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DIAMOND-DRILL SAMPLING DATA, FLUORITE-BERYLLIUM DEPOSITS, LOST RIVER VALLEY, SEWARD PENINSULA, ALASKA, 1964

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with a section on petrography by Walter L. Gnagy
and a section on laboratory concentration tests
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* open-file report

UNITED STATES DEPARTMENT OF THE INTERIOR
Stewart L. Udall, Secretary

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DIAMOND-DRILL SAMPLING DATA, FLUORITE-BERYLLIUM DEPOSITS, LOST RIVER VALLEY, SEWARD PENINSULA, ALASKA, 1964

by

John J. Mulligan1/

ABSTRACT

The Bureau of Mines in 1964 drilled 16 diamond-core-drill holes totaling 2,554 feet to sample typical fluorite-beryllium deposits of the Lost River valley, Seward Peninsula, Alaska. The principal beryllium mineral associated with the fluorite is chrysoberyl which has not been a source of beryllium. The objective of this drilling program was to estimate if the grade and extent of the deposits justifies metallurgical research to determine if marketable beryllium and fluorite can be produced.

This preliminary report describes the drilling, sampling, and analytical procedures. Detailed results of sample analyses made to date are tabulated, and results of some preliminary metallurgical tests are included. The analytical data have not been evaluated and work on these samples is continuing. Results of evaluation and additional tests will be presented in succeeding reports.

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Work on manuscript completed May 1965.

The Bureau of Mines drilled 10 diamond-core-drill holes totaling 2,554 feet in the Lost River valley, Seward Peninsula, Alaska (fig. 1), during July and August 1954. The drilling was part of a continuing investigation of the fluorite-beryllium resources of the Lost River area being carried on in cooperation with the U.S. Geological Survey. Previous work had shown that large fluorite-beryllium deposits occur in the Lost River valley and that the principal beryllium mineral is chrysoberyl. Beryllium never has been produced from deposits of this type; preliminary metallurgical tests indicate that extensive research will be required to determine if recovery is feasible. The diamond-drill sampling program was designed to indicate whether the size and grade of the deposits justify the necessary metallurgical research.

This report describes the drilling program, the sampling procedures, and the methods of analyses. The analytical data are tabulated in detail. It must be emphasized that these raw data that have not been evaluated. Analytical procedures had to be devised as needed. Additional study of sampling results may indicate the need for additional analyses or revision of the analytical data. Such studies are being carried on and results will be included in succeeding reports.

Geologic maps of the area and geologic logs of the drill core are in a U.S. Geological Survey open-file report entitled "Plane Table Maps and Drill Logs of Fluorite and Beryllium Deposits, Lost River Area, Alaska" by C. L. Sainsbury.

