field laboratory in Anchorage, Alaska using 30-element semiquantitative emission spectrographic and 5-element atomic absorption spectrophotometric analyses. Samples of country rock, mineralized zones, and some additional stream sediment samples were analyzed by the DGGs Minerals Laboratory in College using 10 element atomic absorption spectrophotometry. Most anomalies were calculated using cumulative frequency plots by methods described by Lepeltier (1969); some anomalies were obtained by inspecting the raw data. The statistical anomalies are only approximate indications of mineralization. Many "anomalous" values may be the result of high background in the country rock or favorable metal concentration in a sample that does not represent significant mineralization. On the other hand, more subtle anomalies could be the geochemical signature of significant mineral deposits.

MINERAL RESOURCES

Several mineralized zones and pan concentrate and stream sediment anomalies containing copper, molybdenum, lead, silver, gold, tungsten, and tin are present in the project area. Only minimal follow-up work has been done on any of the prospects or anomalies. Porphyry or breccia pipe mineralization in the Lake Clark B-5 Quadrangle appears to be low grade, and the vein deposits and placer gold deposits in the Bonanza Hills may be limited in extent. The most significant mineral indicators may be tin, tungsten, gold, and copper anomalies in the north and east-central Bonanza Hills. Six mineralized areas are described below.

Copper-silver porphyry deposits

Low-grade disseminated sulfide mineralization within and adjacent to a dacite porphyry of early Tertiary age is present at the Pass prospect in the western Lake Clark B-4 quadrangle (plate 1) just east of the map area. Distinctive orange-red gossans occupying several square kilometers contain sulfide pseudomorphs and pyrite in altered intrusive rock. Typical samples show secondary silicification and propylization. Values of up to 970 ppm copper and 66 ppm molybdenum were obtained from samples at the surface (plate 2, map nos. 243, 244). Similar values have been reported by industry geologists. Further exploration will be necessary to fully evaluate the deposit. Similar but smaller zones of lower grade mineralization can be found in dacite porphyry in the central Lake Clark B-5 Quadrangle.

Bonanza-Ptarmigan Creek gold-tin-tungsten placer deposits

Gold placers on Bonanza Creek have been exploited on a small scale since 1912. Terry and Victoria Gill have operated a small scale placer gold mine on Bonanza and Scenneva Creeks since 1957 using hydraulic and hand methods. Total production from the Bonanza Creek placers probably does not exceed 3,000 troy ounces of gold.

Bonanza Creek valley was glaciated during Wisconsin time; glacial erratics have been reworked into the Scenneva and Bonanza Creek fluvial deposits. Work by Jasper (1961) indicates a possible dredgable placer along 8 miles of Bonanza Creek, which he calculated could contain 18-20 million cubic yards of gold-bearing gravel. Limited drilling programs attest to the presence of gold in these gravels, but it is not possible to predict the grade of the deposit at the present time. Small scale gold mining by the Gills will probably continue as it has in the past. Gold placers occur in various gravel deposits of upper Ptarmigan Creek; however, they have been only lightly prospected and probably have a lower potential than those of Bonanza Creek.

The DGGs has discovered significant tin and tungsten values in heavy concentrates from Gill's gold mine on Scenneva Creek, where coarse fractions (+20 mesh) contain up to 60 percent cassiterite (SnO_2) and values of up to 1.36 percent tungsten.

Upper Bonanza Creek copper-lead-silver vein deposits

Quartz-sulfide vein deposits containing tetrahedrite, arsenopyrite, galena, and chalcopyrite cut hornfelsed sedimentary and volcanic rocks on a ridge in the central Bonanza Hills. One well exposed vein system (plate 2, map no. 130) is exposed as a 3 meter-wide zone of numerous quartz sulfide 'splatter' veins extending at least 150 meters along strike and to a depth of 50 meters. Three channel samples across 3 meters of vein width at the ridge crest produced an average of 3 ounces of silver per ton and about 0.5 percent combined copper and lead. Two other nearby veins (plate 2, map nos. 127-129) yield similar values, indicating a larger area of sulfide vein mineralization. At least 20,000 tons of sulfide-bearing material can be inferred, but the grade appears to be low.

North-central Bonanza Hills copper-tin-tungsten anomalies

Distinctive tin and tungsten values in pan concentrates outline the border phases of the Bonanza pluton in the north-central Bonanza Hills (plate 2, map nos. 117, 159, 162, 163, 179). No lode discoveries have been made but a small satellite body of two-mica quartz monzonite has been mapped in the upper portion of the east fork of Bonanza Creek (plate 1). Disseminated chalcopyrite and pyrite are locally present in other small plutons, particularly near the contacts with surrounding country rock.

