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Planetable maps and drill logs of fluorite and beryllium deposits, Lost River area, Alaska

By

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Introduction

The actual planetable mapping was done by J. M. Kelly and D. W. Peters, who traced units delineated by Sainsbury. On both maps additions, such as the Mary Lou and Camp Creek faults, were made by Sainsbury. Hence, map units used and major faults are the responsibility of Sainsbury, but actual placement of the contacts and float zones of ore are the responsibility of Kelly and Peters. The logs of the 16 holes drilled by the U.S. Bureau of Mines were made by the author.

In the descriptions of the drill core the word "same," followed by additional comments, means that the general lithology of the core is the same as that in the previous interval, but that details differ as described. The term "CaF_2-Be rock" is used throughout to describe a rock that may be varied locally, but for the most part consists of a fine-grained intergrowth of fluorite, mica, tourmaline, diaspore, chrysoberyl, and traces to small amounts of numerous other minerals.

Camp Creek area

Geology

The map of this area was prepared principally for delineation of the geology of the fluorite-beryllium deposits drilled by the U.S. Bureau of Mines in 1964. The tin deposits were discussed fully in U.S. Geological Survey Bulletin 1129, Geology of the Lost River mine area, Alaska, by C. L. Sainsbury, 1964.

The beryllium deposits consist mainly of fine-grained fluorite that contains the mineral chrysoberyl ($BeAl_2O_4$), with minor amounts of euclase ($BeAlSiO_4$ (OH)) and beryllian diaspore intergrown with tourmaline and white mica. The composition of the ores is discussed more fully in U.S. Geological Survey Circular 479, Beryllium deposits of the western Seward Peninsula, Alaska, by C. L. Sainsbury, 1963.

The deposit at Camp Creek consists of a wide zone of replacement veins and veinlets in fractured limestone that is localized beneath a thrust fault, the Rapid River fault. The ore zone dips south, and the highest grade ore is localized at the intersection of a second thrust fault, the Camp Creek thrust fault, with the Rapid River fault. The heavy regolith prevents the tracing of the Camp Creek fault into the

ore zone on the surface, and on the map this fault is terminated at Camp Creek, although it undoubtedly continues along the south side of Camp Creek for some distance. On both the Camp Creek and Rapid River faults, the upper plate probably moved northward or northwestward. At the west end of the better grade ore, a steep fault of unknown displacement crosses Cassiterite Creek and enters the area of the main ore deposit, where the regolith precludes tracing it farther. This fault is mineralized to some extent with fluorite-beryllium rock, as are other north-trending faults west of Cassiterite Creek. Another fault, dipping 15° east where it is exposed at the caved stope on the Cassiterite dike, is probably a thrust fault that continues southward toward the mouth of Camp Creek, but its placement is uncertain where it enters Camp Creek.

In considering further drilling of the Camp Creek deposit, one should remember that mineralized veins and veinlets are localized by fractures related to the thrusting, by a strong joint system in the limestone, and along the walls of dikes, several of which are known only as runs of float. Each of these structural zones has localized fluorite-beryllium veins and veinlets, and the close delineation of minable ore will require that exploration proceed with all mineralized structures in mind. Evidence gained by the Bureau of Mines drilling, which proved that sulfide minerals such as arsenopyrite, pyrite, galena, and stannite occur at depth, suggests that at depth the fluorite-beryllium deposits may grade into tin deposits, where cassiterite is associated with sulfide minerals such as arsenopyrite, pyrite, marmatite, chalcopyrite, and molybdenite.

Logs of drill holes

Camp Creek
DD Hole 101 (U.S.B.M.)
Logged by C. L. Sainsbury
U.S. Geological Survey

Direction: S. 2° W.
Slope: Horizontal

Length: 241 feet

Footage From	Footage To	Percent of core recovered	Core description
0	10.0	90±	Medium gray fine-grained argillaceous limestone, CaF_2-Be bedding nearly parallel to hole. 1-1.5 in. veinlet at 2.5, fragments at 3.4-3.6, 9.8-10.
10.0	16.4	98	Same, veinlet 10° to hole at 13.5 feet, for 4 in.
16.4	19.6	81	Same, scattered 1/18 in. joint facings of CaF_2-Be.
19.6	22.2	96	Same.
22.2	25.1	62	Same, bedding parallel hole at 25.3, nearly so elsewhere.
25.1	26.4	93	Same lithology.
26.4	28.0	94	Same, 1/4 in. calcite veinlets inclined 80° to hole.
28.0	30.4	67	Same, thin veinlet at 30.3-30.4.
30.4	32.0	94	Same.
32.0	33.3	85	Same, bedding clearly shown very nearly parallel to hole.
33.3	35.5	95	Same, bedding 5-10° to hole.
35.5	37.7	95	Same, bedding about 15° to hole.
37.7	39.8	72	Same, 1/4 in. CaF_2-Be veinlet at 40.5.
39.8	43.1	42	Same.
43.1	44.4	92	Same, 1/4 in. veinlet CaF_2-Be at 43.5 inclined about 70° to hole and about 45° to bedding.
44.4	48.0	89	Same, 1/8 in. CaF_2-Be veinlet and diaspore (?) vainlet at 47.0 inclined to hole about 55°.
48.0	49.4	79	Same.
49.4	50.2	100	Same, clay facing on veinlet at 50 inclined 75° to hole.
50.2	51.2	80	Same.
51.2	53.6	50	Same.
53.6	54.6	80	Same.
54.6	55.6	100	Same, bedding 30° to hole.
55.6	57.9	87	Same.
57.9	62.8	96	Same, bedding still 30° to hole.
62.8	67.2	95	Same.
67.2	69.7	48	Same, core broken, stained red, slight dolomitization, bit of CaF_2-Be at 69.5.

Camp Creek
DD Hole 101--Continued

Footage From	Footage To	Percent of core recovered	Core description
69.7	72.1	79	Gray limestone, bedding 5-10° to hole, CaF_2-Be at 69.9-71.1, core broken in ore area.
72.1	74.0	74	Same, 1/4 in. CaF_2 veinlet at 72.6, 80° to hole.
74.0	78.0	88	Same, local faint dolomitization. Some CaF_2-Be rock at 74.8-75.3.
78.0	84.4	95	Same, at 78.3 a 1/2 in. CaF_2-Be veinlet.
84.4	88.0	92	Same, bedding 10° to hole, few calcite veinlets 5° to hole. At 86.7 a 1/8 in. kaolin veinlet perpendicular to hole.
88.0	89.3	79	Same.
89.3	93.1	79	Same, few 1/2 in. patches faint dolomitization associated with fractures.
93.1	96.6	97	Same, calcite veinlets inclined to hole 65°.
96.6	97.0	79	Same, argillaceous bands more wavy.
97.0	101.0	87	Same, faint dolomitization associated with reddish stain.
101.0	104.0	67	Same, faint dolomitization, a 1/2 in. veinlet CaF_2-Be perpendicular to hole at 102.1, broken, gravelly fluorite at 103.2-104.
104.0	106.0	95	Same, less dolomite, bedding inclined to hole 20°. A 1 in. veinlet CaF_2-Be perpendicular to hole at 104.4.
106.0	113.0	97	Gray limestone, bedding inclined to hole 15° to parallel to hole. 1/4 in. calcite veinlet perpendicular to hole at 111.7.
113.0	116.0	100	Same.
116.0	116.3	100	Same.
116.3	119.3	97	Same.
119.3	120.2		Same, slight color change (lighter) with dolomitization.
120.2	120.3	92	Kaolinite veinlet with red oxide stains, limestones becoming dolomitic.
120.3	123.0		Same lithology, two sets of fractures at 121.3, a clay fracture inclined to hole 25°, a 1/4 in. fluorite mica veinlet 80° to hole. CaF_2-Be cuts mica. Broken with red staining, more dolomitization at 121.6-127. Clay with broken core at 122.6-122.8.
123.0	126.9	87	123.0-124.7, dolomitized; red staining along clay seams which are inclined 30° to hole. At 124.9, small fracture 40° to hole, and change to slightly dolomitized limestone.
126.9	127.0		Same.
127.0	128.0	84	Broken, stained, several 1/2 in. CaF_2-Be veinlets almost perpendicular to hole. Bedding 30° to hole.
128.0	130.0		Slightly dolomitized; broken with clay and staining at 129.6-130.
130.0	134.5	51	Dolomitized argillaceous limestone CaF_2-Be (?) section at 130.5-130.7; broken and clayey 133.5-134.5.

Camp Creek
DD Hole 101--Continued

Footage From	Footage To	Percent of core recovered	Core description
134.5	138.0	83	Gray limestone to light-gray dolomitic limestone, bedding parallel hole to 136.5, then obscure. 1/4 in. CaF_2-Be veinlet inclined 30° to hole at 136.7, section of CaF_2-Be 137.8-138.4.
138.0	141.0	73	Dolomitic red-stained limestone, with CaF_2-Be at 138.0-138.4; becomes red stained and broken with 1/4 in. fluorite veinlets at 139.5-141.
141.0	143.0	75	Same.
143.0	148.0	68	Same, slight kaolinization with broken core at 143.2.
148.0	154.4	78	Same, decrease in red staining from 152 on, badly broken with clay and carbonate veinlets 148-150.
154.4	161.0	100	Broken gray limestone recrystallized to light gray with dark fragments, local red staining and carbonate veinlets.
161.0	162.3	85	Same.
162.3	163.7	79	Same.
163.7	164.8	100	Same.
164.8	168.0	91	Same, but with progressive increase of gray limestone in matrix. Still no visible bedding.
168.0	172.0	93	Same, but with bedding (clay seams) becoming visible, inclined 45° to hole at 171.5.
172.0	178.0	75	Same lithology and bedding inclination.
178.0	182.0	75	Same, increased brecciation, progressive loss of dark-colored fragments.
182.0	187.0	94	Broken light-gray limestone with calcite veinlets, no visible bedding; cut at 183.8 by a few veinlets of umber-colored carbonate. Becomes dolomitic at 184.
187.0	191.2	78	Same light-gray dolomitized limestone.
191.2	192.0		Broken sugary-textured red-stained fluorite for 4 in., then broken red-stained CaF_2-Be (?) vein.
192.0	197.0	24	Badly broken with vugs lined with calcite, red staining, todorokite fragments, associated with poor core recovery.
Fault?			
197.0	201.0	25	Pyrolusite (?) nodules cemented with calcite, porous, vuggy iron-stained (limonitic) CaF_2-Be rock of relatively low grade associated with poor core recovery.
201.0	203.0	35	Same as 197-201, but more carbonate, fewer CaF_2-Be veinlets.
203.0	205.1	29	Broken iron-stained limestone.
205.1	205.6	50	Same as 197.0-201.0, with increase in amount of crystalline umber-colored carbonate (manganiferous calcite?).
205.6	206.7		Broken medium-dark-gray limestone with white calcite veinlets.