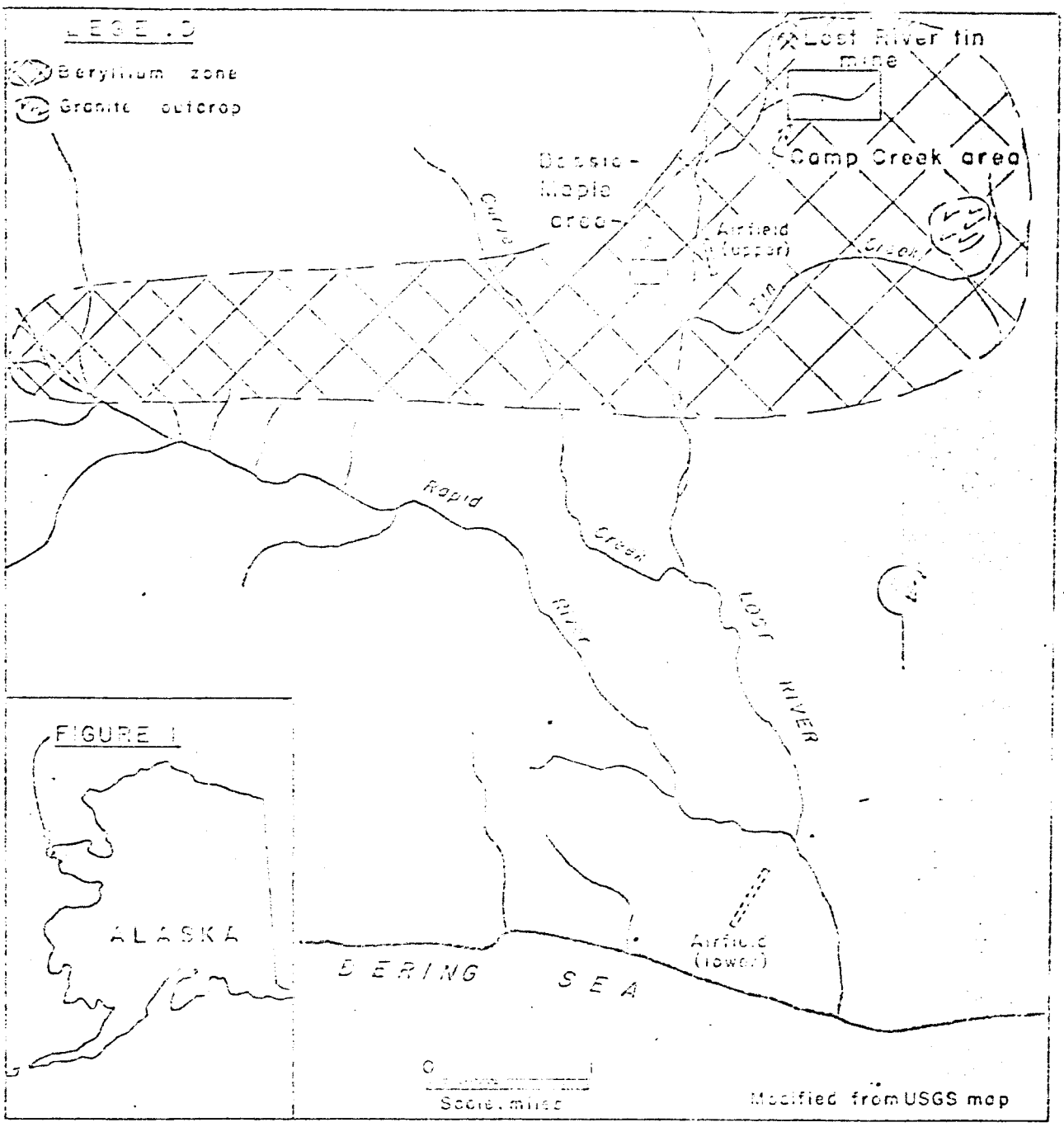

FIGURE 1.- Probable Extent of Zone in which Beryllium Minerals Occur, Lost River Valley, Seward Peninsula, Alaska.

ACKNOWLEDGMENTS

The investigation of the western Seward Peninsula fluorite-beryllium deposits has been administered and coordinated by the Bureau of Mines Area VIII Mineral Resource Office, Juneau, Alaska. Metallurgical research is carried on at the Salt Lake City Metallurgy Research Center, Salt Lake City, Utah.

The diamond drilling described in this report was done in cooperation with the U.S. Geological Survey. Drill hole locations were selected by the Bureau engineer based on recommendations by the U.S. Geological Survey. The drilling was done by contract drillers. The Bureau engineer and samplers collected the core and sludge samples and kept the drilling records. The Survey geologists mapped the area, including the drill holes, made geological logs, and estimated the grade as the work progressed. Samples were later analyzed at the Bureau of Mines laboratory at Juneau, Alaska.

The project required the continued active cooperation and assistance of C. L. Sainsbury, U.S. Geological Survey geologist, and his assistants, Donald Peters and James Kelly. Their cooperation is gratefully acknowledged.

Many others also contributed. The owners of the Lost River tin mine, Mr. L. J. Grothe and Mr. C. T. Pearson, furnished housing and some equipment. Mr. W. M. Burand, Mining Engineer, Alaska Division of Mines and Minerals, assisted the Bureau engineer in collecting the original metallurgical samples. Mrs. Helen Blodgett of Teller and the Air Force Communications Service (ACS) personnel of Nome maintained radiotelephone communications which were essential to the day-to-day operation of the project.

LOCATION AND ACCESSIBILITY

The Lost River valley (latitude 65°27' N, longitude 167°11' W) is about 80 miles N 37° W of Nome, and 30 miles from the western tip of the Seward Peninsula, Alaska (fig. 1). The nearest permanently inhabited villages are Teller and Teller Mission about 25 miles to the east and Wales about 30 miles to the west.

The usual means of access is by plane from Nome, the transportation center of the Seward Peninsula. There are two airfields in the Lost River valley. The principal airfield (lower airfield) is about 1-1/2 miles northwest of the mouth of Lost River and, when in good repair, has been used by planes as large as the DC-3 and the C-46. The other field (upper airfield) is in Lost River valley at the mouth of Cassiterite Creek and has been used by planes carrying a maximum payload of one ton.

Heavy or bulky freight normally is taken in or brought out by barges that land on the beach at the mouth of Lost River. A graveled truck road extends 6 miles inland to the Lost River mine. The truck road is serviceable, but requires some repair, principally bridges.

During this project access to the drilling sites was by rough trails suitable for 4-wheel-drive vehicles. The trails were built with an angle dozer which also was used to drag the drill from one site to the next.

HISTORY

Beryllium minerals were identified at the Lost River tin mine in 1942 by U.S. Geological Survey geologists working in cooperation with the Bureau of Mines. The identification was noted in the Bureau of Mines report on this project (2).[2/] In 1944 the similarity between the "ribbon rock" described by Knopf (6) in 1908 and the helvite-bearing "ribbon rock" from Iron Mountain, New Mexico was noted by R. H. Jahns (4). Some specimens taken by Knopf were on file in Washington, D. C.; tests showed that the Tin Creek ribbon rocks contained beryllium. The significance of this discovery was not realized for many years.

2/ Underlined numbers in parentheses refer to items in the bibliography at the end of this report.

The Bureau of Mines meanwhile detected beryllium at many other places in the western Seward Peninsula by spectrographic analyses of samples taken during a series of tin investigations (8, 9, and 11). Reports of beryllium occurrences in these publications drew attention to the western Seward Peninsula tin belt as a possible source of beryllium (14). Therefore, in September 1959, a Bureau of Mines 2-man crew sampled surface exposures at the Lost River mine and some adjacent areas. Analyses revealed that possibly valuable amounts of beryllium occur at the Lost River mine.

During the summer of 1960, the U.S. Geological Survey started a program of regional geologic mapping in the Lost River area. Particular attention was given to beryllium which ultimately resulted in the discovery of several beryllium deposits (13, 14, and 17). Beryllium-rich specimens were collected from the Lost River area and elsewhere on the Seward Peninsula. Chrysoberyl

was recognized as an important beryllium-bearing mineral in the Lost River deposits. Visual guides were noted that made it practical to search for other beryllium deposits without the necessity of carrying cumbersome detecting devices.