VABM Trail gold anomaly

Pan concentrates (plate 2, map nos. 185, 186) north of VABM Trail yield strong gold anomalies. The region around VABM Trail is composed of a rhyolite or dacite dome complex that locally contains pronounced gossan zones. The entire dome complex has undergone sericitic and silicic alteration. Analyses of rock samples from this area are not available at the present time.

Upper Bonanza Creek gold lode prospect

Small zones of arsenopyrite and stibnite-bearing veins adjacent to a small quartz monzonite pluton in the east-central Bonanza Hills have yielded up to 1.25 ounces of gold per ton (plate 2, map no. 157). The bedrock is poorly exposed and additional sampling is needed to evaluate the prospect.

REFERENCES

- Jasper, Martin W., 1961, Preliminary examination of Bonanza Creek valley alluvials, Lake Clark Quadrangle, Alaska; Alaska Div. Mines Minerals Prospect Exam. 115-3.
Lepeltier, Claude, 1969, A simplified treatment of geochemical data by graphical representation: Econ. Geology, vol. 68, p. 538-550.

Table 1. Analytical data for K-Ar age determinations¹

Sample No.	Rock type	Mineral dated	K ₂ O (weight percent)	Sample weight (grams)	⁴⁰ Ar _{rad} (moles/gm) x 10 ⁻¹¹	$\frac{^{40}\text{Ar}_{\text{rad}}}{^{40}\text{K} \times 10^{-3}}$	$\frac{^{40}\text{Ar}_{\text{rad}}}{^{40}\text{Ar}_{\text{total}}}$	Age ± 1. (m.y.)
77 BT 217	biotite quartz monzonite	biotite	8.410 8.423 $\bar{x} = 8.417$	0.1053	81.027	3.811	0.735	64.0 ± 1.9
77 BT 224	hornblende diorite	hornblende	1.160 1.160 $\bar{x} = 1.160$	0.2264	12.120	4.136	0.490	69.4 ± 2.1
77 E 217	biotite pyroxene granodiorite	biotite	9.060 9.060 $\bar{x} = 9.060$	0.1169	97.293	4.251	0.874	71.3 ± 2.1
77 E 216	biotite dacite	biotite	8.350 8.320 $\bar{x} = 8.335$	0.1464	75.402	3.581	0.635	60.2 ± 1.8
77 E 216	"	"	"	0.1087	73.575	3.495	0.663	$\bar{x}_2 = 58.8 \pm 1.8$ 59.5 ± 1.8
77 E 211	biotite granodiorite	biotite	8.723 8.700 $\bar{x} = 8.712$	0.1307	80.610	3.663	0.137	61.6 ± 1.8
K-Ar 6	hornblende biotite granodiorite	biotite	6.457 6.417 $\bar{x} = 6.437$	0.1273	58.492	3.597	0.774	60.5 ± 1.8
K-Ar 2	"	"	"	1.0248	7.449	3.336	0.210	56.2 ± 1.7
K-Ar 5 Ar split 1	augite andesite porphy	"	0.710 0.700 0.717 0.710 $\bar{x} = 0.709$	3.7495	6.699	3.739	0.899	62.9 ± 1.9
K-Ar 5 Ar split 2	"	"	"	"	6.668	3.722	0.895	$\bar{x}_2 = 62.6 \pm 1.9$ 62.7 ± 1.9

¹Analyses by D.L. Turner, Geophysical Institute, University of Alaska, Fairbanks, AK 99701.

Table 2. Atomic absorption analyses of stream sediment samples (in ppm), central Lake Clark Quadrangle, Alaska¹