Camp Creek
DD Hole 101--Continued

Footage From	Footage To	Percent of core recovered	Core description
206.7	208.0	77	Same limestone with noticeable umber-colored carbonate.
208.0	209.0	80	Same limestone with few 1/4 in. fluorite veinlets.
209.0	210.5	93	Same limestone noticeably darker.
210.5	212.5	85	Broken gray limestone with umber-colored carbonate with fluorite at 211-211.8; low beryllium.
212.5	216.5		Broken gray limestone.
216.5	217.7	84	Same limestone with noticeable umber-colored carbonate.
217.7	220.5		Light-gray dolomite with white dolomitic patches, veinlets. Few 1/4-1/2 in. fluorite veinlets, some with blue-green (tourmaline?) mineral.
220.5	223.7		Same.
223.7	225.0	67	Broken, several fluorite veinlets, noticeable dark carbonate.
225.0	227.3		Light-gray dolomite with few 1/8 in. chalcedony stringers.
227.3	228.3		Dolomite with few very hard (chalcedony?) stringers, some fluorite.
228.3	229.9	92	Mixed limestone and dolomite.
229.9	231.2		Breccia with dark carbonate, several fluorite (?) veinlets.
231.2	232.0		Broken reddish dolomitized limestone (approximate end of strong dolomitization).
232.0	241.0	81	Faintly red-stained limestone, light gray to pinkish gray on fracture, locally broken, few 1/8-1/4 in. fluorite veinlets.

Note: From about 190 feet to end of hole, general dolomitization, occurrence of umber-colored carbonate, and greenish tourmaline(?) indicate hole is on outer edge of mineralized zone.

Camp Creek
DD Hole 102 (U.S.B.M.)
Logged by C. L. Sainsbury
U.S. Geological Survey

Direction: N. 6° W.
Slope: -70°

Length: 110 feet

Footage From	Footage To	Percent of core recovered	Core description
0	5.0	None	
5.0	10.0	36	Broken hematite-stained limestone, few 1/4 in. veinlets, last foot crumbled and kaolinized.
10.0	14.0	77	Faintly bleached fractured argillaceous limestone, white calcite veinlets, local red staining.
14.0	15.5	40	Same.
15.5	16.4		Same, faint increase in red staining.
16.4	17.1	73	CaF_2-Be veinlet, border irregularly inclined 45° to core.
17.1	19.0	80	Same as 15.5-16.4, increased red staining; at 18-19, 1/4 in. CaF_2-Be veinlet trends along hole.
19.0	20.5	40	Same.
20.5	22.0	13	Altered dike?
22.0	24.0	45	Same, altered dike?
24.0	26.0	45	Altered dike, intense clay alteration and iron staining at 25-26.
26.0	27.9	76	Broken stained bleached limestone, minute CaF_2-Be veinlets.
27.9	28.5		Broken core, limestone with CaF_2-Be veinlets.
28.5	30.0	100	CaF_2-Be rock, visible veinlets; one inclined 35° to hole and one 45°. Noticeable manganese staining.
30.0	30.6	83	Core broken, CaF_2-Be core.
30.6	32.2	75	CaF_2-Be rock, wavy diaspore? Fluorite veinlet inclined 35° to hole at 31.7.
32.2	34.2	70	CaF_2-Be rock, some noticeable manganese staining.
34.2	34.7	67	Broken core of red-stained dolomite. At 34.5 veinlet inclined 20° to hole.
34.7	37.5		Solid CaF_2-Be rock; veinlets of mica, fluorite, manganese dioxide, inclined 60° to hole.
37.5	41.0	89	Solid CaF_2-Be rock, two veinlets intersecting, one of fluorite inclined 25° to hole; cut by a second of fluorite inclined 30° to hole; partially replaced limestone at 38.2-38.6.
41.0	41.8	94	CaF_2-Be rock, abundant late white veinlets.
41.8	42.2		Unreplaced brecciated limestone, few veinlets of vuggy calcite.
42.2	42.5		Unreplaced limestone.
42.5	42.8		Same, with a CaF_2-Be veinlet inclined 30-35° to hole.
42.8	46.0		Fractured brecciated marmarized limestone.
46.0	47.7	90	Brecciated red-stained limestone.
47.7	49.0		CaF_2-Be rock, vein inclined 60° to hole.
49.0	51.0		Fractured limestone.

Camp Creek
DD Hole 102--Continued

Footage From	Footage To	Percent of core recovered	Core description
51.0	55.4	86	Same, few 1/4-1/2 in. veinlets 55° to hole.
55.4	61.0	95	Broken hard limestone, partially dolomitized.
61.0	61.5		Same.
61.5	63.2	100	Mixed CaF_2-Be rock and dark carbonate with dispersed todorokite, few relict dolomite fragments. Ore veinlet 20° to hole.
63.2	66.0		Uniform pinkish CaF_2-Be rock, few dark todorokite veinlets.
66.0	67.8		Pinkish CaF_2-Be rock, with a persistent todorokite-CaF_2-diaspore (?) veinlet trending 5° to core.
67.8	71.0		CaF_2-Be rock with increase of black manganese staining, noticeable fluorite veins 70° to hole.
71.0	71.5	60	Broken core of mixed CaF_2-Be ore and red-stained dolomite.
71.5	76.0	13	Extremely poor core recovery (approximately 15 percent), corresponding to water loss and other difficulties, indicating highly porous broken zone. Pebbles representing 71.5-75.5 are mixed CaF_2-Be rock and stained limestone. For assay value it is best to accept value of total assay of interval 71-72 and leave interval 75.5-76 as barren limestone.
Fault?			
76.0	76.2		Red-stained limestone, same as 75.5-76.
76.2	76.6	94	(CaF_2-Be?) rock, with umber-colored carbonate containing todorokite.
76.6	81.0		Recrystallized limestone, pinkish tinge, numerous white calcite veinlets at all orientations, few relict breccia fragments of dark limestone. Slight clay alteration at 79.7. Bedding almost perpendicular to hole.
81.0	81.5	100	Stained recrystallized limestone.
81.5	86.0	60	Same, bedding (?) almost perpendicular to hole.
86.0	91.0	66	Same, bedding perpendicular to hole.
91.0	96.0	30	Same.
96.0	110.0	62	Virtually same, few broken areas, no veins.

Camp Creek
DD Hole 103 (U.S.B.M.)
Logged by C. L. Sainsbury
U.S. Geological Survey

Direction: N. 4° E.
Slope: -70°

Length: 179 feet

Footage From	Footage To	Percent of core recovered	Core description
10.0	33.3	71	Medium-gray fine-grained limestone, small areas and veinlets of white calcite; bedding varied but at high angle to hole throughout.
33.3	35.0		Same.
35.0	38.0	62	Core broken, corresponds with coarse crystallinity and red staining.
38.0	45.0		Light-gray to light-olive-gray limestone somewhat more argillaceous than 10-33.3.
45.0	45.8	67	Thin white to purplish fluorite vein trends along hole.
45.8	49.0		Same as 38-45, thin fluorite veinlet.
49.0	49.2	50	Light-violet fluorite and muscovite mica--no beryllium.
49.2	52.0		Faintly dolomitic argillaceous limestone; at 52 bedding 70° to hole. Orange-yellow colored argillaceous bands.
52.0	54.0	60	Same.
54.0	63.0	46	Altered (and iron-stained) fine-grained rhyolite(?) dike with feldspar phenocrysts to 1/8 in. in length.
63.0	64.8	11	Kaolinized iron-stained rhyolite(?).
64.8	65.5	71	Limestone breccia with white calcite in darker carbonate matrix.
65.5	66.6		Breccia and yellow-stained argillaceous limestone.
66.6	91.1	79	Medium-dark-gray fine-grained limestone with white calcite veinlets, breccialike fragments encased in darker argillaceous limestone.
91.1	96.4		Same, but with yellow-orange coloration.
96.4	112.6	48	Same, but with lighter color and increased amount of white calcite.
112.6	121.2	100	Same.
121.2	122.2	96	CaF_2-Be rock with central area of diaspore veinlets which give excellent count on beryllium detector.
122.2	179.0	95	Medium-gray limestone with local veinlets of white calcite; a beryllian diaspore veinlet 1/2 in. wide at 158.5 inclined 65° to hole; bedding obscure, but generally inclined 20° to 40° to hole, when visible.

Note: No definite fault recognized--bedding is at a high angle to core throughout.