A Bureau of Mines 2-man crew obtained samples from the main haulage adit, Lost River mine, in 1960 and also used a beryllium detecting field instrument to identify outcroppings that contained beryllium. In 1961, a Bureau of Mines 2-man crew drilled and sampled 163 percussion-drill holes and two vertical diamond-drill holes in the altered limestone adjacent to the Lost River tin mine. All available samples from previous operations also were checked. This work (1) made it possible to infer the approximate grade and general extent of beryllium deposition at the Lost River tin mine.

During 1961 and 1962 the U.S. Geological Survey announced the discovery of several other fluorite-beryllium deposits in Lost River valley. These discoveries, added to the fluorite-beryllium deposit, inferred from the Bureau sampling at Lost River tin mine, indicated that the area probably contains important reserves of fluorite and beryllium. Therefore, in 1962 a Bureau of Mines engineer collected bulk specimens for metallurgical testing. A series of preliminary tests made at the Bureau of Mines Salt Lake City Metallurgy Research Center during the following year demonstrated that the recovery of beryllium and fluorite presents complex problems. Obviously, complex metallurgical research is not justified unless relatively large reserves amenable to modern mining methods are present. Obviously also, an intensive sampling program designed to accurately measure reserves is not justified until metallurgical research has indicated that marketable

fluorite and beryllium can be produced. Therefore, the reconnaissance-type diamond-drill sampling program described in this report was undertaken to obtain data on which to base a rough estimate of the extent and nature of the fluorite-beryllium deposits.

PROPERTY AND OWNERSHIP

The work described in this report was done on a group of patented and unpatented claims held by Lenhart J. Grothe and Clayton T. Pearson, the owners of the Lost River tin mine. Claim boundaries were not checked in detail. The claims included in this group are listed in table 1.

TABLE 1. - Lode and placer claims, Lost River valley, 1964[1]

Patented	Unpatented
Lode Claims	**Lode Claims**
Surveyor[2]	BE#1[3]
Shon Ruc[2]	BE#2[3]
Klondyke[2]	BE#3[3]
Bald Eagle[2]	BE#4[3]
Carry Gow[2]	BE#5[3]
Three Prospectors[2]	BE#6[3]
Collier[2]	BE#7[3]
Mars[2]	BE#8[3]
Jubitor[2]	BE#10[3]
Green[2]	BE#11[3]
Rob Roy[2]	BE#12[2]
Jenney Lyn[2]	BE#13[2]
Triangle[2]	BE#14[2]
Lincoln[2]	BE#15[2]
Engineer[2]	BE#19[2]
Maple[3]	Granite Discovery[4]
Bessie[3]	Granite #1[4]
Poor Mans[3]	Granite #2[4]
Tiger[3]	Granite #3[4]
"I"[3]	Granite #4[4]
"J"[3]	Granite #5[4]
	Prospect[4]
Placer claims[6]	Granite Fraction[4]
Thressa[2]	Rose E.[5]
Margaret[2]	Margaret M.[5]
Gertrude[2]	

1/ Data from State of Alaska, Department of Natural Resources. Includes only unpatented claims that were known to be held as of December 1964 and patented claims. Numerous claim monuments indicate that other claims have been staked in the area in recent years. Apparently many have been abandoned; but some data may not have been recorded when this table was compiled (December 1964).

2/ Locations include or are continguous to the Lost River tin mine in the Cassiterite Creek-Camp Creek area. Owned by Lenhart J. Grothe and Clayton T. Pearson, Box 411, Nome, Alaska.

3/ Locations include the Bessie and Maple prospect and extend eastward to the vicinity of the mouth of Tin Creek. Patented claims optioned by Lenhart J. Grothe and Clayton T. Pearson who also own the unpatented claims.

4/ Located on the north side of Tin Creek. Owned by United States Smelting Refining and Mining Company.

5/ Located about 3/4 mile northeast of the mouth of Esch Creek. Owned by James E. Tozer, Champe Ranson, J. L. Kellogg, and Robert Kuzminski of Adak(?), Alaska. This group has prospected the area for at least two seasons and is believed to have staked additional claims, late in 1964, in the Cassiterite Creek-Tin Creek area.

6/ No unpatented placer claims are known to be in force.

GENERAL GEOLOGY

The Lost River mine has been described in many U.S. Geological Survey and Bureau of Mines reports. The most comprehensive description is in U.S. Geological Survey Bulletin 1129, Geology of Lost River Mine Area, Alaska, by C. L. Sainsbury, published in 1964. The beryllium deposits drilled during this project are described in a U.S. Geological Survey open-file report entitled Planetable Maps and Drill Logs of the Camp Creek and Bessie-Maple Beryllium Fluorspar Deposits, Lost River Area, Alaska, by C. L. Sainsbury.

WORK BY THE BUREAU OF MINES

Bureau of Mines work on the Lost River beryllium deposits in 1964 included diamond drilling and metallurgical testing. The diamond drilling was a limited reconnaissance sampling project intended to roughly indicate the approximate grade and the general extent of typical deposits. The metallurgical tests were preliminary laboratory investigations to indicate the nature of the metallurgical problems.

Diamond Drilling

Nature and Extent

The Bureau of Mines diamond drilling in the Lost River valley (fig. 1) in 1964 included 13 holes totaling 2,158 feet in the Camp Creek area and three holes totaling 399 feet in the Bessie-Maple area. A Bureau of Mines engineer directed the drilling utilizing the advice of the Geological Survey geologist. Drilling was done by contract. After the first two weeks, one drill was operated 24 hours per day 7 days per week by two crews; each crew consisted of a driller and a helper. A Bureau sampler was on duty at all times to pack the core in boxes, collect, thicken, sack, and dry the sludge samples, and keep a detailed record of progress. The Bureau crew also prepared access trails and drill sites. A detailed record of daily drilling progress is in table 2. Except during the period July 5 through 15 when only one driller was on duty, the omission of a shift indicates no progress because of mechanical difficulties, moving, etc.

