DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-449

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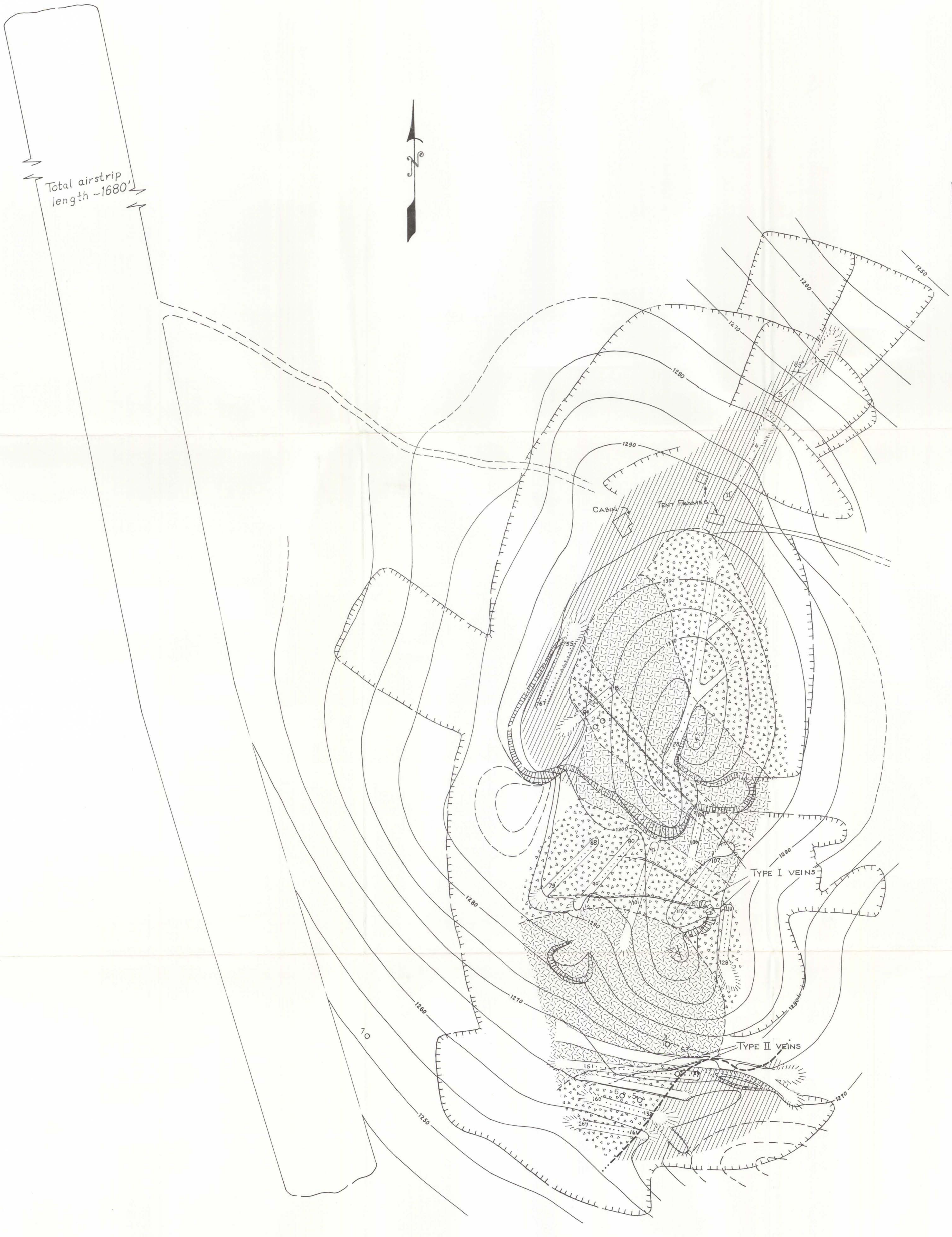


EXPLANATION

OLIVINE BASALT

BRECCIATED OLIVINE BASALT

POST-CRETACEOUS

LOWER AND UPPER CRETACEOUS

KUSKOKWIM GROUP. INTERBEDDED GRAYWACKE AND SHALE

CRETACEOUS

AREA OF REMOVED OVERBURDEN

PROSPECT TRENCH, SHOWING SAMPLE LOCALITIES
Numbers correspond to sample numbers in table 1

DUMP

FAULT WITH QUARTZ-CARBONATE-CINNABAR VEIN, SHOWING DIP

DIAMOND DRILL HOLE

STRIKE AND DIP OF BEDS

STRIKE AND DIP OF BASALT FLOW STRUCTURE

APPROXIMATE CONTACT

CONCEALED CONTACT

FAULT

Topography from planetable survey by D.H. Sorg and M.B. Estlund, 1971

GEOLOGY BY D. H. SORG AND M. B. ESTLUND, 1971

SCALE 1" = 50'