Camp Creek
DD Hole 104 (U.S.B.M.)
Logged by C. L. Sainsbury
U.S. Geological Survey

Direction: N. 2° E.
Slope: -70°

Length: 139 feet

Footage From	Footage To	Percent of core recovered	Core description
0	16.0		Overburden and broken bedrock--mixed medium-gray to light-brownish-gray granular limestone and CaF_2-Be rock, red stained.
16.0	18.0	65	Fractured red-stained (originally medium-gray?) limestone, local white calcite, local CaF_2-Be veinlets inclined about 40° to hole.
18.0	21.0	100	Same.
21.0	26.0	92	Same limestone lithology, veinlets 25° to hole to parallel to hole.
26.0	35.0	93	Broken limestone replaced partially to completely with CaF_2-Be rock with local noticeable dark carbonate. At 34-34.5, principally coarse calcite. Veinlets oriented 35° to 85° to hole.
35.0	36.0	58	Thin-bedded argillaceous limestone, bedding 80° to hole, 1/16-1/4 in. red-stained argillaceous bands.
36.0	40.0		Argillaceous limestone replaced partially to completely by CaF_2-Be rock.
40.0	41.5	100	Broken kaolinized argillaceous limestone. At 40-41, veinlets of beryllian diaspore very noticeable, inclined 20° to 40°± to hole.
41.5	42.0	100	CaF_2-Be rock.
42.0	43.0	100	Argillaceous limestone, limonitic staining, local kaolinization, bedding 80° to hole.
43.0	46.5	62	Sheared argillaceous limestone, partially to completely replaced with CaF_2-Be rock, some showing minute veinlets with white mica and fluorite.
46.5	58.7	92	Thin-bedded argillaceous and carbonaceous limestone, bedding 75° to hole, locally parallel to 15° to hole.
58.7	61.5	75	Broken stained argillaceous limestone, local veins of diaspore and CaF_2-Be rock.
61.5	65.7	74	Principally CaF_2-Be rock with veinlets (centers) at several directions to hole; local dark carbonate.
65.7	68.0	78	Medium-grade CaF_2-Be rock, local brown carbonate; kaolinized at 67.6-68.
68.0	70.6	83	Partly dolomitized argillaceous limestone, faint limonite staining, bedding inclined 75° to hole.
70.6	72.0		Principally CaF_2-Be rock, one vein wall 50° to hole.
72.0	73.2	100	Red-stained argillaceous limestone, sparsely veined with CaF_2-Be veinlets.
73.2	74.7	89	Principally CaF_2-Be rock.

Camp Creek
DD Hole 104--Continued

Footage From	Footage To	Percent of core recovered	Core description
74.7	76.1	78	Red-stained argillaceous limestone with calcite veinlets.
76.1	78.7		Sparsely veined red-stained CaF_2-Be rock.
78.7	83.8	60	Principally CaF_2-Be rock, brown carbonate at 83-83.8.
83.8	84.3		Red-stained argillaceous limestone, bedding 60° to hole.
84.3	84.6	71	CaF_2-Be veinlet.
84.6	92.5		Broken red-stained argillaceous limestone with CaF_2-Be veinlets; noticeable brown carbonate at 87-88; noticeably richer, altered zone at 88.4-89 with fluorite, clay, and white mica.
92.5	93.9	86	Principally CaF_2-Be rock, probably directly along a veinlet inclined 5° to hole, with a central zone 3/8 in. thick of purple fluorite.
93.9	101.0		Bleached thin-bedded argillaceous limestone, red-stained near 93.9, becoming limonite color at 98, returning to red stained at 101. Bedding inclined 85° to hole.
101.0	104.3	77	Principally CaF_2-Be rock probably along a vein parallel to hole. Vein center is fluorite, white mica, and todorokite; walls are banded CaF_2-Be rock with white microcrystalline chrysoberyl.
104.3	104.8	88	Red-stained argillaceous limestone with bedding inclined to hole 80°.
104.8	109.4		Principally CaF_2-Be rock.
109.4	110.9	91	Red-stained argillaceous limestone with bedding 80° to hole.
110.9	112.7		Ore vein parallel to hole. Central part consists of todorokite, fluorite, and white mica. Walls are banded CaF_2-Be rock.
112.7	121.7	88	Thin-bedded red-stained argillaceous limestone, bedding 65° to hole. Sparse 1/16-1/18 in. ore veinlets nearly parallel to hole.
121.7	139.0	96	Medium-gray unaltered locally argillaceous limestone.

Camp Creek
DD Hole 105 (U.S.B.M.)
Logged by C. L. Sainsbury
U.S. Geological Survey

Direction: N. 2° E.
Slope: -70°

Length: 122 feet

Footage From	Footage To	Percent of core recovered	Core description
0	5.0		Broken fragments of frostbroken rock and loose boulders consisting of medium-gray granular sparrite (crystalline limestone) and CaF_2-Be rock.
5.0	5.6		CaF_2-Be rock, noticeably crystalline, creamy to pinkish coloration; faint films of todorokite.
5.6	6.4	25±	Medium-gray sparrite.
6.4	6.8		CaF_2-Be rock, noticeably crystalline, creamy to pinkish coloration; faint films manganese mineral; few hard grayish veinlets of diaspore (?) inclined 80° to hole.
6.8	8.0		Medium-grained medium-gray sparrite.
8.0	8.5		Mixed ore and medium-gray sparrite.
8.5	10.5		Medium-gray sparrite.
10.5	11.0	60	Medium-gray sparrite and fragments CaF_2-Be.
11.0	14.5	40	Faintly dolomitized medium-gray limestone with CaF_2-Be veinlets as much as 4 in. thick.
14.5	16.5	25	Broken core consisting of granular CaF_2(-Be?) and red-stained gray sparrite.
16.5	18.2	71	Faintly dolomitized medium-gray limestone with white veinlets, patches of white calcite; several 1/8-1 in. veinlets of CaF_2-Be with central core of beryllian (?) diaspore (?) inclined 35° to hole.
18.2	28.7	86	CaF_2-Be rock with local areas of light brownish carbonate and coarsely crystalline pink dolomite. Numerous veinlets of diaspore (?) (probably beryllian) generally inclined 30-40° to hole. Section gives good beryllium readings on detector.
28.7	29.1		Medium-gray dolomitic limestone.
29.1	29.8	88	Veinlet (inclined 20° to hole) of hard white beryllian diaspore with fluorite on walls. Diaspore reads "hot" on detector.
29.8	31.2		Faintly dolomitized medium-gray sparrite with 1/8 in. CaF_2-Be veinlet inclined 20° to hole.
31.2	33.0	95	CaF_2-Be rock along a veinlet nearly parallel to hole.
33.0	46.7	98	Light-gray to light-medium-gray faintly dolomitic limestone with white calcite patches and veinlets, and few hairline to 1/8 in. CaF_2-Be veinlets.
46.7	48.5	96	CaF_2-Be rock along veinlet inclined 20° to hole.

Camp Creek
DD Hole 105--Continued

Footage From	Footage To	Percent of core recovered	Core description
48.5	50.3	86	Same as 33.0-46.7.
50.3	51.3		CaF_2-Be rock on veinlet inclined 20° to hole.
51.3	53.3	95	Light-gray to medium-light-gray dolomitized limestone.
53.3	54.1	100	CaF_2-Be rock with banding inclined 30°± to hole.
54.1	64.5	86	Faintly dolomitic medium-gray limestone with local 1/16 in. veinlets CaF_2-Be and local veinlets white calcite.
64.5	67.8	71	CaF_2-Be rock, low grade, with abundant brownish carbonate (manganiferous?).
67.8	71.0	88	Light-gray to medium-gray dolomitic limestone.
71.0	73.0	100	CaF_2-Be rock of low (?) grade with abundant brownish carbonate.
73.0	79.1	82	Medium-gray faintly dolomitic limestone with white patches and veinlets of calcite.
79.1	81.1	100	Light-gray rudite with rounded clasts of limestone perhaps averaging 1/2 in.
81.1	86.8	95	Light-gray fine-grained limestone with white patches and veinlets of calcite.
86.8	99.0	33	Badly broken zone of mixed ore types with local brown carbonate, and local "pebbles" of limestone. Zone probably is mostly ore of low (?) grade. A distinct lithologic change indicates that the broken zone is a fault.
Fault?			
99.0	100.4	95	Thin-bedded argillaceous limestone, bleached; argillaceous zones are reddish-orange colored. Bedding 80° to hole.
100.4	102.0	33	Broken fragments of CaF_2-Be rock.
102.0	104.0	78	Thin-bedded argillaceous limestone with argillaceous bands stained red orange.
104.0	122.0	92	Medium-gray to medium-dark-gray argillaceous (and carbonaceous?) limestone, bedding inclined about 70° to hole.