TABLE 2. - Daily progress, diamond-core drilling, Lost River, 1964

Date Month	Day	Shift[1/] No.	Hole No.	Drilling overburden, feet	Core Drilling NX feet	BX feet	BXWL feet	AX feet	Reaming Casing BX-NX feet	AX-BX feet	Total Depth, feet
July	5	1	101		10		1				
July	6	1	101				38				
July	7	1	101				20				
July	8	1	101				30				
July	9	1	101				20				
July	10	1	101				22				
July	13	1	102		10		14		12		
July	14	1	102				52		6		
July	15	1	102				34				
Total	102				10		100		18		110
July	15	2	101					8			
July	16	1	101					23		5	
July	16	2	101					15		12	
July	17	1	101					21			
July	17	2	101					30			
July	18	1	101					3			
Total	101				10		131	100		17	241
July	18	2	103		6						
July	19	1	103		4		28		10		
July	19	2	103				23				
July	20	1	103				3		20		
July	20	2	103						16		
July	21	2	103				3		8		
July	22	1	103				43		2		
July	22	2	103				63				
July	23	1	103				6				
Total	103				10		169		56		179
July	23	1	104		5						
July	23	2	104		11		39				
July	24	1	104				28	9			
July	24	2	104					22		10	
July	25	1	104					25			
Total	104				16		67	56		10	139
July	25	1	105	10							
July	25	2	105	2			36		5		
July	26	1	105				12		31		
July	26	2	105				18		25		
July	27	1	105				44				
Total	105			12			110		61		122

TABLE 2. - Daily progress, diamond-core drilling, Lost River, 1964 (continued)

Date Month Day	Shift[1/] No.	Hole No.	Drilling overburden, feet	Core Drilling NX feet	Core Drilling BX feet	Core Drilling BXWL feet	Core Drilling AX feet	Reaming Casing EX-NX feet	Reaming Casing AX-BX feet	Total Depth, feet
July 28	1	106	10	4		5				
July 28	2	106				63				
July 29	1	106				68				
July 29	2	106				7				
Total 106			10	4		143				157
July 29	2	107	5	9		25				
July 30	1	107				33				
July 30	2	107				70				
July 31	1	107				50				
July 31	2	107				6				
Total 107			5	9		184				198
August 3	2	108	10							
August 4	1	108	3			20		7		
August 4	2	108				39		25		
August 5	1	108				15		27		
August 5	2	108				45		10		
August 6	1	108				62				
August 6	2	108				16				
Total 108			13			197		69		210
August 7	1	109	15	5		16		16		
August 7	2	109				38		19		
August 8	1	109				56				
August 8	2	109				27	10		3	
August 9	1	109							7	
August 9	2	109					23			
Total 109			15	5		137	33	35	10	190
August 10	1	110	5	5		20				
August 10	2	110				74				
August 11	1	110					26		12	
August 11	2	110					20		14	
Total 110			5	5		94	46		26	150
August 12	2	111	2	8		25				
August 13	1	111				85				
August 13	2	111				75				
August 14	1	111				12				
Total 111			2	8		197				207
August 14	1	112	4	6		35				
August 14	2	112				76	3			
August 15	1	112				37	9		12	
Total 112			4	6		148	12		12	170

TABLE 2. - Daily progress, diamond-core drilling, Lost River, 1964 (continued)

Date Month Day	Shift 1/ No.	Hole No.	Drilling overburden, feet	Core Drilling NX feet	Core Drilling EX feet	Core Drilling BXWL feet	Core Drilling AX feet	Reaming Casing EX-NX feet	Reaming Casing AX-BX feet	Total Depth, feet
August 15	2	113	10							
August 16	1	113		10		12		10		
August 16	2	113				33		5		
August 17	1	113					20			
Total 113			10	10		45	20	15		85
TOTAL, CAMP CREEK			76	93		1722	267	254	75	2158
August 18	1	114	10	5						
August 18	2	114				54				
August 19	1	114				23		15		
August 19	2	114						25		
August 20	1	114					32			
August 20	2	114					27			
August 21	1	114					1			
Total 114			10	5		77	60	40		152
August 21	1	115	10	6						
August 21	2	115				21		20		
August 22	1	115				25		17		
August 22	2	115				15				
August 23	1	115				8				
Total 115			10	6		69		37		85
August 23	1	116	7	3		3				
August 23	2	116				31		30		
August 24	1	116				46		10		
August 24	2	116					34			
August 25	1	116					26			
August 25	2	116					12			
Total 116			7	3		80	72	40		162
TOTAL BESSIE-MAPLE			27	14		226	132	117		399
GRAND TOTAL			103	107		1948	399	271		2557

1/ Shift 1, 7:00 a.m. to 7:00 p.m.; shift 2, 7:00 p.m. to 7:00 a.m.

Sample Handling in the Field

Diamond-drill core samples were placed in plywood boxes at the hole by the Bureau of Mines sampler. As soon as possible after filling, the core boxes were taken to the sample storage shed where the project engineer measured the core recovery and the Geological Survey geologist logged the core and estimated the grade. The core was then packed and shipped to the Bureau of Mines laboratory at Juneau, Alaska for analyses.