0 50 100 200 FEET

ALTITUDES APPROXIMATE, DATUM AT MEAN SEA LEVEL
CONTOUR INTERVAL 5 FEET
CONTOURS DASHED WHERE APPROXIMATE

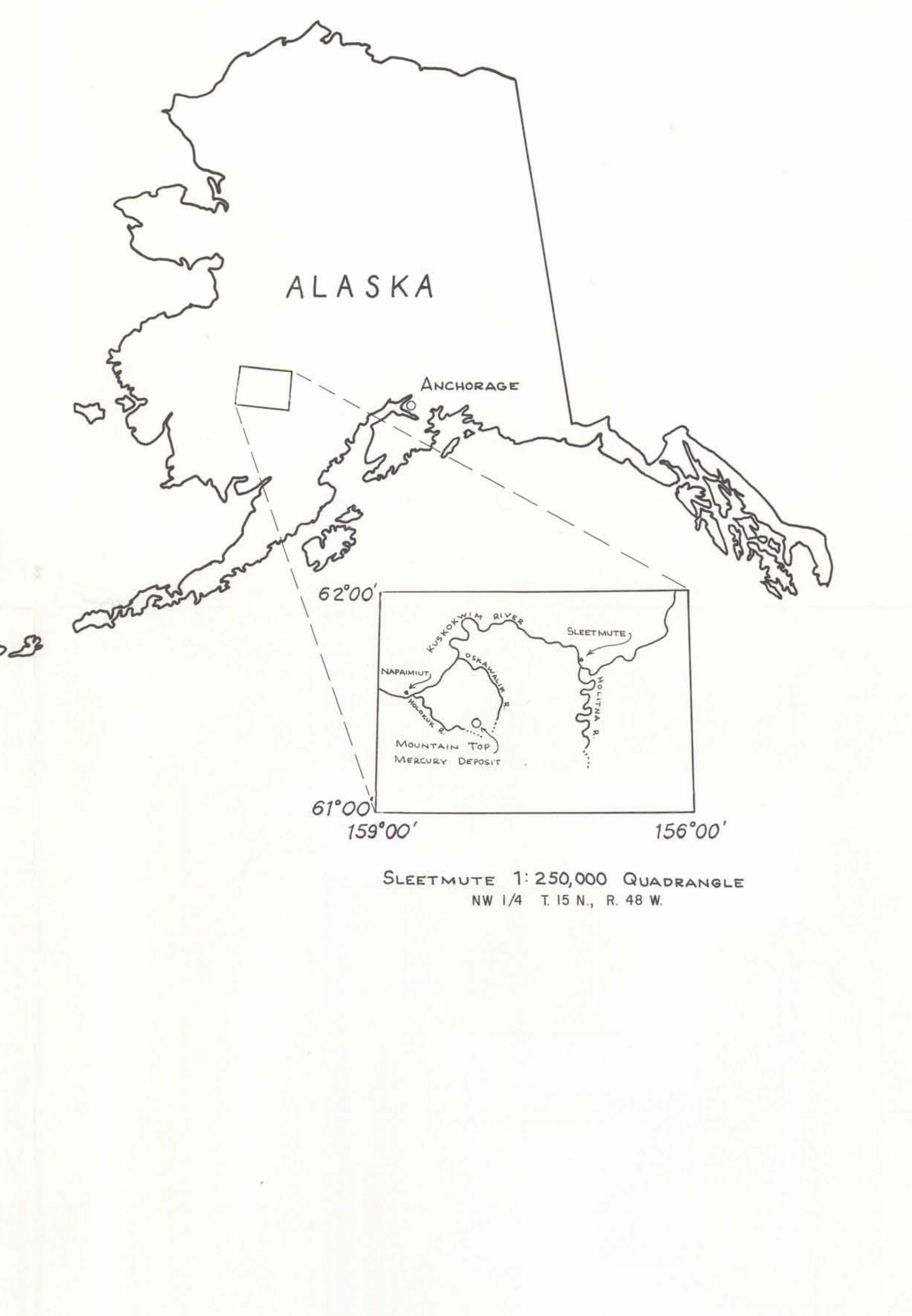
TABLE 1

Analyses, unless noted, are semiquantitative spectrographic and are reported in the series 0.1, 0.15, 0.2, 0.3, 0.5, 0.7, 1.0, 1.5, and so on, or by the following symbols: N = not detected; L = detected but below limit of determination, - = not looked for; > = greater than

Parts per million: Ag through Zr. Percent: Fe, Mg, Ca, Ti.