Camp Creek
DD Hole 106 (U.S.B.M.)
Logged by C. L. Sainsbury
U.S. Geological Survey

Direction: N. 2° E.
Slope: -70°

Length: 157 feet

Footage From	Footage To	Percent of core recovered	Core description
0	14.0	20±	Overburden and broken bedrock of medium-gray fine-grained limestone with dark argillaceous and carbonaceous partings, sparse CaF_2-Be veinlets. Bedding perpendicular to hole.
14.0	15.0	67	Medium-gray limestone, broken and healed with white calcite. Sparse CaF_2-Be veinlets.
15.0	17.4		Broken limestone mostly replaced by "old-cream" colored CaF_2-Be rock.
17.4	22.0	84	Broken, rehealed dark carbonaceous limestone with numerous white calcite veinlets. A creamy CaF_2-Be veinlet at 19-19.2.
22.0	23.4	100	Principally CaF_2-Be rock.
23.4	25.5	98	Broken, recemented medium-gray limestone, a 1 in. veinlet of CaF_2-Be rock perpendicular to hole at 23.8.
25.5	26.1	98	Broken medium-gray limestone partially replaced by CaF_2-Be rock.
26.1	30.7	98	Broken, rehealed carbonaceous gray limestone with very few CaF_2-Be veinlets.
30.7	34.5	71	Principally CaF_2-Be rock with "old-cream" colored diaspore (?) veinlets.
34.5	37.2	88	Broken, rehealed medium-gray carbonaceous limestone, bedding about 70° to hole. A CaF_2-Be veinlet at 35.7-35.9.
37.2	41.0	100	Broken, rehealed thin-bedded carbonaceous limestone.
41.0	45.5	98	Dark carbonaceous limestone completely replaced by fine-grained CaF_2-Be and some sulfides.
45.5	47.7	86	Principally CaF_2-Be rock of reddish to "old-cream" coloration.
47.7	49.9	74	Broken, rehealed medium-gray limestone veined irregularly with CaF_2-Be veinlets.
49.9	53.6	79	Broken, rehealed medium-gray limestone approximately 50 percent replaced by CaF_2-Be rock along veinlets almost parallel to hole.
53.6	60.1	65	Broken, rehealed medium-gray limestone partly and irregularly replaced by CaF_2-Be veinlets.
60.1	65.5	62	Principally CaF_2-Be rock with local brownish carbonate.
65.5	68.5	77	Medium-gray limestone with argillaceous and carbonaceous bands colored reddish orange; few thin CaF_2-Be veinlets about 10° to hole, and local patches brownish carbonate.

Camp Creek
DD Hole 106--Continued

Footage From	Footage To	Percent of core recovered	Core description
68.5	70.3	94	Same, less CaF_2-Be rock.
70.3	71.3	94	Principally CaF_2-Be rock, but with some carbonate.
71.3	72.2	87	Red-stained medium-gray limestone, bedding perpendicular to hole.
72.2	78.6	69	CaF_2-Be rock along a veinlet trending parallel to hole, noticeable clay alteration.
78.6	89.0	89	Slightly bleached medium-gray limestone with argillaceous partings altered to red coloration, many thin (1/8 to 1 in.) veinlets of CaF_2-Be rock generally about 25° to hole.
89.0	90.0	98	Reddish-colored CaF_2-Be rock.
90.0	96.3	84	Medium-gray limestone with argillaceous bands stained red-orange, and few CaF_2-Be veinlets.
96.3	97.0	60	CaF_2-Be rock.
97.0	97.4	50	Limestone with bedding perpendicular to hole.
97.4	98.8	50	Core loss--principally CaF_2-Be rock on veinlet perpendicular to hole.
98.8	101.0	63	Medium-gray limestone with argillaceous bands stained red, very little CaF_2-Be rock.
101.0	104.5	80	Medium-gray limestone replaced along veinlets oriented about 35° to hole--possibly 50 percent of interval is CaF_2-Be rock.
104.5	107.5	60	Noticeable core loss. Remaining is medium-gray limestone with several 1/2 in. veinlets CaF_2-Be rock about 30° to hole.
107.5 Fault?	110.0	44	High core loss. Fault? Remaining core is medium-gray limestone with red-orange stained partings.
110.0	111.2	49	Core broken. Principally CaF_2-Be rock along veinlet with todorokite staining.
111.2	112.2(?)	42	Broken core. Argillaceous limestone with red-orange partings to slightly limonitic partings.
112.2(?)	116.4	57	Principally CaF_2-Be rock.
116.4	127.0	96	Medium-gray limestone with red-stained argillaceous partings containing a few 1/8-4 in. CaF_2-Be veinlets generally reddish, generally about 25° to hole. Bedding almost perpendicular to hole.
127.0	129.9	92	Sparsely veined, red-stained medium-gray limestone.
129.9	130.5	92	Banded pinkish CaF_2-Be rock.
130.5	148.0	70	Red-stained limestone, bedding perpendicular to hole, with local (and sparse) veinlets of CaF_2-Be rock.
148.0	152.1	80	Red-stained argillaceous limestone, about 40 percent replaced by pinkish CaF_2-Be rock.
152.1	157	73	Same as 130.5-148.

Camp Creek
DD Hole 107 (U.S.B.M.)
Logged by C. L. Sainsbury
U.S. Geological Survey

Slope: Vertical Length: 198 feet

Footage From	Footage To	Percent of core recovered	Core description
0	14.0	--	Mixed CaF_2-Be rock and limestone, ore badly stained by todorokite; fluorite noticeably coarse textured but generally flesh colored to white.
14	16.7	84	Broken limestone, partially replaced by coarser-grained fluorite, locally purplish, and containing beryllium, pyrite, and probably other sulfides. Bedding (?) 70° to hole.
16.7	19.0	95	Broken medium-gray limestone with many small white calcite veinlets.
19.0	19.7	95	Sulfide-bearing CaF_2-Be vein.
19.7	24.1	83	Same as 16.7-19.
24.1	25.2	50	CaF_2-Be rock along veinlet inclined about 5-7° to hole.
25.2	28.0	50	Bad core loss; consists of broken bleached partially kaolinized limestone with fluorite and low (?) beryllium.
Fault?			
28.0	28.6	90	Broken carbonaceous and argillaceous limestone with abundant white calcite veinlets.
28.6	32.0	90	Medium-gray limestone sparsely to completely replaced by CaF_2-Be rock containing sulfide minerals (sparse), muscovite, and todorokite.
32.0	35.2	96	Broken carbonaceous and argillaceous limestone cut by white calcite veinlets.
35.2	37.2	92	CaF_2-Be ore along a veinlet inclined about 20° to hole. Veinlet contains micaceous todorokite, fluorite, and mica; walls are granular CaF_2-Be rock.
37.2	37.6	50	Carbonaceous, argillaceous limestone, inclined 80° to hole, cut by calcite veins.
37.6	39.0	50	CaF_2-Be rock along veinlet.
39.0	42.0	57	Same as 37.2-37.6.
42.0	43.3	38	Mostly banded, granular CaF_2-Be rock with pyrite, probably other sulfides.
43.3	46.0	91	Thin-bedded carbonaceous limestone.
46.0	48.7	65	Fluoritized carbonaceous limestone with abundant pyrite and minor lead-gray sulfide. Fluorite locally purple.
48.7	52.1	100	Thin-bedded carbonaceous limestone with abundant minute pyrite cubes.
52.1	55.0	72	Broken, recemented carbonaceous limestone mostly replaced by CaF_2-Be(?) rock; abundant pyrite.

Camp Creek
DD Hole 107--Continued

Footage From	Footage To	Percent of core recovered	Core description
55.0	58.7	87	Thin-bedded carbonaceous limestone locally replaced by CaF_2-Be. Thin gypsum veinlet at 56.8, noticeable pyrite throughout.
58.7	60.6	98	Carbonaceous, argillaceous limestone altered so that argillaceous bands weather limonitic.
60.6	62.0	100	Fluoritized carbonaceous limestone, some pyrite.
62.0	63.0	98	Thin-bedded carbonaceous limestone weathers limonitic.
63.0	64.6	98	CaF_2-Be ore with noticeable sulfide minerals. Visible veinlets of creamy diaspore (?) inclined about 25-30° to hole.
64.6	65.7	98	Carbonaceous, argillaceous limestone; bedding inclined about 80° to hole.
65.7	68.1	98	CaF_2-Be rock of noticeable "old-cream" color. Veinlets inclined about 30° to hole.
68.1	70.8	98	Slightly stained argillaceous, carbonaceous limestone, bedding inclined about 70° to hole.
70.8	72.0	98	Broken carbonaceous, argillaceous limestone healed with white calcite. Some beryllium-bearing veinlets (faint count on beryllium detector).
72.0	74.2	100	Same, without detectable beryllium.
74.2	76.6	100	Principally the usual flesh to pinkish CaF_2-Be rock; veinlets inclined about 70° to hole. Assays .06 percent beryllium oxide.
76.6	78.0	99	Bleached limestone moderately replaced by calcite and CaF_2-Be rock.
78.0	80.7	98	Carbonaceous and argillaceous limestone with local CaF_2-Be veinlets 2 in. wide at 79 and 80.5.
80.7	82.2	98	Dark fine-grained sulfide-bearing fluorite rock (with beryllium?).
82.2	82.8	100	Carbonaceous limestone, broken and healed with calcite.
82.8	83.6	100	Broken limestone with several veinlets of mica, fluorite, and todorokite.
83.6	87.0	100	Faintly bleached carbonaceous limestone partially replaced by CaF_2-Be at 86.2-86.5.
87.0	88.7	94	Dark fine-grained sulfide-bearing CaF_2-Be rock; veinlets inclined 20-30° to hole.
88.7	91.5	94	Slightly broken thin-bedded carbonaceous limestone, bedding inclined about 75° to hole.
91.5	94.0	95	CaF_2-Be rock with some sulfides (sparse).
94.0	94.8	100	Carbonaceous limestone.
94.8	95.7	100	CaF_2-Be rock along a veinlet with 1 in. core of fluorite with specks of pyrite, galena (?), and stannite.
95.7	96.9	100	Carbonaceous limestone, bedding inclined 85-90° to hole.
96.9	97.2	100	CaF_2-Be rock along veinlet inclined about 30° to hole.