Map No.	Field No.	Au	Hg	Cu	Pb	Zn
001	77LC162	0.05	0.12	20.00	10.00	55.00
002	77LC145	0.05	0.12	30.00	10.00	50.00
003	77LC143	0.05	0.30	25.00	10.00	50.00
004	77LC144	0.10	0.06	20.00	10.00	60.00
005	77LC166	0.05	0.26	75.00	15.00	90.00
006	77LC168	0.05	0.13	70.00	15.00	75.00
007	77LC142	0.05	0.12	15.00	10.00	60.00
008	77LC167	0.05	0.20	40.00	15.00	65.00
009	77LC172	0.05	0.08	10.00	10.00	55.00
010	77LC171	0.05	0.10	20.00	10.00	80.00
011	77LC165	0.05	0.06	20.00	15.00	100.00
012	77LC164	0.05	0.12	15.00	10.00	65.00
013	77LC150	0.05	0.16	25.00	15.00	65.00
014	77LC149	0	0.08	20.00	10.00	55.00
015	77LC148	0.05	0.06	25.00	15.00	75.00
016	77LC146	0.10	0.24	25.00	10.00	60.00
017	77LC147	0	0.12	20.00	10.00	60.00
018	77LC163	0.05	0.94	35.00	5.00	40.00
019	77LC170	0.05	0.02	10.00	10.00	50.00
020	77LC169	0.05	0.08	5.00	10.00	70.00
021	77LC141	0.05	0.16	20.00	10.00	55.00
022	77LC140	2.00	0.06	15.00	10.00	55.00
023	77LC139	0.05	0.12	30.00	10.00	55.00
024	77LC161	0.05	0.18	45.00	10.00	55.00
025	77LC137	0.05	0.24	35.00	15.00	75.00
026	77LC160	0.05	0.28	20.00	10.00	70.00
027	77LC138	0.15	0.06	20.00	15.00	80.00
028	77LC134	0.05	0.06	25.00	25.00	150.00
029	77LC039	0.05	0.06	25.00	20.00	90.00
030	77LC135	0	0	55.00	25.00	140.00
031	77LC159	0.05	0.04	35.00	20.00	85.00
032	77LC115	0.05	0.06	35.00	85.00	320.00
033	77LC151	0.05	0.04	30.00	25.00	100.00
034	77LC152	0.05	0.04	30.00	20.00	90.00
035	77LC117	0.10	0.06	15.00	10.00	90.00
35A	77LC116	0.70	0.06	30.00	20.00	160.00
35B	77LC117	0.10	0.06	15.00	10.00	90.00
036	77LC153	0.10	0.08	40.00	100.00	340.00
037	77LC118	0.05	0.08	15.00	10.00	60.00
038	77LC119	0.05	0.08	10.00	10.00	60.00
039	77LC120	0.05	0.06	10.00	10.00	60.00
040	77LC121	0.10	0.08	20.00	15.00	60.00
041	77LC154	0.10	0.16	15.00	15.00	60.00
042	77LC122	0.10	0.06	20.00	15.00	65.00
043	77LC155	0.10	0.06	20.00	15.00	65.00
044	77LC123	0.05	0.08	20.00	15.00	60.00
045	77LC156	0.05	0.08	10.00	10.00	50.00
046	77LC157	0.05	0.06	15.00	10.00	45.00
047	77LC124	0.05	0.06	25.00	10.00	65.00
048	77LC114	0.05	0.04	15.00	10.00	60.00
049	77LC097	0.05	0.02	15.00	15.00	70.00
050	77LC074	0.05	0.04	10.00	15.00	65.00
051	77LC104	0.05	0.08	20.00	10.00	65.00
052	77LC103	0.05	0.08	25.00	15.00	65.00
053	77LC071	0.05	0.04	20.00	15.00	70.00
054	77LC073	0.05	0.02	15.00	15.00	80.00
055	77LC072	0.05	0.02	25.00	50.00	15.00
056	77LC101	0.05	0.08	20.00	10.00	70.00
057	77LC069	0.10	0.06	40.00	20.00	90.00
058	77LC098	0.05	0.04	50.00	15.00	150.00

¹Atomic absorption spectrophotometric analyses for all elements by USGS. -80 mesh fractions analyzed only for all samples.

Table 2. (page 2 of 4)