Map No.	Lab. No.	Field No.	Ag	As	Au[1]	B	Ba	Be	Bi	Co	Cr	Cu	Hg	La	Mo	Mn	Nb	Ni	Pb	Sb	Sc	Sn	Sr	V	W	Y	Zn	Zr	Fe	Mg	Ca	Ti
1	BDR-092	71ASg10-0	10	(N)	L(.02)	300	1000	1	(N)	20	20	20	10	(L)	(L)	1500	(L)	50	10	(N)	20		300	200	50	50	(L)	200	7	.5	.07	1
2	BDR-093	71ASg10-1	1.5			150	700	(L)		(N)	70	20	35	(L)	20	70	(L)	7	15		30		200	500	(N)	30	(N)	150	7	.2	.05	.5
3	094	2	(L)			100	300	(L)		30	20	100	15	(N)	15	3000	(L)	70	(N)		30		150	200		30	300	150	7	.15	(L)	.5
4	095	3	1.5			150	1500	(L)		(N)	30	20	25	(N)	(L)	100	(L)	7	(L)		15		150	300		10	(N)	150	2	.3	.05	.5
5	096	4	1			150	1000	(L)		(N)	100	70	25	(N)	15	150		5	15		20		200	300		30		200	7	.3	.05	.3
6	097	71ASg11-0	(N)			200	700	1		15	150	70	L(10)	(N)	(L)	500		50	15		30		150	200		30		100	7	.5	.1	.5
7	098	1				300	1500	1		20	150	100		(L)	(L)	1000		100	30		30		300	300		70		300	10	.7	.2	.7
8	099	2				300	700	1		20	150	100		(L)		700		70	10		30		150	300		30		200	10	.7	.15	.7
9	100	3				300	700	1		20	150	100		(N)		1000		70	10		30		150	300		30		150	15	.7	.1	.7
10	101	4				200	1000	(L)		20	100	50				1500		70	15		30		300	200		30		150	10	.5	.15	.7
11	102	5				300	700	1		20	150	70	10			700		100	15		30		200	500		30		150	10	.7	.15	.7
12	103	71ASg12-0				50	700	(L)		30	700	70	15			1500		300	15		30		150	200	50	20		150	10	.5	1	.7
13	104	1				50	700			50	1000	100	L(10)		(N)	1500		300	10		50		150	300	(N)	20		150	15	.7	.7	1
14	105	2				50	700			30	1000	70	20		(L)	700		200	10		30		200	200		20		100	7	.7	1.5	.7
15	106	3				20	700			50	1500	100	L(10)			1500		300	15		30		200	300		30		150	15	.7	2	1
16	107	4				50	300			30	700	70	L(10)			1500		200	15		30		(L)	200		20		100	10	.3	.07	.7
17	108	5				30	500	1		50	1000	70	30			1000		300	10		30			200		30		150	10	.7	.1	.7
18	109	6				50	300	1		50	1000	100	15			1500		300	15		30			200		30		150	10	.7	.2	.7
19	110	7				70	300	(L)		70	1500	150	L(10)			1500		300	15		50			300		30		150	15	.7	.3	1
20	111	8				50	300	(L)		30	1000	70	L(10)			1500		200	10		30			300		20		100	10	1	.2	.7
21	112	9				50	300	(L)		50	1500	70	600			2000		300	(L)		50			300		30		150	15	1.5	.3	.7
22	113	10				30	300	(L)		30	1000	100	20			1500		150	15		30			200		15		70	10	.5	.15	.5
23	114	13				50	500	(L)		30	700	70	10	(L)	(N)	1500		150	20		20		150	200		15		100	10	.5	.7	.7
24	115	14				30	700	(L)		30	1000	70	L(10)	(N)	(L)	1500		200	10		30		300	300		20		150	15	.5	.5	1
25	116	15				50	700			50	1000	70	140	(N)	(L)	1500		300	(L)		30		300	300	(L)	15		150	15	1	.3	1
26	117	16				70	300			30	1500	100	20	(N)	(L)	1000		200	15		30		(L)	200	(N)	15		100	10	.7	.2	1
27	118	17				70	700			50	700	70	55	(L)	(L)	1500		150	20		30		150	200	(N)	30		200	15	1.5	.7	1
28	119	18				50	700			50	1000	70	36	(N)	(5)	1000		200	15		30		300	200	(N)	20		150	10	1.5	.2	1
29	240	71ASg25-0				70	700	1		50	1000	70	120		(L)	1500	(L)	200	15		30		150	200		20		100	10	.7	.1	.7
30	241	2'				70	700	(L)		30	1000	70	50		(L)	1500	(L)	200	10		30		150	200		20		150	10	.7	.15	.7
31	BDR-242	71ASg25-4'	(N)	(N)	L(.02)	30	700	(L)	(N)	30	1000	70	25	(N)	(N)	700	(L)	200	(N)	(N)	30	(N)	300	200	(N)	15	(N)	150	10	.7	3	.7
32	243	6'				30	500			20	1500		10		(N)	200		150	15				100			30		100	7	.5	2	.7
33	244	8'				30	700			50	1500		170		(L)	1500		300	(L)				300			30		150	10	.7	3	1
34	245	10'				30	1000			30	1000		25		(L)	1500		300	(L)				300			30		150	10	1	3	.7
35	246	12'				30	700			30	1500		15		(L)	1500		200	(N)				300			30		150	10	3	3	1
36	247	14'				30	700	(L)		20	1000		35		(N)	700		200	(N)				300			20		100	10	1	3	1
37	248	16'				50	700			50	1500		56		(L)	1500		300	10				200			15		100	10	.7	2	.7
38	249	18'				50	700			50	1000		10		(L)	1500		300	(L)				200			10		100	10	2	2	1
39	250	20'				50	700			30	1500	50	40		(N)	700		200	(N)				300			20		150	10	.5	3	1
40	251	22'				20	700			30	1500	70	120		(L)	1000		200	(L)				300			15		100	10	3	5	.7
41	252	24'				20	700				1500	70	65		(N)	700		300	10				300			10		150	10	.7	3	1
42	253	26'				70	500				1500	70	20		(N)	700		300	(L)				(L)			15		100	7	.3	.15	.7
43	254	28'				50	500	1			200	50	1600		(L)	3000		300	10				150			30		150	10	.3	.15	.7
44	255	30'				20	700	(L)			1500	70	50		(L)	1000		200	(L)				300			30		100	10	.7	3	.7
45	256	32'				20	700						90			1000		300	10							20		100	10	3	5	.7
46	257	34'				15	700						L(10)			1500			(L)							15		100	10	5	5	.7
47	258	36'				20	700						L(10)			1500			15							20		150	15	7	5	.7
48	223	71ASg23-0				70	300			30	700	70	220		(N)	1000		200	(L)				200			20		100	7	1	1.5	.7
49	224	1				50	500			70	100	50	75		(L)	1500		300	10				300			20		100	10	.7	2	.7
50	225	2				30	500			30	1000	50	120		(L)	1000		200	(L)		30		300	200		15		100	10	1.5	3	.7
51	226	3				30	700					70	35			1500			(N)		20		300	200				100	10	1.5	5	.7
52	227	4				70	150					70	20			1500			(N)		30		(L)	300				150	10	.2	.15	1
53	228	5				50	300			50	1500	150	170			1500			10				300	500		30		70	10	.2	.07	.7
54	229	6				150	1000	1.5		30	150	150	20		(N)	5000			10					300				150	7	1	.2	.7
55	230	71ASg24-0				150	700	1		30	70	100	20		15	5000		100	(L)					300				150	10	.5	.07	.7
56	231	1				150	700	(L)		20	300	70	20		(L)	1500		70	10					200				100	10	.7	.15	.7