Camp Creek
DD Hole 107--Continued

Footage From	Footage To	Percent of core recovered	Core description
97.2	102.3	100	Thin-bedded carbonaceous limestone with local CaF_2-Be rock at 98-98.3, 99.1-99.5, 100.3-100.5.
102.3	103.6	100	CaF_2-Be rock along fluorite veinlets inclined about 30° to hole.
103.6	104.5	100	Slightly bleached carbonaceous limestone.
104.5	105.2	100	CaF_2-Be rock.
105.2	105.8	100	Bleached carbonaceous limestone.
105.8	107.3	100	CaF_2-Be rock, veinlet of creamy diaspore (?) inclined 30° to hole.
107.3	108.3	22	Slightly bleached limestone without closely spaced carbonaceous and argillaceous partings.
108.3	109.5	22	CaF_2-Be rock (.6 percent beryllium oxide by rough field assay).
109.5	123.3	84	Almost barren limestone consisting of 1/8 to 1/4 in. wavy carbonaceous bands and interbedded faintly olive gray limestone. Carbonaceous bands contain numerous pyrite cubes and irregular clots of pyrite and/or marcasite. A few 1/8-1/2 in. CaF_2-Be veinlets generally inclined about 35-40° to hole. Bedding almost perpendicular to hole.
123.3	130.0	97	Lithologic change to limestone with wavy carbonaceous and argillaceous partings comprising less than 15 percent of rock. Few veinlets 1/2-4 in. CaF_2-Be rock (at 123.3, 125.3, 126.5, 127.5, 127.9, 129.6) all inclined about 30° to hole.
130.0	136.2	91	Same lithology with increased red-staining and increase of CaF_2-Be rocks as follows: 130.5-131.0, 131.5-131.6, 132.8-133.5, 134.5-135.3, all generally along veinlet inclined about 35° to hole and all being the reddish CaF_2-Be rock.
136.2	138.8	60	Principally CaF_2-Be rock.
138.8	145.0	83	Red-stained argillaceous limestone with a few veinlets of reddish CaF_2-Be rock. Bedding inclined about 75° to hole.
145.0	151.5	70	Same lithology, noticeable increase in pinkish CaF_2-Be rock as follows: 145-145.5, 145.8-146.8, 147.2-148, all veins inclined 30-60° to hole.
151.5	152.6	87	Grayish- to creamy-colored CaF_2-Be rock with sulfides along veinlet inclined about 65-80° to hole.
152.6	162.0	59	Thin-bedded argillaceous, carbonaceous limestone with a distinct olive-gray color to carbonaceous films. Few minute fluorite veinlets.

Camp Creek
DD Hole 107--Continued

Footage From	Footage To	Percent of core recovered	Core description
162.0	168.5	93	Fault zone? Brecciated limestone partially dolomitized, then cut by white calcite veinlets (de-dolomitization), irregularly replaced by CaF_2-Be(?) rock.
Fault?			
168.5	172.0	80	Moderately fractured limestone with white calcite veinlets and few 1/2-4 in. veinlets of CaF_2-Be rock, as follows: 168.7-168.8, 170.1-170.2, 171.1-171.5.
172.0	185.0	59	Sheared light-gray to light-olive-gray limestone with dark argillaceous, carbonaceous bands with noticeable pyrite. Shearing has produced a talcose rock with polished shear surfaces on bedding.
185.0	186.0	0	Core loss.
186.0	187.2	83	Same type limestone as 172-185 with faint red staining.
187.2	188.0	75	Red-stained limestone with pinkish CaF_2-Be veinlet at 187.5-187.7 perpendicular to hole.
188.0	188.3	60	Red-stained limestone, some CaF_2-Be rock.
188.3	191.0	60	Pinkish CaF_2-Be rock, broken. 1 percent beryllium oxide by rough field determination.
191.0	192.4	86	Red-stained limestone.
192.4	192.8	100	Pinkish CaF_2-Be rock.
192.8	198.0	41	Broken core, considerable loss. Slightly bleached medium-gray limestone with broken pieces of CaF_2-Be rock.

Hole ends in ore zone.

Camp Creek
DD Hole 108 (U.S.B.M.)
Logged by C. L. Sainsbury
U.S. Geological Survey

Direction: N. 1°? W.
Slope: -70°

Length: 210 feet

Footage From	Footage To	Percent of core recovered	Core description
0	10.0	None	No core.
10.0	10.3	20	Partly marmarized medium-gray limestone cut by cream-colored CaF_2-Be rock along veinlet inclined about 20° to hole.
10.3	15.7	24	Poor core recovery in upper part, probably entirely CaF_2-Be rock generally pinkish to red brown.
15.7	18.0	73	Bleached medium-gray limestone irregularly replaced by CaF_2-Be rock of creamy color.
18.0	30.6	77	Relatively thick bedded medium-gray limestone cut by white calcite veinlets; few 1/16-1/2 in. veinlets of creamy CaF_2-Be rock generally inclined about 20° to hole. Bedding obscure but suggestion of bedding at high angles to core.
30.6	32.4	62	Noticeable core loss, probably all reddish CaF_2-Be rock along vein at about 20° to core.
32.4	36.5	88	Medium-gray limestone with several 1/8-2 in. veinlets CaF_2-Be rock generally inclined about 25° to hole.
36.5	42.0	75	Same, but with decrease in size of CaF_2-Be veinlets.
42.0	46.5	53	Same as 32.4-36.5, veinlets inclined 25° to hole.
46.5	69.7	95	Medium-gray limestone with few 1/8-1/2 in. veinlets CaF_2-Be rock, generally about 20° to core.
69.7	72.0	84	Reddish to brownish CaF_2-Be rock along a veinlet inclined about 15° to hole.
72.0	79.7	97	Sparsely veined medium-gray limestone, veinlets inclined about 25-30° to hole.
79.7	81.0	98	Pinkish CaF_2-Be rock along veinlet inclined about 25° to hole.
81.0	119.0	89	Sparsely veined medium-gray limestone cut by 1/8-2 in. veinlets of pinkish CaF_2-Be rock. Noticeably richer at 86.5-87, 88.9-90.6, 106-108. . At 83 ft bedding inclined about 55° to hole.
119.0	135.5	99	Same, with minor local variation in color of limestone and veinlets.
135.5	140.0	95	Noticeably greater amount of rehealed fractures with irregular replacement of "old-cream" colored CaF_2-Be rock.
140.0	148.0	94	Dark limestone veined by white calcite veinlets.
148.0	149.1	96	Principally "old-cream" colored CaF_2-Be rock.
149.1	162.0	94	Dark limestone with white calcite veinlets, very few CaF_2-Be veinlets.

Camp Creek
DD Hole 108--Continued

Footage From	Footage To	Percent of core recovered	Core description
162.0	166.5	86	Red-stained (originally dark) limestone with veinlets of CaF_2-Be rock.
166.5	170.5	86	Red-stained argillaceous limestone with perhaps 45 percent CaF_2-Be rock.
170.5	177.0	78	Red-stained thin-bedded argillaceous limestone, bedding generally inclined about 60° to hole.
177.0	180.3	49	Principally CaF_2-Be rock along veins inclined about 30-50° to hole.
180.3	182.2	90	Red-stained thin-bedded argillaceous limestone, bedding inclined about 65° to hole.
182.2	185.0	72	Principally CaF_2-Be rock along veins inclined 15-60° to hole.
185.0	191.7	70	Red-stained argillaceous limestone with veinlets of CaF_2-Be rock generally inclined less than 20° to core.
191.7	210.0	78	Thin-bedded argillaceous limestone, bedding inclined about 60° to hole. Red stained near ore end, staining gradually decreasing away from ore until at 205 argillaceous bands are principally dark gray.

Camp Creek
DD Hole 109 (U.S.B.M.)
Logged by C. L. Sainsbury
U.S. Geological Survey

Direction: North
Slope: -60°

Length: 190 feet

Footage From	Footage To	Percent of core recovered	Core description
0	20.0	0	Overburden.
20.0	25.0	26	Medium-gray argillaceous limestone broken and veined with white calcite. Bedding about 25° to hole.
25.0	30.0	6	Same, more white calcite.
30.0	34.0	34	Fluoritized, pyritized very fine-grained rhyolite dike.
34.0	41.5	52	Broken limestone-bearing CaF_2-Be rock with noticeable brown carbonate.
41.5	45.0	82	Faintly bleached medium-gray limestone with few CaF_2-Be veinlets inclined about 30° to hole (one 2 in. at 42.7).
45.0	46.0	85	Reddish to brownish CaF_2-Be rock along a vein 20° to hole.
46.0	49.9	98	Bleached, red-stained argillaceous limestone with a few 1/4-1/2 in. CaF_2-Be veinlets inclined 20° to hole.
49.9	52.3	76	Reddish to brownish CaF_2-Be rock along a veinlet inclined about 20° to hole.
52.3	57.8	74	Thin-bedded argillaceous limestone with local 1/2 in. CaF_2-Be veinlet at 53 inclined 20° to hole. Bedding inclined about 80° to hole.
57.8	58.7	77	CaF_2-Be rock with creamy color.
58.7	60.2	78	Argillaceous limestone.
60.2	61.3	87	Principally CaF_2-Be rock along a narrow veinlet inclined about 20° to hole.
61.3	63.6	87	Faintly bleached argillaceous limestone.
63.6	64.0	86	CaF_2-Be rock along a vein inclined about 20° to hole.
64.0	67.9	86	Thin-bedded argillaceous limestone, bedding inclined about 60° to hole.
67.9	69.7	85	Principally CaF_2-Be rock, but probably a narrow veinlet inclined to hole about 15-20°.
69.7	72.0	85	Medium-gray limestone with white calcite.
72.0	77.2	64	CaF_2-Be rock along a vein inclined about 20° to hole.
77.2	80.8	81	Thin-bedded argillaceous limestone with red-stained argillaceous layers.
80.8	82.6	81	CaF_2-Be rock with walls containing noticeable dark carbonate.
82.6	91.3	85	Thin-bedded argillaceous limestone with argillaceous bands stained red.
91.3	94.0	82	Reddish CaF_2-Be rock along a veinlet inclined about 25-35° to hole.