Map No.	Field No.	Au	Hg	Cu	Pb	Zn
059	77LC099	0.05	0.02	30.00	15.00	110.00
060	77LC100	0.05	0.06	35.00	20.00	65.00
061	77LC070	0.25	0.04	30.00	15.00	90.00
062	77LC102	0.05	0.08	30.00	10.00	75.00
063	77LC105	0.05	0.06	25.00	10.00	80.00
064	77LC075	0.05	0.02	20.00	15.00	80.00
065	77LC096	0.10	0.02	20.00	15.00	75.00
066	77LC095	0.05	0.04	35.00	20.00	100.00
067	77LC113	0.05	0.08	35.00	15.00	75.00
068	77LC112	0.05	0.08	25.00	10.00	65.00
069	77LC094	0.05	0.04	20.00	10.00	60.00
070	77LC076	0.05	0.04	20.00	15.00	80.00
071	77LC106	0.05	0.08	30.00	15.00	80.00
072	77LC077	0.05	0.06	35.00	15.00	80.00
073	77LC078	0.05	0.04	25.00	15.00	110.00
074	77LC108	0.05	0.06	25.00	15.00	45.00
075	77LC080	0.05	0.04	35.00	15.00	100.00
076	77LC079	0.05	0.08	15.00	15.00	75.00
077	77LC081	0.05	0.04	35.00	15.00	70.00
078	77LC107	0.05	0.08	55.00	10.00	90.00
079	77LC082	0.05	0.02	35.00	15.00	75.00
080	77LC093	0.05	0.02	20.00	10.00	70.00
081	77LC111	0.05	0.20	40.00	10.00	45.00
082	77LC092	0.05	0.04	15.00	10.00	50.00
083	77LC090	0.05	0.06	35.00	15.00	140.00
084	77LC091	0.10	0.08	25.00	20.00	110.00
085	77LC087	0.05	0.04	30.00	15.00	140.00
086	77LC110	0.05	0.04	35.00	15.00	100.00
087	77LC088	0.05	0.04	50.00	20.00	130.00
088	77LC089	0.05	0.06	30.00	10.00	70.00
089	77LC085	0.30	0.06	30.00	15.00	75.00
090	77LC109	0.05	0.08	20.00	10.00	65.00
091	77LC083	0.05	0.08	15.00	15.00	95.00
092	77LC084	0.05	0.06	15.00	10.00	140.00
093	77LC086	0.80	0.04	20.00	10.00	70.00
099	77LC202	0.05	0.04	20.00	15.00	75.00
101	77LC182	0.25	0.08	35.00	20.00	110.00
102	77LC201	0.05	0.14	40.00	25.00	130.00
103	77LC210	0.54	0.02	35.00	20.00	90.00
104	77LC211	0.10	0.10	45.00	35.00	120.00
104A	77LC212	0.10	0.04	30.00	40.00	140.00
106	77LC200	0.10	0.04	45.00	30.00	100.00
108	77LC189	0.05	0.04	35.00	25.00	120.00
113	77LC178	0.05	0.06	20.00	25.00	70.00
115	77LC179	0.05	0.06	45.00	40.00	80.00
116	77LC180	0.50	0.04	120.00	70.00	130.00
117	77LC181	0.25	0.08	65.00	30.00	160.00
134	77LC183	0.25	0.06	30.00	20.00	120.00
142	77LC188	0.10	0.08	20.00	15.00	70.00
145	77LC190	0.05	0.02	30.00	20.00	100.00
146	77LC209	0.05	0.04	20.00	15.00	70.00
159	77LC174	0.10	0.04	25.00	15.00	70.00
160	77LC175	0.05	0.04	65.00	20.00	160.00
161	77LC176	0.05	0.04	25.00	20.00	120.00
171	77LC177	0.25	0.06	55.00	20.00	170.00
179	77LC173	0.10	0.06	35.00	15.00	75.00
181	77LC203	0.10	0.06	40.00	20.00	70.00
182	77LC204	0.05	0.02	25.00	20.00	100.00
183	77LC196	0.05	0.02	15.00	15.00	50.00
184	77LC199	0	0	20.00	15.00	75.00
185	77LC198	0	0.02	15.00	15.00	60.00
186	77LC197	11.00	0.02	15.00	15.00	60.00
187	77LC195	0	0.04	20.00	15.00	55.00