57	232	2				200	700			20	150	70	15		(L)	1000		70	15					300		20		150	10	.5	.1	.7
58	233	3				200	700			15	150	50	15		(N)	1000		70	(L)					200		20			7	.5	.15	.7
59	234	4				200	300			10	70	70	10		(N)	700		30	(L)		20		150	200	100	30			5	.7	.15	.7
60	235	5				200	700			30	300	70	15		(L)	2000		100	10		30		200	300	(N)	30			7	.5	.1	.7
61	BDR-236	71ASg24-6	(L)	(N)	L(.02)	200	700	(L)	(N)	70	100	150	30	(N)	7	5000	(L)	200	20	(N)	30	(N)	500	300	(N)	30	300	150	10	.5	.1	.7
62	237	7	(N)			200	500			30	150	70	10		(L)	1500		100	10				300		(L)		(N)	150	7	.5	.15	.7
63	238	8				200	700			20		70	10		(N)	700		70	15				500		(N)			200	7	.7	.2	.7
64	239	9				200	500			30		70	15		(N)	2000		150	20				500		(N)	15		100	10	.7	.15	.7
65	259	71ASg24-10	(L)			200	1000	1.5				100	15		(L)	3000		100	30				300			30		150	10	2	.15	.7
66	260	11	(N)			300	1000	1					15			3000			15										10	.15	.15	.7
67	261	12'	(N)			200	1000	1					30			3000			15							15			10	1	1	.7
68	161	71ASg17-0				30	300	(L)			500	30	25			1000		150	10				200	200		15		70	7	.3	1.5	.5
69	162	1				50	300				500	50	15			1000		150	10				100					100	10	.2	.15	.5
70	163	2				30	500				700	50	10			1000		200	15				150					100	10	.7	.7	.5
71	164	3				70	200	1			500	30	15			1000		150	10				100					70	7	.5	.2	.5
72	165	4				50	150	(L)				50	20			1500		200	(L)				150			20		70	10	.3	.15	.5
73	166	5				70	150					50	20		(N)	1000		200	(L)				100			20		100	7	.2	.15	.7
74	167	6				70	100			20		30	15			700		150	(N)				(L)			15			5	.1	.1	.7
75	168	7				70	150			30		50	20			1500		200	(L)							20			10	.2	.15	.7
76	169	8				70	150			50		30	20		(L)	1500										20			10	.3	.2	.7
77	170	9				70	150			30		50	20		(N)	1500										15			7	.2	.1	.7
78	171	10				70	150			30		50	L(10)			700		150	(N)										5	.15	.07	.7
79	172	11				70	150					30	10			700		150	(N)										5	.15	.07	.7
80	174	71ASg18-0				70	200					30	30			1000		150	10					150		20			7	.5	.3	.5
81	175	1				30	500				700	50	50			700		200	15				300	200		15			7	1	.15	.5
82	176	2				70	300				500	70	70		(L)	1500		150					(L)			20			10	.5	.3	.5
83	177	3				50	150			50	700	70	50		(N)	1500		300								20		150	15	.15	.07	.7
84	178	4				70	300	1		30	500	50	250		(N)	1500		150								15		100	10	.2	.05	.5
85	179	5				70	300	(L)		30	500	50	550		(L)	1000		150	10							20			7	.3	.1	.5
86	180	6				70	200	(L)		30	300	70	850		(L)	100		200	(L)							20			10	.15	.07	.5
87	181	7				70	300	(L)		50	700	70	35		(L)	1000		200	20							15			10	.5	.1	.7
88	182	8				50	200	1		50	700	70	250		(L)	1500		200	15		50		100			30			15	.5	.15	.7
89	183	9				50	150	(L)		20	500	50	1300		(N)	700		150	(L)		20		(L)			20			7	1	.07	.7
90	184	10				50	150	1		30	700	70	20,000		(L)	1000		150	(L)		30		(L)			15			10	.15	.05	.7
91	BDR-185	71ASg19-0	(N)	(N)	L(.02)	10	700	(L)	(N)	30	1000	70	120	(N)	(N)	700	(L)	200	10	(N)	30	(N)	500	200	(N)	20	(N)	100	10	.7	3	.7
92	186	5'				20	150	1		20	300	30	20		(L)	3000		150	10		50		100			30		70	15	.7	1	.5
93	187	10'				70	150	(L)		30	700	70	25		(N)	500		150	(L)		20		(L)			15		150	7	.15	1	1
94	188	15'				100	300			30	1000	70	20		(N)	500		150	15		20		(L)			15		150	7	.7	.7	.7
95	189	20'				100	300			30	700	70	25		(L)	1500		200	10		20		100			20		100	10	.7	1	.7
96	190	25'				70	700	1		70	1500	100	20		(L)	1500		300	15		50		200	300		20		150	10	.7	3	G1
97	191	30'				30	200	(L)		20	300	50	30		(N)	1500		150	(N)		15		100	150		15		70	7	.15	1	.3
98	192	35'				15	(N)	(N)		10	30	(N)	50		(N)	(N)		100	(N)		15		(N)	150		10		(L)	1	(L)	(L)	.2
99	193	40'				50	300	1		30	500	70	70		(L)	1500		150	15		30		100	200		30		70	10	.2	.15	.5
100	194	45'				70	300	(L)		30	700	50	170		(N)	700		150	(N)		15		100	200		15		100	7	.15	.07	.7
101	195	50'				30	300	(L)		30	300	30	170		(N)	700		150	10		20		100	200		10		70	7	.1	.05	.7
102	218	71ASg22-0				70	200			70	1000	100	15		(L)	1500		300	15		30		(L)	300		20		100	10	.7	.2	.7
103	219	5'				70	200			50	1000		10			1500		300	10										10	.7	.2	1
104	220	10'				50	300	1		20	700		20			1000		150	(L)										7	1	.3	.7
105	221	15'				70	500	1		50			25			1500		200	10				200			15			10	.7	3	.7
106	222	20'				50	500	(L)		30			40			1500		150	15		20		100			20			10	1	.5	.7
107	196	71ASg20-0'				100	200	1		30	500	70	120			1500		150	15		20		100	200		15		70	7	.3	.07	.7
108	197	1				70	300	(L)		70	1000	100	75		20	2000		300	15		30		300	300		15		100	10	3	(L)	.7
109	198	2				70	300	(L)		30	700	70	300		(L)	1500		150	15		30		200	300		10		100	7	.5	.15	.7
110	199	3				150	500	1		70	700	70	500		(L)	3000		200	20		50		300			30			15	.5	.15	.7
111	200	4				150	300	(L)		10	100	50	15		(N)	5000		50	(N)		30		200			30			5	.5	.1	.7
112	201	5				150	300	(L)		50	500	70	25		(L)	1500		200	15		30		100			20		70	10	.7	.07	.7
113	202	6				150	70	1		15	150	50	15		(L)	3000		150	(L)		30		300			30		100	10	.7	.1	.7
114	203	7				150	300	1.5		20	70	50	20		(N)	1500		100	(N)				300			30		150	7	.3	.07	.5
115	204	8				150	150	(L)		50	1500	150	20		5	150	(N)	300	30				100			20		150	3	.5	.15	.7
116	205	9				150	500	(L)		70	1000	100	30		(L)	3000	(L)	500	(L)		50		500			30		100	15	.5	.1	.7