Camp Creek
DD Hole 109--Continued

Footage From	Footage To	Percent of core recovered	Core description
94.0	102.0	76	Bleached medium-gray limestone with several sections of CaF_2-Be rock up to 4 in. along veinlets at low angles to hole.
102.0	111.4	66	Thin-bedded argillaceous limestone with regular argillaceous bands stained reddish. Few small broken sections CaF_2-Be rock.
111.4	112.8	84	Medium-gray limestone, locally replaced irregularly by patches of CaF_2-Be rock.
112.8	124.2	94	Principally CaF_2-Be rock, partly along veinlets nearly parallel to hole, partly crossed by banding almost perpendicular to hole. Beryllium content shown as particularly good by the beryllium detector.
124.2	127.7	96	Mostly red-gray limestone with a few argillaceous partings and a persistent veinlet 1/8 in. wide trending parallel to hole.
127.7	129.7	91	Thin-bedded argillaceous limestone; bedding inclined about 60° to hole.
129.7	140.0	91	Medium-gray limestone, less argillaceous than 127.7-129.7, with local CaF_2-Be rock at 129.7-129.9, 130.5-130.8, and with a few thin veinlets inclined about 30° to hole.
140.0	141.1	98	Regularly bedded (thin) argillaceous limestone with argillaceous bands stained limonitic to reddish.
141.1	141.8	98	CaF_2-Be rock (with substantial amount of dark carbonate) along veinlet with a center of fluorite and mica 3/8 in. thick inclined 20° to hole.
141.8	144.0	98	Same as 140-141.1.
144.0	145.2	97	Principally CaF_2-Be rock.
145.2	154.3	91	Argillaceous limestone with bedding inclined about 80° to hole, and with veinlets of CaF_2-Be rock as much as 1 in. wide inclined at high angles to hole.
154.3	156.4	95	Principally CaF_2-Be rock replacing argillaceous limestone.
156.4	161.0	85	Regularly thin-bedded argillaceous limestone.
161.0	162.6	86	Approximately 50 percent of CaF_2-Be rock on three veinlets about 40° to hole.
162.6	166.0	88	Medium-gray limestone with a few argillaceous partings, veined locally with white calcite.
166.0	167.9	70	Intergrown brownish carbonate and CaF_2-Be rock along a vein with central core of purple fluorite, mica, and todorokite.

Camp Creek
DD Hole 109--Continued

Footage From	Footage To	Percent of core recovered	Core description
167.9	178.0	55	Broken zone with core loss. Medium-gray limestone, locally argillaceous with numerous small veinlets (to 1 in.), probably aggregating 15-20 percent of interval.
178.0	190.0	62	Principally regularly banded argillaceous limestone locally badly broken, stained red to limonitic, becoming gray at the end of hole. Few intervals to as much as 4 in. of broken CaF_2-Be rock. Bedding generally inclined about 60° to hole, but at end hole enters penecontemporaneously deformed area.

Note: Scanning by mobile beryllium detector indicates that all mineralized sections marked such contain beryllium.

Camp Creek
DD Hole 110 (U.S.B.M.)
Logged by C. L. Sainsbury
U.S. Geological Survey

Direction: North
Slope: -60°

Length: 150 feet

Footage From	Footage To	Percent of core recovered	Core description
0	5.0	0	Overburden, no core.
5.0	10.0	25	Broken bedrock of fractured , rehealed dark limestone.
10.0	12.5	72	Broken medium-gray limestone, partly recrystallized to marble.
12.5	13.8	56	CaF_2-Be rock along a vein (with a center of fluorite-mica-todorokite) inclined about 30° to hole.
13.8	17.0	56	Fine-grained medium-gray to olive-gray limestone with noticeable pyrite.
17.0	22.0	94	Thin-bedded (regular) argillaceous limestone inclined 35° to hole a mica-fluorite veinlet 1 in. thick at 17.6, with noticeable sulfides on walls, inclined 20° to hole (almost perpendicular to bedding).
22.0	24.0	84	CaF_2-Be rock.
24.0	30.9	85	Thin-bedded (irregular bedding) argillaceous limestone; bedding inclined about 50° to hole, 1/2 in. veinlets CaF_2-Be rock.
30.9	33.0	73	Principally CaF_2-Be rock.
33.0	57.4	92	Medium-gray to light-olive-gray argillaceous limestone, locally partly dolomitized and with a few 1/2-1 in. CaF_2-Be veinlets inclined about 25° to hole. Principally regular bedded.
57.4	64.2	100	Medium-gray argillaceous (irregular bedding) limestone, bedding inclined about 60° to hole.
64.2	72.2	98	Same limestone as 57.4-64.2, but with several 2-5 in. veinlets CaF_2-Be rock.
72.2	73.8	98	CaF_2-Be rock ("old cream" color).
73.8	80.1	97	Argillaceous limestone (irregular bedding) with approximately 20 percent CaF_2-Be rock ("old cream" colored).
80.1	90.6	97	Medium-gray argillaceous limestone (irregular bedding) with a few 1/4-3/8 in. veinlets of CaF_2-Be inclined about 30° to hole.
90.6	94.0	98	Principally CaF_2-Be rock replacing medium-gray argillaceous limestone along veinlets trending almost parallel to hole.
94.0	104.4	98	Medium-gray sparrite (crystalline limestone) with a few veinlets CaF_2-Be rock 1/8-1 in. inclined about 15° to hole.

Camp Creek
DD Hole 110--Continued

Footage From	To	Percent of core recovered	Core description
104.4	105.5	68	Broken zone with core loss and pieces of definite tectonic breccia and abrupt lithologic change indicate fault.
Fault?			
105.5	150.0	84	Medium-gray argillaceous limestone (regular bedded), practically unmineralized, with bedding inclined about 30° to hole.

Note: Hole probably failed to reach down-dip extension of surface zone of richer float, which is associated with fractures on the fault, and rhyolite dikes.

Camp Creek
DD Hole 111 (U.S.B.M.)
Logged by C. L. Sainsbury
U.S. Geological Survey

Direction: S. 2° W.
Slope: -40°

Length: 207 feet

Footage From	Footage To	Percent of core recovered	Core description
0	10	0	Overburden.
10	14.8	34	Broken, rehealed medium-gray limestone with irregular red argillaceous "clots."
14.8	15.0	34	CaF_2-Be rock.
15.0	20.0	22	Poor core recovery, red staining associated with fractures parallel to hole.
20.0	26.1	69	Argillaceous limestone (regular bedding) with argillaceous layers stained red to yellowish-orange, and inclined about 25° to hole. A section of CaF_2-Be rock at 22.7-23.2.
26.1	26.6	88	Sulfide-bearing CaF_2-Be rock.
26.6	32.2	81	Argillaceous limestone (irregular bedding), with recrystallized white calcite patches and veins.
32.2	33.1	70	CaF_2-Be rock.
33.1	35.7	70	Same as 26.6-32.2.
35.7	40.0	68	About 70 percent CaF_2-Be rock replacing recrystallized limestone.
40.0	41.1	82	Broken, recemented argillaceous limestone.
41.1	41.9	82	CaF_2-Be rock.
41.9	48.0	80	Medium-gray limestone locally marbleized.
48.0	50.0	78	Broken, rehealed medium-gray limestone with one 1 in. thick fluorite-sulfide veinlet inclined 20° to hole and two such veinlets inclined 70° to hole.
50.0	55.0	66	Broken distorted argillaceous limestone rehealed with white calcite, kaolinized and red stained at 54-55.0; two fluorite-sulfide veinlets 1/2 in. thick.
55.0	60.0	48	Broken red-stained argillaceous limestone approximately 30 percent replaced (in bands) by fluorite-beryllium rock.
60.0	69.1	100	Broken medium-gray limestone cut by irregular veinlets of white calcite.
69.1	69.6	100	CaF_2-Be rock.
69.6	75.5	97	Same as 62-69.1, with a 2 in. CaF_2-Be veinlet at 74 inclined about 60° to hole.
75.5	75.9	94	CaF_2-Be rock.
75.9	98.0	95	Medium-gray limestone cut by white calcite veinlets and by CaF_2-Be veinlets as thick as 5 in., which are inclined about 60° to hole, and which aggregate about 10 percent of section.
98.0	101.8	100	Medium-gray argillaceous limestone (irregular bedding) with 4 in. of CaF_2-Be rock at 99.2-99.6, and at 101.2-101.6, plus few 1/4 in. veinlets, all inclined about 60° to hole.

Camp Creek
DD Hole 111--Continued

Footage From	Footage To	Percent of core recovered	Core description
101.8	124.3	96	Medium-gray argillaceous limestone (irregular bedding) inclined about 50° to hole, several 1-2 in. veinlets of CaF_2-Be rock inclined about 70° to hole probably aggregating less than 2 percent of core.
124.3	125.4	98	Principally pinkish CaF_2-Be rock.
125.4	128.4	98	Medium-gray argillaceous limestone (irregular bedding) with three CaF_2-Be veinlets 2 in. thick inclined about 55° to hole.
128.4	129.1	100	Principally CaF_2-Be ore.
129.1	157.0	91	Same as 125.4-128.4.
157.0	161.0	95	Medium-gray argillaceous limestone (moderately regular bedding), free of fluorite veinlets. Bedding inclined about 30° to hole.
161.0	173.8	95	Medium-gray argillaceous limestone (moderately regular bedding) with several 1-3 in. CaF_2-Be veinlets inclined about 70° to hole.
173.8	178.0	90	Broken medium-gray argillaceous limestone replaced approximately 50 percent by CaF_2-Be (?) rock.
178.0	184.0	87	Medium-gray argillaceous limestone (regular bedding) with bedding inclined about 25° to hole, very few 1/4-1/2 in. veinlets of mica + fluorite inclined about 80° to hole.
184.0	190.0	78	Medium-gray argillaceous limestone, red argillaceous layers inclined to hole at progressively lower angles, cut by a few 1/2-1 in. veinlets CaF_2-Be rock.
190.0	192.5	64	Red-stained argillaceous limestone replaced about 40 percent by CaF_2-Be rock.
192.5	196.0	73	Faintly red stained argillaceous limestone with very minor CaF_2-Be rock.
196.0	202.6	89	Red-stained argillaceous limestone with irregular replacement by CaF_2-Be(?) rock along joints. Approximately 10 percent replaced.
202.6	207.0	98	Medium-gray, argillaceous limestone (irregular bedding) with bedding inclined about 35° to hole. A 3 in. veinlet of CaF_2-Be rock at 205.7-206.