Sludge samples were recovered in all cases where it was possible to seal the drill hole without excessive cost or delay. Sludge sample intervals correspond with core sample intervals. Sludge samples usually include about 5 feet of hole. Therefore, one sludge sample may cover the same intervals as two or more core samples. A sludge t was installed at the collar of the casing. A hose, or occasionally wooden launders, carried the sludge samples to steel 55-gallon oil barrels. As each sludge barrel was filled, the sludge discharge was shifted to the next barrel. The samples were allowed to settle; then the clear water was siphoned off. The thickened semi-liquid sludge was poured into canvas sacks which were hung on racks under a shelter to dry. The air-dried sludges were packed in steel drums and shipped to the Bureau of Mines Juneau laboratory for final drying and analyses.

The BX-wireline (BXWL) core barrels that were used whenever possible produced relatively large volumes of cuttings because the diameter of the hole is the same as conventional BX but the core recovered is only slightly larger in diameter than conventional AX core. The sludge sample includes these cuttings, plus the ground up core and any material from the walls that falls into the hole. The drilling water was pumped down the drill rods; sludge returned between the drill rods and the sides of the hole. The

much broken rock encountered in all holes caused sludge recovery to be very erratic and raises doubts as to the validity of the samples. Some sludge samples from diamond-drill holes 101 and 102 had to be split because of a shortage of sample containers but the sludge samples from the later holes were not split.

Sample Evaluation

The Beryllium Detector

The bombardment of any naturally occurring beryllium by gamma radiation of sufficient energy will remove a neutron from the nucleus of the beryllium atom; this principle is utilized in nuclear beryllium detection. The induced neutron reaction is proportional to the amount of beryllium in the material tested. The short range of neutron travel prevents detection of beryllium-bearing materials unless they are within a few inches of a detection device.

The component parts of beryllium detection devices are a gamma source (antimony 124), a detector, and a counter. The source emits gamma radiation which causes the beryllium in a sample to emit neutrons. The neutrons cause a reaction in the detector that is converted to electrical impulses which are recorded as a series of counts. The count is a measure of the beryllium content of material under test, but it is also a function of the instrument efficiency, distance from the sample, size of the sample, and strength of the gamma ray source. The short half-life of antimony 124 (60 days) necessitates daily instrument calibration.

A portable beryllium detector was adapted for use in the laboratory. The instrument was mounted in a concrete enclosure, and a rotating pan mechanism was designed to place samples directly under the source and detector to make quantitative analyses. All analyses were made by comparing counts obtained from a sample against counts from known standard samples. Reliability depends on the maintenance of constant conditions during the instrument calibration and sample testing and the accumulation of enough

counts for statistical accuracy. Constant conditions were maintained between instrument calibration and assaying by preparing samples and standards to the same fineness and density in identical sample containers; placement and spatial relationships were identical. Constant temperature was maintained by thermostatically controlled heating elements placed in the laboratory enclosure.

High statistical accuracy in beryllium assaying is obtained by using long counting periods. The counting error for any period of radioactive counting is considered to be double the square root of the total counts divided by the total count less the background count; longer counting periods become necessary as the grade of the sample decreases. The time requirement for high statistical accuracy in low-grade samples becomes impractical. Therefore, each sample was scanned for a standard period of 5 minutes. This gave relatively more reliable results as the grade increased. Samples selected at random were assayed chemically and checked by longer counting intervals.

Sludge Samples

Sludge samples were received from the field in canvas sacks. The samples were dried and weighed. The lumps were broken. While still in the canvas sack each sludge sample was placed in pressure contact with the laboratory berylometer and scanned for a 5-minute interval. The amount of beryllium present was determined by comparing the count obtained with the count obtained when standard samples of similar size in similar sacks were scanned in the same manner. The standard samples were prepared from material taken from the outcropping of the Camp Creek deposit; the material was finely ground and the amount of beryllium present was determined by chemical analyses.

Core Samples

The core was received in Juneau in wooden core boxes. Splitting the much broken core material was attempted but proved to be impractical; therefore, all mineralized core was crushed to minus 1/4-inch size. The crushed material was placed in sacks and scanned with the berylometer in the same manner as the sludges. Standards for comparison were prepared from material from the outcrop of the Camp Creek deposit, ground to minus 1/4-inch size, and placed in canvas sacks. The beryllium content of standard samples was determined by chemical analyses.

Core samples too small to be scanned in sacks were scanned in standard cans and compared with appropriate standards of the same grain size and volume. The beryllium content of these standards was determined by chemical analyses.

Occasional rapid chemical checks were made to confirm scanning if any irregularity, such as small sample size, caused the operator to doubt results. Rapid check analyses of this type have not been recorded in this report.

Core samples for checks on the accuracy of analyses by scanning were selected at random. Sample pulps for chemical checks were ground to minus 80 mesh and normal analytical procedures were followed. Samples for long counts to check analyses by scanning were crushed to minus 10 mesh and placed in standard cans for analyses. The counting interval was adjusted to give a statistical error of less than 5 percent. Standards were prepared from similar material of similar grain size; the beryllium content was determined by chemical analyses. Results of checks by both chemical analyses and longer counts are in table 3.