117	206	10				100	500	(N)		15	700	30	35			150		100	(N)		20		500			15		150	7	.2	.07	1
118	207	71ASg21-0				150	700	(L)		20	100	70	15			3000		50	(L)				200					150	7	.3	(L)	.7
119	208	1				150	700			20	100		10			2000		50	10				200					100	7	.3	(L)	.7
120	209	2				100	500			15	300		300			3000		100	15				300	200		20		100	7	.3	(L)	.7
121	BDR-210	71ASg21-3	(N)	(N)	L(.05)	150	700	(L)	(N)	20	150	50	10	(N)	(N)	2000	(L)	50	10	(N)	20	(N)	200	200	(N)	20	(N)	100	7	.5	.07	.7
122	211	4				150	500	1		30	70	70	10		(N)	1500		70	(L)		30		150	300		30		150	10	.5	.07	.7
123	212	5				200	700	1		15		70	15		(L)	1000		50	10				300			50		200	7	.5	.1	.1
124	213	6				200	700	(L)		15		50	10			1000		50	(L)				300			30		150	7	.5	.15	1
125	214	7				200	1500	(L)		10		100	20			200		30	10				500			20			10	.7	.15	.7
126	215	8				70	300	(L)		50	700	100	30			1000		300					100						10	.3	.1	1
127	216	9				50	700	1		50	1000	70	45			1500							150	200					10	.7	1.5	.7
128	217	10				30	500	1		70	1000	70	35			1500							200	200					10	.7	1.5	.7
129	BDR-138	71ASg15-0	1.5			70	1000	(N)		(N)	70	50	80		(N)	30		10		100	10		100	150					5	.07	(L)	.7
130	139	5'	(N)			500	700	1		(N)	70	20	20	(L)		30		7	15	(N)	20		500	300		30			3	.7	.1	.7
131	140	10'	(L)			300	1000	(L)		30	200	100	1700	(N)		700		100	15	(L)	30		700	500		30			15	.7	.1	.7
132	141	15'	(N)			500	500			(N)	70	5	70		(L)	20		(L)	(L)	(N)	15		200	300		15			3	.7	.1	.7
133	142	20'		300		200	500			30	1500	150	50		(N)	700		300	15	200	30		100	500		15		70	15	.3	.07	.7
134	143	25'		(N)		300	500			30	1500	100	46		50	300		300	(L)	200	30		(L)	300		10		70	15	.15	(L)	.7
135	144	30'				300	700			15	1000	70	30		5	150		200	(N)	100	20		150			20			10	.2	.07	.7
136	145	35'				300	1000			30		100	60		7	700		300	10	100			200			50			10	.5	.15	.7
137	146	40'				300	700			30		70	50		(L)	500		300	20	100			150	200		15			10	.3	.07	.7
138	147	45'				300	1000			30		70	30			700		200	10	200			500	300		15		100	7	.3	.07	.7
139	148	50'	(L)	(L)		300	700			50	700	100	40			3000		300	10	300	50		150	300		20		150	10	.2	.07	.7
140	149	55'	(N)	(N)		300	1000			30	700		60			700			10	200	20		200	200		15		150	10	.2	.07	.7
141	150	60'	.7	(L)		300	1000			50	1500		50			1000			20	100	30		200	300		20		100	15	.3	.07	1
142	151	65'	(L)	700		300	1500				1000		170			3000			(N)	100			150	200		20		150	15	.3	.15	1
143	152	70'	(N)	(L)		300	1500						85			3000			10	100			500	300	(L)	20		100	15	.5	.15	1
144	153	75'		300		300	1500						15,000			1500			10	(L)			200	200	(N)	15		100	15	.3	.1	1
145	154	80		300		200	1500						110			1500			15	100	20		500	300		20		100	10	.7	.2	1
146	155	85		(L)		200	1000						300		(N)	1500			(L)	100	20		200	150		10		70	10	.2	.07	.7
147	156	90	(L)	5000		300	1000	1		100	1500	150	50		(L)	5000		500	15	300	50		300	300		30		150	15	.3	.15	.7
148	157	95	1.5	(L)		150	700	(L)		15	700	15	40		(N)	300		70	(N)	(L)	15		(L)	300		(L)		100	2	.15	.1	1
149	158	100	1	700		100	300	(L)		20	300	50	30		(L)	500		150	(L)	H-200	15		150	200		10		70	7	.2	.07	.5
150	159	105	(N)	(N)		100	700	1		50	300	70	25		(L)	2000		200	10	H-100	50		150	200		15		70	7	.2	.05	.5
151	160	110	(N)	(N)	L(.05)	70	300	(L)	(N)	70	500	100	25	(N)	(L)	5000	(L)	300	15	H-200	30	(N)	100	200	(N)	15	(N)	100	15	.2	.07	.7
152	129	71ASg14-0	(N)	(N)		150	700	1.5		20	300	150	15			1500		150	15	-100			200	300	(N)	30		150	10	.7	.1	.7
153	130	5'	1.5	200		300	500	(L)		7	1000	50	20			150		70	(L)	-200			150		(L)	30		150	5	.3	.07	1
154	131	10'	(N)	(N)		300	300	(L)		20	700	30	35			500		150	10	-300			200		(N)	20		150	7	.5	.15	1
155	132	15'		300		300	700	1		30	1000	150	50		5	700		300	20	-300	70		150			30		100	15	.5	.1	1
156	133	20'		(N)		50	700	(L)		30	700	150	35		(L)	500		200	10	-200	20		200					100	10	.3	.1	.7
157	134	25'				50	1000	1		100	1500	100	120			5000		500	15	-300	30		200					150	10	.7	.15	1
158	135	30'				50	700	(L)		70	700	100	35			2000		300	15	-150	30		100			20		70	10	.5	.15	.7
159	136	35'	1	700		100	700	(L)		20	1000	70	30	(L)	(N)	1500		150		-300			(L)	200		15		100	7	.5	.2	.7
160	137	40'	(N)	(N)		150	700	(L)		30	700	70	25	(N)	(N)	1000		200		200			100	200		15		100	7	.3	.2	.7
161	120	71ASg13-0'				150	1500	(L)		70	150	100	15	(L)	(L)	5000		150		(N)			700	300	(L)	30		150	15	.7	.15	.7
162	121	5'				300	1000	1		50	150		15			700		100	30	(N)			700					150	15	1	.15	.7
163	122	10'		300		100	700	1		30	700		50			1500		200	15	H-200			150					100	10	.2	.07	.7
164	123	15'		(N)		300	700	1.5		15	100		20	(N)	(N)	150		70	15	(L)			700		(N)			200	10	1	.15	.7
165	124	20'	1	1000		300	300	(L)		(L)	700	20	70		(L)	70		50	(L)	H-200			150					150	3	.7	.2	1
166	125	25'	1.5	700		200	1000	(L)		30		100	30			700		200	15	-1500				200				150	10	.3	.1	1
167	126	30'	(N)	200		100	700	1		50		70	25			3000		300	10	-700				300		20		100	10	.15	.07	.7
168	127	35'		300		50	100	1		30		50	40			5000		300	10	-700			100	200		20		100	7	.07	.07	.7
169	128	40'		(N)		200	1500	1.5		70		100	10			5000		300	15	700			150	200		30		150	10	.5	.15	.7
Limits of determination			.5	200	.02	10	5	1	10	20	5	5	5	20	5	10	10	2	10	100	5	10	50	10	50	10	200	20	.05	.02	.05	.001