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Map No.	Field No.	Au	Hg	Cu	Pb	Zn
188	77LC194	0.10	0.04	20.00	15.00	55.00
189	77LC191	0.05	0.04	15.00	15.00	65.00
190	77LC192	0.05	0.02	30.00	20.00	80.00
191	77LC193	0.10	0.06	15.00	15.00	50.00
192	77LC208	0.05	0.06	10.00	15.00	90.00
193	77LC207	0.05	0.18	20.00	20.00	90.00
194	77LC206	0.05	0.06	15.00	15.00	70.00
195	77LC205	0.05	0.06	10.00	10.00	60.00
199	77LC185	0.05	0.10	20.00	15.00	70.00
200	77LC186	0	0.08	30.00	20.00	130.00
203	77LC187	0.05	0.04	15.00	15.00	75.00
205	77LC013	0.05	0.04	15.00	15.00	60.00
206	77LC054	0.05	0.02	10.00	10.00	95.00
207	77LC053	0.05	0.04	30.00	10.00	70.00
208	77LC019	0.05	0.02	25.00	15.00	90.00
209	77LC014	0.05	0.04	10.00	15.00	80.00
210	77LC018	0	0.02	25.00	30.00	100.00
211	77LC017	0.05	0.02	10.00	25.00	80.00
212	77LC016	0.05	0.02	20.00	25.00	90.00
213	77LC015	0.05	0.02	5.00	15.00	90.00
214	77LC008	0.05	0.04	10.00	10.00	60.00
215	77LC026	0.05	0.04	20.00	15.00	70.00
216	77LC007	0.10	0.06	15.00	15.00	55.00
217	77LC006	0.05	0.04	15.00	15.00	65.00
218	77LC052	0.25	0.04	25.00	15.00	65.00
219	77LC005	0.05	0.08	20.00	15.00	65.00
220	77LC009	0.05	0.04	20.00	20.00	95.00
221	77LC011	0.05	0.18	70.00	30.00	170.00
222	77LC012	0.05	0.08	40.00	10.00	110.00
223	77LC010	0.25	0.14	35.00	20.00	75.00
224	77LC001	0.05	0.08	50.00	30.00	160.00
225	77LC004	0.05	0.12	140.00	55.00	380.00
226	77LC051	0.25	0.14	30.00	20.00	90.00
227	77LC003	0.05	0.04	30.00	20.00	90.00
228	77LC002	0.05	0.04	30.00	15.00	80.00
229	77LC038	0.05	0.78	20.00	20.00	60.00
231	77LC028	0.05	0.04	25.00	20.00	75.00
232	77LC027	0.05	0.04	15.00	15.00	70.00
233	77LC025	0.10	0.04	25.00	95.00	320.00
234	77LC024	0.05	0.04	15.00	30.00	160.00
235	77LC023	0.05	0.06	10.00	30.00	110.00
236	77LC057	0.25	0.02	15.00	20.00	90.00
237	77LC022	0.05	0.06	20.00	40.00	120.00
238	77LC029	0.10	0.02	30.00	45.00	190.00
239	77LC058	0.05	0.02	35.00	35.00	95.00
241	77LC030	0.05	0.02	35.00	35.00	320.00
242	77LC021	0.10	0.04	75.00	55.00	230.00
245	77LC056	0.05	0.06	25.00	30.00	140.00
248	77LC020	0.05	0.02	15.00	30.00	65.00
249	77LC055	0.05	0.02	25.00	35.00	200.00
250	77LC059	0.10	0.04	30.00	50.00	260.00
251	77LC037	0.05	0.08	20.00	20.00	60.00
253	77LC034	0.05	0.08	20.00	15.00	60.00
254	77LC035	0.10	0.04	15.00	20.00	80.00
255	77LC133	0.05	0.06	20.00	10.00	55.00
256	77LC132	0.05	0.04	30.00	15.00	75.00
257	77LC158	0.05	0.24	35.00	25.00	80.00
258	77LC130	0.05	0.35	55.00	15.00	70.00
259	77LC068	0.05	0.02	35.00	20.00	70.00
260	77LC036	0.10	0.08	30.00	25.00	70.00

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Map No.	Field No.	As	Hg	Cu	Pb	Zn
262	77LC032	0.05	0.12	20.00	50.00	260.00
263	77LC031	0.05	0.04	5.00	35.00	70.00
267	77LC040	0.05	0.06	20.00	30.00	85.00
269	77LC033	0.25	0.12	20.00	20.00	60.00
270	77LC129	0.05	0.06	15.00	15.00	40.00
271	77LC128	0.05	0.04	55.00	15.00	60.00
272	77LC131	0.10	0.18	65.00	15.00	75.00
275	77LC065	0.05	0.18	35.00	20.00	70.00
276	77LC050	0.05	0.72	50.00	40.00	110.00
277	77LC066	0.05	0.08	30.00	20.00	70.00
278	77LC049	0.05	0.10	10.00	20.00	80.00
279	77LC048	0.05	0.32	15.00	20.00	70.00
280	77LC064	0.05	0.06	15.00	20.00	70.00
281	77LC136	0.05	0.08	15.00	20.00	75.00
282	77LC067	0.05	0.12	10.00	20.00	70.00
283	77LC063	0.05	0.08	15.00	20.00	70.00
284	77LC047	0.25	0.04	15.00	20.00	75.00
285	77LC127	0.05	0.06	20.00	25.00	140.00
286	77LC126	0.05	0.03	15.00	20.00	100.00
287	77LC046	0.05	0.10	15.00	35.00	90.00
288	77LC045	0.05	0.08	10.00	15.00	60.00
289	77LC125	0.10	0.04	10.00	10.00	60.00
290	77LC062	0.10	0.12	20.00	35.00	100.00
291	77LC041	0.05	0.06	25.00	15.00	80.00
292	77LC060	0.10	0.02	20.00	30.00	90.00
293	77LC042	0.05	0.02	30.00	15.00	85.00
294	77LC043	0.05	0.02	35.00	15.00	120.00
295	77LC044	0.05	0.02	40.00	20.00	110.00
296	77LC061	0.05	0.04	25.00	15.00	100.00