TABLE 3. - Comparison of beryllium assays by 5-minute scanning, by longer counting interval, and by chemical analyses

Hole No.	Footage from	Footage to	Lab. No.	Beryllium Detector Scan[1] nBeO percent	Beryllium Detector Long Count[2] nBeO percent	Chemical assay BeO percent
101	127.0	128.0	64-1426	0.01	-	0.016
101	191.2	192.0	64-1434	.58	0.64	.65
101	192.0	197.0	64-1435	.22	.24	-
101	205.1	206.7	64-1439	.15	.18	-
101	229.9	231.2	64-1446	.14	-	.13
102	25.0	26.0	64-1452	.09	-	.10
102	28.5	30.0	64-1455	.24	.28	-
102	30.0	34.2	64-1456	.18	.21	.23
102	34.2	34.7	64-1457	.15	.17	-
102	34.7	37.5	64-1458	.16	.17	-
102	37.5	41.0	64-1459	.22	.25	-
102	41.0	41.8	64-1460	.29	.32	.33
102	47.7	49.0	64-1466	.25	.28	-
102	61.5	63.2	64-1469	.31	.32	.39
102	63.2	66.0	64-1470	.24	.21	-
102	66.0	67.8	64-1471	.40	.45	-
102	67.8	71.0	64-1472	.40	.34	-
102	71.0	71.5	64-1473	1.66	1.92	2.23
102	71.5	76.0	64-1474	.35	.62	-
102	76.2	76.6	64-1476	.18	.18	-
103	121.2	122.2	64-1479	.40	.25	-
104	16.0	18.0	64-1481	.04	-	.03
104	21.0	30.0	64-1483	.29	.21	-
104	30.0	35.0	64-1484	.31	.26	-
104	35.0	38.0	64-1485	.13	-	.14
104	38.0	40.0	64-1486	.20	.22	-
104	40.0	43.0	64-1487	.17	.17	-
104	47.0	55.0	64-1489	.13	-	.13
104	61.5	65.3	64-1492	.37	.46	-
104	65.3	68.0	64-1493	.16	.17	.20
104	68.0	72.0	64-1494	.18	.21	-
104	76.3	78.7	64-1497	.13	-	.11
104	78.7	83.0	64-1498	.29	.28	-
104	92.5	93.9	64-1501	.44	.43	.47
104	102.0	104.3	64-1505	.86	.89	1.07
104	104.3	107.0	64-1506	.47	.40	-
104	107.0	109.4	64-1507	.19	.18	-
104	110.9	112.7	64-1509	.22	.19	.24
105	8.0	8.5	65-38	.10	-	.10
105	18.2	22.0	65-43	.13	-	.14
105	22.0	23.0	65-44	.44	.39	-
105	46.7	48.5	65-49	.35	.35	.35

TABLE 3. - Comparison of beryllium assays by 5-minute scanning, by longer counting interval, and by chemical analyses (continued)

Hole No.	Footage from	Footage to	Lab. No.	Beryllium Detector Scan[1] nBeO percent	Beryllium Detector Long Count[2] nBeO percent	Chemical assay BeO percent
105	48.5	50.3	65-50	0.15	0.14	-
105	54.1	57.0	65-55	.16	.14	-
105	66.5	67.8	65-59	.22	.23	0.26
105	71.0	72.0	65-62	.29	.31	-
105	72.0	73.0	65-63	.24	.27	-
105	84.0	87.0	65-70	.15	.16	-
105	93.2	95.5	65-73	.37	-	.51
105	95.5	98.1	65-74	.16	.18	-
105	98.1	99.0	65-75	.16	.22	-
105	100.4	101.6	65-77	.27	.42	-
105	101.6	102.0	65-78	.41	.58	-
106	15.0	17.0	65-87	.13	.17	.17
106	17.0	17.4	65-88	.17	.17	-
106	22.0	23.0	65-91	.33	.32	-
106	25.5	26.1	65-94	.15	.17	.17
106	30.7	32.0	65-96	.31	.31	-
106	32.0	34.0	65-97	.17	.17	-
106	42.0	45.5	65-103	.26	.27	-
106	45.5	47.0	65-104	.26	.28	-
106	47.0	47.7	65-105	.10	-	.15
106	49.9	52.0	65-107	.17	.14	-
106	52.0	53.5	65-108	.25	.27	-
106	53.5	57.0	65-109	.09	-	.09
106	62.0	65.5	65-112	.18	.18	-
106	70.3	71.3	65-115	.05	-	.09
106	72.0	77.0	65-117	.47	.44	-
106	77.0	78.6	65-118	.29	.33	-
106	82.0	84.7	65-120	.02	-	.02
106	89.7	90.0	65-123	.16	.20	-
106	90.0	94.7	65-124	.05	-	.09
106	96.3	97.0	65-126	.16	.18	-
106	103.3	104.5	65-130	.32	.33	-
106	115.0	116.4	65-136	.16	.17	-
106	123.0	127.0	65-139	.19	.18	-
106	129.9	130.5	65-141	.28	.28	-
106	150.0	152.1	65-150	.16	.17	-
107	0.0	14.0	65-153	.09	-	.11
107	14.0	16.0	65-154	.20	.24	.26
107	16.0	16.7	65-155	.23	.23	-
107	19.0	19.7	65-157	.34	.29	-
107	24.0	25.2	65-161	.23	.25	-
107	25.2	28.0	65-162	.16	.19	.22
107	28.6	32.0	65-164	.28	.24	-
107	37.6	39.0	65-168	.14	-	.14

TABLE 3. - Comparison of beryllium assays by 5-minute scanning, by longer counting interval, and by chemical analyses (continued)