Camp Creek
DD Hole 112 (U.S.B.M.)
Logged by C. L. Sainsbury
U.S. Geological Survey

Direction: S. 2° W.
Slope: -60°

Length: 170 feet

Footage From	Footage To	Percent of core recovered	Core description
0	10.0	0	No core, overburden.
10.0	11.0	44	Broken iron-stained limestone.
11.0	15.0	44	Principally iron-stained fluoritized limestone with manganese staining and with noticeable brown carbonate.
15.0	17.5	57	Broken red-stained limestone with minute CaF_2-Be veinlets.
17.5	31.0	71	Broken stained CaF_2-Be rock and red-stained limestone (about 30 percent fluorite rock).
31.0	42.0	64	Principally iron-stained CaF_2-Be rock, with local clay alteration.
42.0	43.5	100	Regular-bedded argillaceous limestone with argillaceous red-stained bands--no ore veinlets.
43.5	44.1	100	CaF_2-Be rock.
44.1	45.2	98	Faintly dolomitized medium-gray limestone with minor CaF_2-Be veinlets.
45.2	49.8	93	Medium-gray argillaceous limestone (irregular bedding) veined with white calcite, local yellow to red argillaceous bands.
49.8	50.5	93	Banded CaF_2-Be rock on a vein almost perpendicular to hole.
50.5	68.5	98	Faintly bleached argillaceous limestone, argillaceous bands stained red to orange. Banded CaF_2-Be rock at 52.8-53.1; at 56.3-56.7; at 60.3-61.0; at 62.4-63.0; at 65.5-66.2. Smaller fluorite-veinlets sporadic.
68.5	76.1	77	Principally CaF_2-Be rock with abundant brown carbonate, and with local vugs lined with white calcite (?), local white calcite veinlets cut ore (late calcite).
76.1	85.0	86	Bleached medium-gray argillaceous limestone with argillaceous bands stained reddish to orange; CaF_2-Be rock at 81-81.5; at 83.3-83.7 on veins inclined about 50° to hole.
85.0	93.0	65	Red-stained argillaceous (regular bedding) limestone, locally kaolinized, cut by 1/4-1/2 in. mica-fluorite veinlets inclined about 45° to hole.
93.0	103.6	84	Medium-gray limestone, few argillaceous partings which are stained red-orange, and CaF_2-Be rock at 97.4-97.8, plus several 1/4-1/2 in. veinlets inclined about 30° to hole.

Camp Creek
DD Hole 112--Continued

Footage From	Footage To	Percent of core recovered	Core description
103.6	104.7	82	CaF_2-Be rock.
104.7	105.5	82	Same as 93-103.6 limestone, no fluorite.
106.0	133.0	71	Medium-gray, sparsely argillaceous limestone with a few 1/4-3 in. veinlets CaF_2-Be rock aggregating less than 10 percent of core.
133.0	138.8	69	Similar to 106-113 with increase in red-stained argillaceous layers and decrease in number and thickness of CaF_2-Be veinlets.
138.8	139.3	57	CaF_2-Be veinlet.
139.3	148.2	68	Regular-bedded argillaceous limestone with red-stained argillaceous bands inclined about 65° to hole; very few 1/4-1/2 in. CaF_2-Be veinlets inclined about 65° to hole.
148.2	148.9	75	Mostly CaF_2-Be rock.
148.9	158.0	51	Same as 139.3-148.2 with decreasing red staining and fewer veinlets.
158.0	170.0	87	Argillaceous limestone (regular bedding), mostly gray, but with local red staining associated with minor fluorite veinlets at 162, 165, and 169.9.

Camp Creek
DD Hole 113 (U.S.B.M.)
Logged by C. L. Sainsbury
U.S. Geological Survey

Direction: North
Slope: -70°

Length: 85 feet

Footage From	Footage To	Percent of core recovered	Core description
0	10.0	15	Overburden, few sections of core.
10.0	15.0	20	Broken bedrock, almost entirely flesh-colored CaF_2-Be rock.
15.0	36.0	51	Principally CaF_2-Be rock, local dark carbonate; some sparsely mineralized light-gray dolomite at 23.8-24.5 feet.
36.0	40.0	100	Moderately argillaceous limestone, faint red-orange staining to argillaceous bands; local CaF_2-Be rock in veinlets to 3 in. inclined about 20° to hole.
40.0	44.0	97	Sparry limestone, faint reddish coloration to argillaceous bands; cut by local CaF_2-Be veinlets as much as 1/4 in. thick.
44.0	45.5	88	Principally CaF_2-Be rock.
45.5	48.0	88	Same as 40-44.
48.0	52.1	85	Mostly CaF_2-Be rock, with a barren section at 48.8-49.
52.1	53.7	100	Fractured dolomitized limestone with 2 in. of CaF_2-Be in central part.
53.7	55.7	100	Broken sparry limestone partly dolomitized and replaced (approximately 40 percent) by CaF_2-Be rock along veinlets inclined about 60° to hole.
55.7	59.0	88	Broken reddish stained faintly argillaceous limestone.
59.0	70.0	53	Argillaceous limestone, almost barren, with argillaceous red-stained partings inclined about 65° to hole.
70.0	85.0	58	Argillaceous limestone, locally broken and red stained, practically no staining or veinlets toward end of hole. Bedding at 80 about 75° to hole.

Lost River valley

Geology

Ore deposits at the Bessie-Maple prospect in the Lost River valley are localized along the Rapid River fault, principally where the fault is intruded by dark dikes having the chemical composition of lamprophyres. At the west end, the tin prospect known as the Bessie-Maple prospect contains abundant sulfide minerals, including stannite, galena, ferroan sphalerite, pyrite, and arsenopyrite, and lies along an altered dike believed to have been rhyolite originally. On both walls of the tin zone, fluorite-beryllium rock replaces the surrounding limestone along fractures and joints, and forms a wide zone of low-grade mineralized rock.

Southeast of the tin prospect, several dark dikes and a small pluton pierce the Rapid River fault and intrude the upper plate rocks--shales, dolomite, and dark dolomitic limestones of latest Early Ordovician age, which are cut off to the west along the Bessie fault. Three diamond drill holes by the Bureau of Mines tested the richer fluorite-beryllium rock exposed on the surface near the dikes, and a cross section through the Rapid River fault is drawn on the basis of information from their logs (see section A-A'). In these holes (114, 115, 116) fluorite-beryllium rock forms solid zones several feet wide alongside a zone of sulfide minerals, including stannite, galena, and stibnite (?) or a sulfosalt, and a wider zone of lower grade ore. Thus, at the Bessie-Maple prospect, a strong zonation perpendicular to the tin-bearing lodes is indicated.

At the Grothe-Pearson prospect, east of the alluvium in Lost River valley, fluorite-beryllium rock occurs along the walls of altered lamprophyre dikes that intrude the upper plate of the Rapid River fault. Trenches expose both altered dikes that contain beryllium and veins and veinlets of fluorite-beryllium rock in altered limestone. The exposures, as well as the energies of the mappers and time available to them, were not sufficient to outline in detail all the dikes or float runs of fluorite-beryllium rock. In the eastern trench a flat-lying blanket of spongy "limonite" is exposed locally and may indicate that sulfide minerals above have been leached and oxidized and that the resulting iron hydroxide was deposited at the top of the permafrost zone. Hence, it is not unlikely that deep drilling may disclose a mass of marmarized limestone cut by mineralized veinlets containing minerals similar to those in veinlets in mineralized limestone at the Lost River mine.

At the east end of the mapped part of the Rapid River fault, float of fluorite-beryllium rock occurs in an area where dark dikes cut the fault. Farther east, a great number of boulders of iron-stained silicified limestone lie scattered over the ground surface and indicate that the underlying limestone is veined to some degree by silica-bearing veins or veinlets that also contain sulfide minerals. The significance of this type of mineralization in terms of the potential for tin and beryllium is not known.

Summary

All the beryllium deposits discussed herein are localized along the Rapid River fault. The Rapid River fault continues west for several miles, where, in the valley of Rapid River some 3 miles westward, other deposits of fluorite-beryllium rock are known (see Circular 479, referred to previously). Hence, over a distance of almost 8 miles, the Rapid River fault has been proved favorable for ore, and ore deposits on the public domain were found by the Geological Survey during 1964 along the fault in the area between the Bessie-Maple prospect and the deposits in the valley of Rapid River. Companies and individuals who are interested in the area should carefully prospect the Rapid River fault. Throughout its length between Rapid River and the Bessie-Maple prospect, the fault dips south and marks the contact between thin-bedded argillaceous limestone that weathers yellowish red and a thicker bedded gray limestone on the south that weathers gray and forms gray slopes.