Table 4. Analyses of additional stream sediment samples (in ppm) in the Bonanza Hills area Lake Clark Quadrangle, Alaska¹

Map No.	Field No.	Au	Ag	Cu	Pb	Zn	Mo	Sb	W	Ni	Th
95a	77BT110	0.00	0.77	25	43	105	0.0	0	ND	29	11.00
96	77BT85	0.01	0.16	41	11	120	0.0	0	ND	--	6.25
97	77BT86	0.01	0.33	56	13	136	0.0	0	ND	--	--
98	77BT79	0.03	0.09	21	13	127	0.0	0	ND		4.00
100	77BT77	0.02	0.08	25	7	87	0.0	0	--	--	--
117	77BT92	0.01	0.36	61	35	93	0.0	0	--	--	--
121	77BT95	0.02	0.17	62	20	238	0.0	0	ND	125	4.75
138	77BT210	0.00	1.19	57	<u>79</u>	152	2.0	0	ND	42	5.00
139	77BT211	0.00	0.79	40	<u>23</u>	109	2.4	0	ND	33	4.25
141	77BT191	0.00	0.80	39	19	112	0.0	0	ND	33	4.25
144	77BT189	0.00	1.64	80	20	124	0.6	0	ND	51	5.25
150	77BT176	0.00	1.10	60	8	93	0.0	0	ND	28	4.25
154	JTK88	0.00	1.52	56	<u>164</u>	194	3.4	0	ND	66	6.50
155	JTK87	0.00	1.26	55	<u>217</u>	178	0.0	0	ND	14	--
164	77BT140	0.02	0.16	31	<u>12</u>	83	0.0	0	--	--	6.50
165	77BT139	0.01	0.41	47	29	167	0.4	0	--	--	7.25
169	77BT134	0.00	0.26	26	12	86	0.0	0	--	--	13.50
170	77BT133	0.01	0.19	26	10	94	0.0	0	ND	ND	5.25
174	77BT162	0.00	0.97	45	17	116	0.0	0	ND	32	3.75
175	77BT154	0.00	0.55	27	10	62	0.9	0	ND	10	7.25
176	77BT155	0.03	0.00	21	10	78	0.0	0	ND	28	--
177	77BT157	0.00	0.55	26	23	67	0.0	0	ND	12	5.25
178	77BT156	0.00	0.94	39	19	99	0.0	0	ND	25	7.75
198	77BT202	0.00	0.77	35	0	93	0.0	0	ND	18	3.00

¹Atomic absorption spectrophotometric analyses for all elements except Th by Nicki Coursey; flourometric methods for Th by Henry Potworowski, DGGs Minerals Laboratory.

ND - Means below the limit of detection of 75 ppm.

-- - Means not analyzed.

-80 mesh fractions analyzed only for all samples.

-underlined values are anomalous.

Table 6. Analyses of mineralized zones and country rock, central Lake Clark Quadrangle, Alaska (in ppm)