[1] Atomic absorption



SLEETMUTE 1:250,000 QUADRANGLE
NW 1/4 T. 15 N., R. 48 W.

Introduction

The Mountain Top deposit was studied during August 1971 as part of a continuing program of the U.S. Geological Survey to investigate mercury deposits and occurrences in the central Kuskokwim region of southwestern Alaska. The geology and topography at the prospect was mapped at 1 inch equals 50 feet, using planetable methods; 169 bedrock and vein samples were collected. The fieldwork was supplemented by petrographic and mineralogic investigations, including determinations by X-ray diffraction. The samples were analyzed for 30 elements by semiquantitative spectrographic methods and for gold and mercury by atomic absorption. Results of these analyses are given in table 1.

Location and accessibility

The Mountain Top mercury deposit is in the Sleetmute (1:250,000) quadrangle about 40 miles southwest of Sleetmute and 10 miles east of Holokuk Mountain, which is on the drainage divide between the Holokuk and Oskawalik Rivers (pl. 1). The deposit is within the central Kuskokwim region as described by Cady and others (1955).

Access is by small aircraft that can land on an 1,680-foot dirt airstrip at the deposit or overland by tractor train during the winter months.

History and production

The deposit was discovered in August 1968 by James R. Wylie, who detected cinnabar in stream sediments panned from Chineekluk Creek, a headwater tributary of the Holokuk River, and from the upper reaches of the Oskawalik River (index map, plate 1). By panning, Wylie traced the detrital cinnabar to its source area several miles upstream.