Hole No.	Footage from	Footage to	Lab. No.	Beryllium Detector Scan[1] nBeO percent	Beryllium Detector Long Count[2] nBeO percent	Chemical assay BeO percent
107	42.0	43.3	65-170	0.22	0.16	-
107	43.3	46.0	65-171	.17	.12	-
107	47.0	48.7	65-173	.17	.18	-
107	52.0	55.0	65-175	.11	-	0.15
107	68.1	70.8	65-183	.24	.27	-
107	70.8	72.0	65-184	.04	-	.04
107	74.2	77.0	65-186	.59	.48	-
107	77.0	78.0	65-187	.33	.35	-
107	80.7	82.0	65-189	.21	.20	.25
107	87.0	88.7	65-193	.22	.21	.24
107	91.5	92.0	65-195	.34	.51	-
107	92.0	94.0	65-196	.60	.77	-
107	96.9	97.0	65-200	.22	-	.27
107	97.0	97.2	65-201	.24	.26	-
107	102.3	103.6	65-204	.45	.47	.44
107	104.5	105.2	65-206	.24	.19	-
107	105.8	107.0	65-208	.43	.49	-
107	108.3	109.5	65-211	.32	.31	.34
107	130.0	132.0	65-218	.16	.16	-
107	132.0	136.0	65-219	.10	-	.13
107	136.0	138.8	65-220	.24	.23	-
107	145.0	145.5	65-223	.14	-	.21
107	151.5	152.6	65-226	.26	.28	-
107	162.0	168.0	65-230	.23	.22	.23
107	168.0	168.5	65-231	.28	.32	-
107	188.0	191.0	65-240	.22	.24	.21
107	192.4	192.7	65-243	.66	.42	-
108	10.3	15.0	65-290	.15	-	.16
108	30.3	32.4	65-297	.21	.20	-
108	32.4	36.5	65-298	.07	-	.08
108	52.0	57.0	65-304	.02	-	.02
108	69.7	72.0	65-308	.52	.57	.44
108	79.7	81.0	65-312	.28	.30	-
108	162.0	166.5	65-338	.05	-	.07
108	182.5	186.0	65-345 & 6	.32	.37	.33
109	34.0	35.0	65-358	.04	-	.05
109	45.0	46.0	65-362	.88	.97	.88
109	50.0	52.0	65-364	1.03	1.02	-
109	52.0	52.3	65-365	.22	.25	-
109	57.8	58.7	65-368	.23	.25	.25
109	60.0	61.3	65-370	.23	.27	-
109	63.6	64.0	65-373	.30	.37	-
109	68.0	69.7	65-375	.72	.83	-
109	72.0	76.0	65-377	.39	.42	.44

TABLE 3. - Comparison of beryllium assays by 5-minute scanning, by longer counting interval, and by chemical analyses (continued)

Hole No.	Footage from	Footage to	Lab. No.	Beryllium Detector Scan1/ nBeO percent	Beryllium Detector Long Count2/ nBeO percent	Chemical assay BeO percent
109	76.0	77.2	65-378	0.34	0.25	-
109	80.8	82.6	65-381	.25	.25	-
109	87.0	91.3	65-383	.02	-	0.02
109	91.3	93.5	65-384	.34	.37	-
109	103.5	106.0	65-389	.25	.28	-
109	111.4	113.0	65-392	.14	-	.18
109	113.0	118.0	65-393	.60	.60	-
109	118.0	123.0	65-394	.59	.59	-
109	129.7	130.0	65-398	.12	-	.19
109	144.0	145.0	65-404	.13	-	.16
109	154.3	155.0	65-408	.43	.43	-
109	155.0	156.4	65-409	.33	.36	-
109	161.0	162.0	65-412	.15	-	.19
109	162.0	162.6	65-413	.21	.25	-
109	166.0	167.0	65-415	.20	.21	-
109	167.9	171.0	65-417	.04	-	.02
110	12.5	13.8	65-491	.69	-	.70
110	64.2	67.0	65-506	.12	-	.12
110	77.0	80.1	65-510	.10	-	.11
110	102.0	104.0	65-517	.04	-	.04
111	35.0	40.0	65-525	.17	-	.17
111	75.9	77.5	65-537	.07	-	.11
111	93.0	98.0	65-541	.06	-	.08
111	128.0	129.1	65-551	.20	-	.22
111	148.0	153.0	65-555	.11	-	.14
111	196.0	200.0	65-566	.12	-	.15
112	20.0	24.5	65-574	.06	-	.07
112	35.0	40.0	65-578	.09	-	.11
112	50.5	51.0	65-585	.02	-	.05
112	66.0	68.5	65-589	.04	-	.04
112	81.0	85.0	65-593	.10	-	.11
113	15.0	20.0	65-615	.25	-	.28
113	30.0	32.0	65-619	.07	-	.08
113	48.0	52.0	65-626	.28	-	.26
114	72.0	74.6	65-639	.05	-	.05
114	81.0	83.4	65-643	.07	-	.07
114	89.0	90.0	65-647	.04	-	.05
114	102.0	107.0	65-651	.20	.21	.15
114	120.0	122.0	65-655	.04	-	.04
114	130.0	136.0	65-653	.06	-	.08
114	151.0	152.0	65-662	.14	-	.11
115	17.0	18.0	65-664	.16	-	.23

TABLE 3. - Comparison of beryllium assays by 5-minute scanning, by longer counting interval, and by chemical analyses (continued)

Hole No.	Footage from	Footage to	Lab No.	Beryllium Detector Scan[1] nBeO percent	Beryllium Detector Long Count[2] nBeO percent	Chemical assay BeO percent
115	20.5	21.0	65-667	0.73	0.70	-
115	29.0	31.0	65-670	.23	.29	0.28
115	53.0	55.0	65-681	.05	-	.06
115	58.5	60.0	65-684	.17	-	.16
115	62.0	63.5	65-687	.37	-	.29
115	68.0	69.5	65-694	.79	.85	-
115	69.5	70.5	65-695	.25	.33	-
115	70.5	72.0	65-696	.31	.35	-
115	72.0	73.0	65-697	.29	.30	.30
116	124.0	129.5	65-730	.02	-	.03
116	140.0	145.0	65-734	.02	-	.03
116	156.0	159.0	65-738	.01	-	.01

1/ 5-minute counting interval.
2/ Counting interval long enough to give a statistical error of less than 5 percent.