Map No.	Field No.	Au	Ag	Cu	Pb	Zn	Mo	Sb	W	Ni	Th	Remarks
94	77BT111	0.01	3.10	65	1	8	1.7	0	ND	17	1.25	Country rock siltstone.
95	77BT110b	0.00	0.00	78	13	131	0	0	ND	60	-	Country rock slate.
105	77BT91	0.02	10.20	190	2	52	0.0	0	ND	24	1.00	Gossanized chip samples of rhyolite
107	77BT75a	0.02	0.71	14	12	213	11.9	0	ND	19	10.8	Chip samples taken of rhyolite at "Rhyolite placer gold bench" (Jasper, 1961). Spans 4 meters of sampling.
	77BT75b	0.04	3.16	66	4	182	3.6	0	ND	80	9.25	
	77BT75c	0.03	2.19	32	19	120	5.5	0	ND	7	15.3	
	77BT75d	0.01	2.52	55	0	5	0.0	0	ND	12	0.75	
109	77BT87	0.05	0.90	64	846	162	0.0	0	ND	33	1.50	Disseminated galena in quartz carbonate vein 0.5 m wide.
	77BT87a	0.00	0.00	77	20	68	0.0	0	ND	35	-	Siltstone.
	77BT87b	0.00	2.73	239	2750	210	0.0	72	ND	21	-	Disseminated galena in quartz carbonate vein 0.5 m wide.
110	77BT88a	0.02	0.13	80	8	93	0.6	0	ND	38	5.75	Quartz carbonate vein.
111	77BT89	0.02	2.89	68	3	34	0.0	0	ND	17	1.00	Country rock siltstone.
112	77BT90	0.04	0.21	24	10	82	0.0	0	ND	31	7.25	Fault gauge.
114	77BT132a	0.02	0.31	15	25	58	0.8	0	ND	7	26.8	Composite grab sample of rhyolite tuff(?).
	77BT132b	0.03	0.36	32	52	79	0.9	0	ND	5	21.8	Composite grab sample of rhyolite tuff(?).
119	77BT121	0.02	0.07	122	9	67	4.1	0	ND	59	5.5	Grab sample of rhyolite dike.
120	77BT94	0.04	5.34	104	3	166	1.7	0	ND	75	5.25	Dacite porphyry dike gossan zone.
123	77BT97	0.00	0.00	52	22	75	0.0	0	--	23	-	Cherty argillite and siltstone country rock.
124	77BT98	0.00	0.50	73	28	79	0.0	0	--	13	-	Meta-andesite.
125	77BT122	0.01	0.13	104	6	28	2.5	0	ND	21	7.00	Cherty argillite country rock.
126	JTK77	0.05	7.00	134	11	33	1.3	69	ND	23	1.75	Quartz carbonate sulfide vein less than 1 meter thick
	JTK77a	0.00	8.08	192	2200	240	0.0	10	--	19	-	possibly equivalent to vein at map location 130.
127	77BT130	0.00	0.00	32	13	100	0.0	0	--	21	-	Rhyolite dike country rock.
128	77BT129	0.02	0.90	40	21	43	1.4	8	ND	24	4.25	Quartz vein.
129	77BT128	2.24	1.76	760	31	11	5.0	183	ND	15	3.75	Quartz carbonate sulfide vein intrudes argillite and volcanics.
	77BT128a	0.00	0.00	159	0	58	4.0	0	--	75	-	Banded argillite country rock.
130	77BT127a	0.20	43.30	1200	2810	93	2.5	65	ND	23	5.50	Vertical quartz-carbonate sulfide vein system 3.0 meters wide and at least 100 meters long; 50 meters of known vertical depth. Contains tetrahedrite, chalcopyrite, galena, and arsenopyrite, 127a-c are channel samples across vein. 127g-l are random grabs.
	77BT127b	0.14	153.00	3750	1740	14	2.5	39	ND	13	10.8	
	77BT127c	0.05	53.60	760	3950	114	3.5	19	ND	23	6.50	
	77BT127g	0.00	11.70	51	570	190	0.0	18	ND	16	-	
	77BT127h	0.15	144.00	980	6700	18	0.0	76	ND	9	-	
	77BT127l	0.00	86.80	860	5300	5	0.0	33	ND	6	-	
131	77BT126	0.02	7.10	120	28	13	1.5	0	ND	12	2.25	Grab sample of cherty argillite.
132	77BT206	0.00	0.20	9	4	111	0.0	0	--	55	-	Gossan zone in sediment.
133	77BT207	0.10	0.00	21	106	38	0.0	21	--	5	-	Meta-andesite gossan.
135	77BT208a	0.00	0.00	84	10	97	0.0	0	--	13	-	Country rock sandstone.
136	JTK134	0.00	0.00	47	7	69	0.0	0	--	40	-	Micaceous sandstone country rock.
137	JTK111	0.00	0.00	131	16	62	0.0	47	--	37	-	Altered metavolcanic rock.
140	77BT215	0.00	0.00	103	6	27	0.0	0	--	6	-	Altered andesite dike(?).
143	77BT190	0.00	0.00	19	5	122	0.0	0	--	0	-	Country rock sandstone.