Logs of drill holes

Bessie and Maple
DD Hole 114 (U.S.B.M.)
Logged by C. L. Sainsbury
U.S. Geological Survey

Direction: N. 10° W.
Slope: -60°

Length: 152 feet

Footage From	Footage To	Percent of core recovered	Core description
0	15.0	10	Broken overburden, dark-gray dolomite.
15.0	48.5	68	Medium-gray dolomite with 1/16-1/4 in. carbonaceous bands inclined about 65° to hole. Numerous small patches and veinlets of white dolomite. At 27.2 and at 31.1 a 1/4 in. veinlet of diaspore (?) and fluorite, respectively, inclined about 45° to hole and almost perpendicular to bedding.
48.5	50.0	47	Core loss corresponds to change to black dolomite and shaly fragments.
50.0	58.5	92	Medium-gray dolomite with white dolomite and calcite veinlets, and an occasional 1/16 in. veinlet of fluorite. Most core contains minute cubes of pyrite.
58.5	69.3	75	Medium-gray dolomite, locally broken and containing limonite in broken areas. Pyrite locally noticeable.
69.3	72.0	37	Medium-gray dolomite with 1/8-1 in. veinlets of fluorite-diaspore (?) rock.
72.0	78.1	70	Medium-gray dolomite approximately 60 percent replaced by CaF_2-Be rock along fractures inclined about 35-40° to hole.
78.1	83.4	44	Medium-gray dolomite noticeably broken and replaced by CaF_2-Be rock along small fractures 1/16-1/4 in. wide.
83.4	107.0	38	Medium-dark-gray dolomite substantially replaced by white fluorite, and containing numerous pyrite crystals as well as an occasional crystal of stibnite (?) or sulfosalt.
107.0	112.2	48	Noticeable increase of fluorite, which is in places colored purple, and of sulfides, including stibnite (?).
112.2	122.0	57	Principally faintly to noticeably purple fluorite and sulfide rock; sulfides include pyrite, galena, stannite, and stibnite (?) or sulfosalt. Sulfides occur in solid masses as thick as 6 in., and are fractured and cut by fluorite. Some purple fluorite contains pyrite. Beryllium content almost nil. Few vugs, which are coated with 1/32 in. cubes of tawny fluorite.

Bessie and Maple
DD Hole 114--Continued

Footage From	Footage To	Percent of core recovered	Core description
122.0	131.0	10	Broken zone with high core loss. Recovered core fragments are mostly white to purple fluorite with few specks pyrite locally--low beryllium content.
131.0	152.0	35	Gray-black shale and shaly limestone cut by 1/16-1/2 in. veinlets of green to tawny muscovite and fluorite; low beryllium.

Bessie and Maple
DD Hole 115 (U.S.B.M.)
Logged by C. L. Sainsbury
U.S. Geological Survey

Direction: N. 10° W.
Slope: -45°

Length: 85 feet

Footage From	Footage To	Percent of core recovered	Core description
0	16.0	0	Broken overburden.
16.0	17.0	50	Medium-dark-gray dolomite with white dolomite veinlets and patches.
17.0	21.0	48	CaF_2-Be rock, iron-stained on fractures.
21.0	29.0	48	Mixed CaF_2-Be rock and subordinate medium-dark-gray dolomite.
29.0	32.3	57	Broken medium-dark-gray limestone with few creamy CaF_2-Be veinlets and specks of stannite, becoming quite noticeable at 32.
32.3	33.0	93	Dark-gray dolomite partly to completely replaced by sulfide minerals, including pyrite, arsenopyrite, stannite, and some wolframite (?).
33.0	46.0	61	Medium-dark-gray dolomite fractured and rehealed with white dolomite veinlets and patches; a few 1/2-1 in. CaF_2-Be veinlets between 33 and 37.
46.0	50.0	25	Altered olive-green feldspar porphyry dike rock (lamprophyre?) and hydrothermal (?) clay at 50.
50.0	53.0	0	Core loss.
53.0	55.0	25	Broken, fluoritized dark dolomite and dike rock, with fine specks of sulfides.
55.0	57.5	20	Medium-gray dolomite replaced by fluorite (locally purple color) and with noticeable sulfide. Local kaolinite (?) veinlets.
57.5	64.0	31	Principally CaF_2-Be rock, iron-stained on fractures.
64.0	68.0	65	Altered olive-green to brown dike rock (lamprophyre?) with strong iron-stained clay alteration 67.5-68, contains beryllium.
68.0	75.0	57	Principally white to cream CaF_2-Be rock.
75.0	75.5	60	Broken medium-dark-gray dolomite with white dolomite veinlets, and with few CaF_2-Be fragments.
75.5	79.0	0	Core loss (fault zone?).
Fault?			
79.0	85.0	34	Gray-black shale and shaly limestone cut by 1/4 in. veinlets of calcite, fluorite, and muscovite.

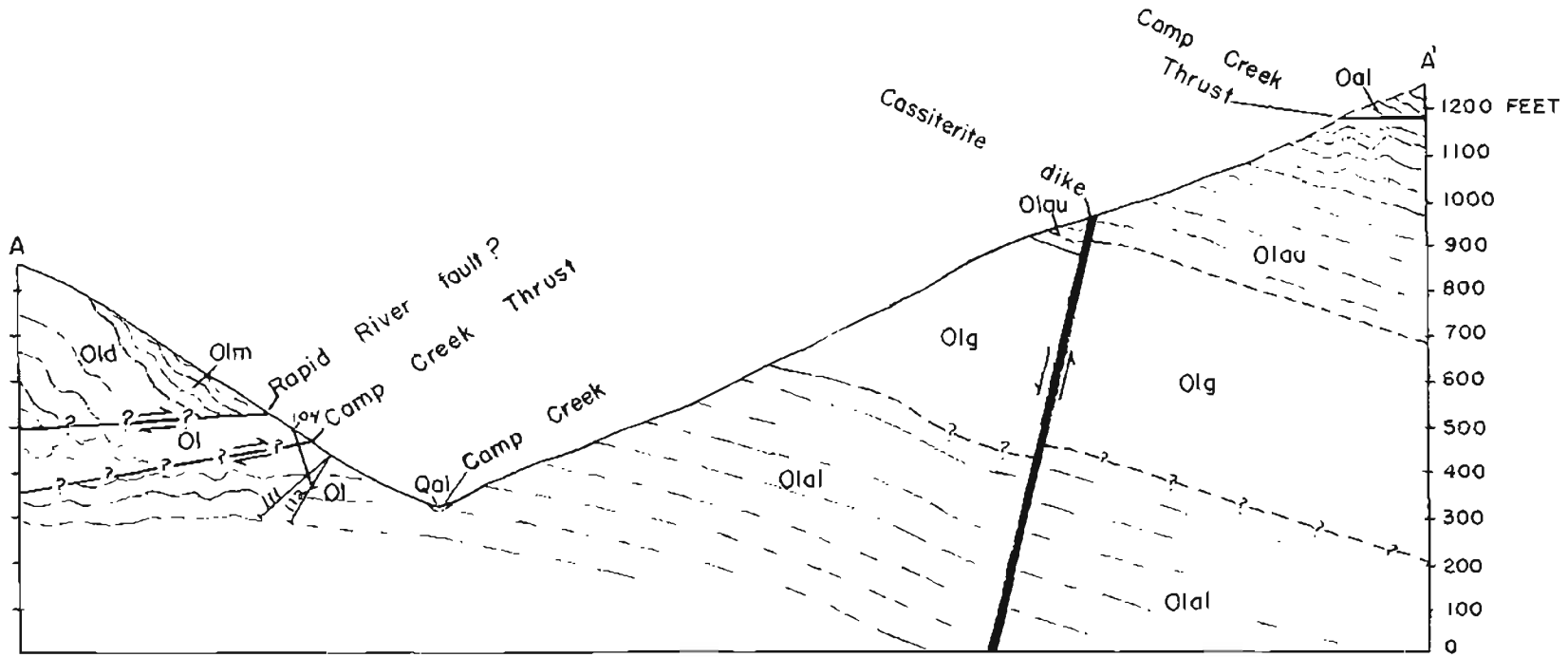
Note: Scanning with field beryllium detector shows that all CaF_2-Be rock contains appreciable beryllium (comparable to that on Camp Creek).

Bessie and Maple
DD Hole 116 (U.S.B.M.)
Logged by C. L. Sainsbury
U.S. Geological Survey

Direction: N. 10° W.
Slope: -40°

Length: 162 feet

From	To	Percent of core recovered	Core description
0	16.0	10	Overburden.
16.0	18.0	25	Medium-dark-gray granular dolomite with calcite and dolomite in fractures.
18.0	51.6	28	Black carbonaceous shaly limestone, with limy shale partings locally, and cut by hairline to 1/2 in. calcite-filled fractures.
51.6	107.6	26	Same, but with noticeable increase in shale.
107.6	117.6	57	Gray-green amygdaloidal dike with calcite amygdules, from 109.6-113, partly kaolinized and stained reddish brown, marcasite (?) on fracture facings.
117.6	117.8	40	Black clay gouge (fault) and lithologic change indicate
Fault?			Rapid River fault.
117.8	120.0	13	Practically no core recovered--fragments recovered are CaF_2-Be rock.
120.0	122.0	0	No recovery.
122.0	124.0	20	Poor recovery--recovered fragments consist of iron-stained limestone with veinlets of pyrite and galena.
124.0	162.0	68	Limestone mylonite with shear lines at about 60° to hole (partly replaced by fluorite throughout?) with distinct CaF_2-Be veinlet at 140.3 along hole. Fluorite (?) lost at area 134-137.5. Minute amount of sulfide mineral throughout areas where dark streaks are most noticeable along with a black opaque mineral that may be graphite. Along shear surfaces a brittle acicular mineral (calcium-magnesium silicate group) has formed and almost resembles wood. At 160.2, bedding can be seen, and is highly contorted.



CROSS SECTION ALONG A-A'

0 400 800 FEET