Wylie's method of exploration is to hand-auger shallow holes about 3 feet deep through regolith, remove regolith over target areas, and, using a bulldozer, dig shallow trenches to locate and expose cinnabar veins. Five cinnabar veins have been exposed. In the summer of 1970 the U.S. Bureau of Mines drilled seven diamond drill holes to test the downward extension of cinnabar veins exposed by trenching. The deepest hole drilled reached a vertical depth of 50 feet. Cinnabar was found in drill holes 1, 3, 4, 5, and 6; it was not detected in drill holes 2 and 7 (pl. 1). During exploration, about 1 ton of high-grade residual cinnabar was recovered and stockpiled from soil and colluvium overlying the veins. No production had been recorded by the summer of 1971.

Estimated ore reserves

Estimates of ore reserve at the deposit are based on "ore in sight," which includes the five exposed cinnabar veins and the residual cinnabar recovered and stockpiled during exploration. Reserve estimates are calculated from measured vein widths and lengths (description of vein types, p. 4 and pl. 1) and a projected vein depth of 10 feet. The average ore grade has been estimated to be approximately 15 pounds of mercury per ton, although by selective mining and hand-cobbing, an ore grade of 200 pounds of mercury per ton or better could be achieved. At an ore grade of 15 pounds per ton, the reserve at the deposit is estimated at 200 flasks of mercury.

Geology and structure

Bedrock at the Mountain Top mercury deposit is interbedded graywacke and shale of the Cretaceous Kuskokwim Group (Cady and others, 1955). The predominant rock types at the deposit are a moderately altered brownish to grayish black, siliceous thin-bedded shale and medium-grained dark-gray graywacke. Locally, the shale and graywacke are cut by numerous discontinuous quartz veinlets.

The shale and graywacke have been intruded by olivine basalt, which is interpreted as a dike. The exposed olivine basalt is 700 feet long, 200 feet wide, strikes N. 30° W., and dips approximately 35° SW (pl. 1). The dike is transected by four faults that strike within 5° of E. and dip almost vertically. The faults are bordered by 100-foot-wide zones of pervasively altered, brecciated olivine basalt that grades rather abruptly into unbrecciated less altered olivine basalt.

Rock alteration

Rock alteration at the deposit is most extensive and intense within the zones of fault-related brecciation. Unbrecciated basalt, which occurs between the parallel faults, shows a broad range in intensity of alteration. The shales and graywackes are locally extensively altered.

Kuskokwim Group

Shale and graywacke of the Kuskokwim Group adjacent to faults has been intensely altered to a bleached whitish-gray rock that consists almost entirely of quartz and dickite. The graywacke matrix has been altered to dickite, and the detrital quartz, feldspar, and mica have been partly silicified. Detrital ferromagnesian minerals have been altered to hydrous iron oxides.

Olivine basalt

The olivine basalt shows a complete gradation from unaltered to completely altered rock. The unaltered olivine basalt is dark grayish black and has a porphyritic texture with olivine phenocrysts as much as 2 mm long set in a fine-grained intergranular groundmass. The olivine phenocrysts are surrounded by a very thin rim of "iddingsite," but their cores are unaltered. The plagioclase groundmass is not altered. Where moderately altered, the olivine basalt is dark grayish brown and the olivine phenocrysts are almost entirely replaced by "iddingsite" and magnetite, although relicts of fresh olivine are preserved locally in phenocryst cores. Groundmass plagioclase is rimmed and partly replaced by cryptocrystalline quartz. The intensely altered olivine basalt is a porous ocherous yellow brown and is intricately veined by limonite. Its primary minerals have been almost completely replaced; olivine by "iddingsite", magnetite, and hydrous iron oxides, and the groundmass minerals by cryptocrystalline quartz, dickite, chlorite, and kaolinite(?). Locally, extremely intense alteration of the olivine basalt has produced a light-tan dense rock entirely composed of cryptocrystalline silica.

Brecciated olivine basalt

Near faults, the olivine basalt is a remarkably uniform brownish-tan breccia composed of altered, angular to subangular olivine basalt clasts 0.5 cm to 5 cm in greatest dimension and averaging about 1 cm. X-ray analysis shows the entire breccia to be composed primarily of quartz, dolomite, and clay minerals. The olivine phenocrysts have been altered to "iddingsite" and, less commonly, replaced by quartz. The breccia matrix has been almost entirely replaced by cryptocrystalline quartz. A later stage, fine- to medium-grained, subhedral quartz fills the interstices between, and forms rims upon, the clasts of altered olivine basalt. Dolomite has replaced much of the subhedral quartz.

Mineralogy of the deposit

Cinnabar is the only mercury mineral at the Mountain Top mercury deposit and has been localized only where faults cut the olivine basalt. The more persistent cinnabar veins are within 6 inches of the fault slip surface and are remarkably uniform across the width of the dike (pl. 1).

Two types of cinnabar-bearing veins occur at Mountain Top. The first and most common type, designated a type I vein and represented by three veins, occurs directly upon, or within 6 inches of, the fault slip surfaces. The veins range in width from 3 to 12 inches and are as much as 160 feet long. This type of vein is characterized by an abundance of massive dolomite.

The second type of cinnabar-bearing vein, designated a type II vein and represented by two veins, is developed directly along the fault slip surface. These veins reach a maximum width of 4 inches but do not exceed 20 feet in length. Dolomite is conspicuously absent.

In both vein types, cinnabar occurs as bright-red to reddish-black, fine- to medium-grained open-space fillings. Locally, cinnabar partially replaced basalt in unbrecciated but extensively fractured and silicified parts of the dike. Small quantities of a light- to dark-brown liquid and solid hydrocarbon accompany the cinnabar. Most of the hydrocarbon is found as a transparent light-brown liquid filling vugs and fractures within chalcedony veinlets. Many of the chalcedony veinlets contain close packed shells of quartz and chalcedony, some of which contain solid dark-brown to black hydrocarbons. The veins are believed to have formed, as proposed by Bailey (1959), by the deposition of silica on interfaces between hydrous vein fluids and immiscible droplets of hydrocarbons.