147	77BT214	0.00	0.00	32	18	17	0.0	0	--	6	-	Alaskite(?) veined with quartz.
	77BT214b	0.16	0.00	133	6	72	0.0	0	--	64	-	Hornfels aureole.
148	77BT203b	0.00	0.00	10	17	70	0.0	0	--	2	-	Rhyolite dike(?) gossan.
	77BT203a	0.18	2.84	10	162	273	0.0	0	--	0	-	Vein breccia.
149	77BT178	0.00	0.00	34	0	52	0.0	0	--	46	-	Quartz monzonite country rock.
151	77BT175	0.25	68.60	317	249	95	1.0	146	--	21	-	Hornfels zone adjacent to quartz monzonite pluton.
152	77BT165	0.11	0.00	151	25	129	0.0	0	--	86	-	Dark gray argillite.
153	77BT169	0.20	85.10	540	793	186	1.1	414	100	17	3.75	Quartz sulfide vein in argillite.
156	JTK86	0.00	1.12	72	7	165	0.0	0	ND	72	0	Gossan in argillite.
157	JTK85c	0.00	1.65	54	14	7	0.0	0	--	2	-	Mineralized intrusive core.
	JTK85d	0.21	3.28	91	46	7	0.0	0	--	1	-	Quartz vein in intrusive rock.
	JTK85e	46.0	38.3	168	1400	18	0.0	12	--	11	-	Country rock (argillite) mineralized with arsenopyrite.
158	JTK84	0.00	0.00	123	7	71	0.0	0	--	60	-	Iron-stained hornfels.
163	77BT158c	0.00	0.00	77	8	68	0.0	0	--	34	-	Argillite-rich hornfels.
166	77BT138	0.06	3.10	70	2	180	1.7	0	ND	17	2.50	Gossan zone in argillite.
167	77BT137	0.05	3.78	71	19	76	1.8	0	ND	17	6.00	Oolitic siltstone bed is locally gossanized.
168	77BT135	0.03	1.82	44	2	40	1.7	0	ND	16	4.50	Siltstone and slate country rock.
172	77BT160a	0.00	1.89	111	7	33	0.0	0	--	9	-	Quartz vein breccia.
173	77BT161	0.23	0.00	121	5	18	0.0	0	--	22	-	Quartz vein breccia.
	77BT161a	0.00	0.00	108	2	97	0.0	0	--	75	-	Banded argillite.
180	77BT147	0.00	0.25	124	5	139	0.0	0	--	41	-	Banded hornfels.
196	77BT198	0.00	0.00	160	0	73	0.0	0	--	26	-	Pyroxene basalt grab sample.
197	77BT200b	0.00	2.11	493	46	1360	8.0	0	--	46	-	Mineralized quartz vein grab sample.
201	JTK70b	0.00	0.00	131	6	63	0.0	0	--	9	-	Andesite grab sample.
202	77BT115	0.00	0.00	124	4	73	0.0	0	--	21	-	Volcaniclastic sandstone.
204	JTK118	0.00	0.00	122	0	66	0.0	0	--	12	-	Epidotized basalt.
204a	JTK128	0.87	0.00	370	0	109	0.0	0	--	36	-	Dark green gray epidotized basalt.
230	77WG24a	0.02	0.00	111	19	69	0.0	0	ND	29	-	Pyrite-bearing fine-grained sandstone.
240	77WG82a	0.08	2.03	1230	19	176	26.0	0	ND	850	-	Sulphide-bearing fine-grained diorite.
241	77WG177a	0.08	1.39	970	65	105	17.0	0	ND	83	-	Gossanized dacite porphyry. Pass Prospect.
244	77WG177b	0.03	0.67	750	12	133	66.0	0	ND	83	-	
246	77WG153	0.04	0.21	128	3	96	4.0	0	ND	57	-	Sulphide-bearing septum of biotite schist in diorite.
247	77WG152	0.04	0.00	220	0	138	2.0	0	ND	35	-	Mineralized contact between biotite schist and intrusion.
252	77WG50	0.08	0.00	145	12	107	5.0	0	ND	24	-	Gossanized pyrite-bearing dacite porphyry.
261	77WG175	0.05	0.31	270	20	107	7.0	0	ND	25	-	Dacite porphyry.
264	77WG174	0.03	0.23	410	5	50	8.0	0	ND	34	-	Hornfelsed sedimentary rocks in talus.
265	77WG74	0.09	0.88	600	10	294	2.0	0	ND	44	-	Hornfelsed, banded sedimentary rocks.
266	77WG72b	0.03	0.00	300	7	88	5.0	0	ND	84	-	Iron-stained, hornfelsed banded argillite.
268	77WG19	0.00	0.00	110	18	54	16.0	0	ND	14	-	Pyrite-bearing gossanized rhyolite near shear zone.
273	77WG35	0.13	0.43	60	3	6	1.0	58	ND	12	-	Sulphide-bearing dike of felsite breccia 1.0 meters thick.
274	77WG61	0.07	0.00	380	2	66	8.0	0	ND	63	-	Hornfelsed septum of sedimentary rocks in diorite.

ND - means below the limits of detection of 75 ppm.
 -- means not analyzed.

Analyses by DGGs Minerals Laboratory.