Although stibnite is commonly associated with mercury deposits of the central Kuskokwim region (Sainsbury and MacKevett, 1965; Malone, 1962; Rutledge, 1950), it is found at Mountain Top only as deeply weathered float fragments and microscopic crystal aggregates in small quartz veinlets near the two cinnabar-bearing veins at the southernmost part of the dike (pl. 1).

Pyrite is associated mainly with the altered wallrocks adjacent to the two southernmost cinnabar-bearing veins in the southernmost part of exposed dike (pl. 1) where it occurs as very fine grained crystal aggregates within the altered groundmass of the olivine basalt. Less commonly, pyrite partially to completely borders altered olivine phenocrysts. The extensive development of hydrous iron oxides throughout the altered olivine basalt and brecciated olivine basalt may be due to the weathering of high-iron olivine or may indicate a greater abundance of pyrite below the zone of weathering.

Quartz, dolomite, and dickite are the most abundant gangue minerals in the cinnabar-bearing veins. Quartz is extremely abundant throughout the altered zones, mainly as a cryptocrystalline replacement of altered olivine basalt, brecciated olivine basalt, and graywacke. Late-stage quartz forms small discontinuous veinlets cutting all other mineral phases.

Dolomite, the only carbonate mineral accompanying the cinnabar-bearing veins at Mountain Top, formed during at least three distinct generations. First-generation dolomite occurs as very fine grained crystal masses forming up to 15 percent of the altered groundmass of the brecciated olivine basalt. Second-generation dolomite forms massive, white to tannish-white, medium- to coarse-grained veins up to 10 inches wide associated with the type I cinnabar-bearing veins. The third and latest generation dolomite forms encrustations upon and crystal-lined vugs within the massive second-generation dolomite.

Dickite, a common clay mineral in many mercury deposits of Alaska, is closely associated with the strongly argillized wallrocks at the deposit. Dickite most commonly forms microcrystalline aggregates, disseminated erratically throughout cryptocrystalline quartz that has replaced parts of the altered olivine basalt, brecciated olivine basalt, and sedimentary rocks. Less commonly, veinlets of chalky white pure dickite cut the altered wallrocks immediately adjacent to the cinnabar-bearing veins.

Buddingtonite, a rare ammonium feldspar, is found locally at the deposit, where, along with minor quartz and pyrite, it locally completely replaces the altered olivine basalt. Buddingtonite has been described from the Sulphur Bank mercury mine, Lake County, Calif. (Erd and others, 1964), where it occurs as a hydrothermal replacement of a Quaternary andesite lava flow and older rocks in an active hot springs system. The close association of buddingtonite with mercury deposits of California and Alaska implies a possible genetic similarity.

GEOCHEMISTRY

All rock and vein samples from the Mountain Top mercury deposit were collected from bedrock exposed in trenches. The samples from the trenches were collected at 5-foot intervals, except for the three northernmost trenches, which were collected at 10-foot intervals. A sampling traverse at 2-foot intervals was conducted across the northernmost cinnabar-bearing vein to determine vein and wallrock mineralogy and to delineate zones of trace-element enrichment and depletion. Sample locations are shown in plate 1 and analytical data are given in table 1.

Rock samples were dried, crushed, and sieved. The minus 80-mesh fraction of the sample was split and a 10-gram sample was analyzed for 30 elements by the six-step semiquantitative spectrographic method and for gold and mercury by atomic absorption.

The spectrographic analyses were reported in percentage or in parts per million (ppm) to the nearest number in the series 1.0, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1 . . . The precision of a reported value is approximately plus 100 percent or minus 50 percent. Analyses for gold and mercury by atomic absorption are accurate to ± 100 percent. Minimum limits of determination for each element are given at the bottom of each tabulated sheet of analyses (table 1). Semiquantitative spectrographic analyses were done by K. J. Currey and A. L. Meier, analyses by atomic absorption by R. L. Miller and D. G. Murrey.

Geochemical profiles, prepared after extensive rock sampling across major cinnabar-bearing veins, indicate that rocks in the veins are depleted in Mn, Ba, Cu, Ni, Cr, and Fe, and that rocks bordering this depleted zone are markedly enriched in Mn, Ba, Cu, Ni, Cr, and Fe.

The average mercury concentration for the altered rocks at the Mountain Top mercury deposit in parts per million (ppm) is shales and graywackes, 10 ppm; olivine basalt, 45 ppm; brecciated basalt, 56 ppm. No data are available for the average mercury threshold values of country rocks in the immediate region of the Mountain Top deposit.

Analyses of rock and stream sediments from the Taylor Mountains C-8, C-6, and A-6 quadrangles, central Kuskokwim region, Alaska (Clark and others, 1970) has established an average regional mercury threshold value of 0.35 ppm to 0.8 ppm (values are from unmineralized rocks). Average regional mercury threshold values at the Mountain Top mercury deposit are probably within this range.

In geochemistry, the Mountain Top mercury deposit is very similar to the Cinnabar Creek mercury mine (Clark and Sorg, 1971), indicating similar genetic phenomena.

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GEOLOGIC MAP OF THE MOUNTAIN TOP MERCURY DEPOSIT, SOUTHWESTERN ALASKA

by
D.H. Sorg and M.B. Estlund

1972

For sale by U. S. Geological Survey, price $.