Fluorite Determinations

Fluorite determinations were made by petrographic estimation. Splits of one or more core samples were crushed to minus 48 mesh and composited to form the sample. The sample was then screened. Fluorite and other major mineral determinations were made on the minus 100 plus 200 mesh fraction. The accuracy of this method was checked by chemical analyses. Results of check analyses are in table 4. Detailed petrographic estimates of the principal minerals are in the section of this report entitled "Petrography."

TABLE 4. - Chemical check of petrographic estimation of the amount of fluorite in diamond-drill core[1/]

Sample description				Petrographic Estimates						Chemical equiv. CaF_2 percent
				Fluorite	Sellaite		Other minerals		Total equiv. CaF_2 percent	
Hole No.	From feet	To feet	Lab. No.	CaF_2 percent	MgF_2 percent	Equiv. CaF_2 percent	Type	Amount percent		
114	107.0	112.0	65-652	55	15	18.7	2/	5	74	71.9
114	112.0	117.0	65-653	55	-	-	2/	5	55	59.2
114	117.0	120.0	65-654	45	-	-	2/	10	45	42.1
114	120.0	122.0	65-655	55	-	-	2/	20	55	41.1
115	29.0	33.5	65-702	25	-	-	3/	1	25	32.8
115	53.0	55.0	65-681	65	2	2.5	3/	20	67	60.7
115	55.0	57.5	65-682	65	-	<.5	3/	25	65	64.0
115	57.5	64.0	65-703	70	-	-	3/	22	70	70.5
116	109.0	113.0	65-726	Trace	-	-	4/	90	Trace	5.2
116	113.0	118.0	65-727	2	-	-	4/	94	2	7.7
116	122.0	124.0	65-729	5	Trace	-	4/	Trace	5	14.6
116	124.0	129.5	65-730	1	-	-	4/	1	1	4.6
116	129.5	133.2	65-731	1	-	-	4/	5	1	3.5
116	133.2	136.6	65-732	1	-	-	4/	10	1	4.1
116	136.6	140.0	65-733	-	-	-	4/	10	-	1.8
116	140.0	145.0	65-734	15	-	-	4/	5	15	12.8
116	145.0	150.0	65-735	-	-	-	4/	3	-	2.8
116	150.0	153.0	65-736	-	-	-	4/	30	-	2.3
116	153.0	156.0	65-737	Trace	-	-	4/	20	Trace	1.9
116	156.0	159.0	65-738	-	-	-	4/	30	-	2.4
116	159.0	162.0	65-739	-	-	-	4/	20	-	1.9

1/ Petrographic estimates were made on 100 x 200 mesh fractions screened from -48 mesh samples ground from splits of 1/4-inch ground core samples. If sellaite or other minerals that contain fluorine were detected during the petrographic estimation, the fluorine content was calculated as equivalent fluorite for comparison with the chemical fluorine assay also calculated as equivalent fluorite.

2/ Zinnwaldite.

3/ Lithium mica.

4/ Lithium mica, mica, and chlorite.

Diamond-Drill-Hole Logs

Diamond-drill-hole descriptions and analytical data are in the sections that follow; detailed geologic descriptions of the core are in a U.S. Geological Survey open-file report (16). All sludge samples were scanned with the beryllium detection device except a relatively few samples from definitely unmineralized sections of the drill holes. Core samples from all sections of the holes that either yielded mineralized sludge samples or showed other evidences of mineralization were scanned. Sludge samples are numbered serially; absence of a sludge sample indicates that no sludge was recovered.

Estimated theoretical sludge recoveries in BX wireline (BXWL) holes for various percentages of limestone and fluorite are in table 5. Sections of a few holes were drilled with conventional AX rods. Tables showing core to sludge ratios in AX holes can be found in most diamond drilling handbooks.

TABLE 5. - Theoretical sludge recovery in BWL hole

Limestone, percent	100	75	50	25	0
Fluorite, percent	0	25	50	75	100
Estimated specific gravity	2.75	2.85	2.95	3.05	3.15
Core recovery, percent:	Sludge, grams per linear foot				
100	1738	1801	1864	1928	1991
75	1903	1972	2041	2111	2180
50	2068	2143	2218	2294	2369
25	2233	2314	2395	2477	2558
0	2398	2485	2572	2660	2747

Camp Creek Area

Thirteen diamond-drill holes were drilled in the Camp Creek valley. Hole locations are shown on figure 2; drill-hole logs and analytical data are in tables 6 through 18. Check analyses to estimate the reliability of analytical data are in tables 3 and 4. The coordinates shown on the drill logs refer to the system of coordinates used at the Lost River mine (7). Coordinates were determined by scaling from plane table maps and therefore are approximate only.

TABLE 6. - Diamond-drill sampling data, hole 101

Hole 101
Location: Camp Creek, Lost River valley
Coordinates: Lat. 3210 N, Dep. 6053 E
Collar elevation: 295
Bearing: S 18° W
Dip: Horizontal

Hole size:
NX: 0 - 10
BXWL: 10 - 141
AX: 141 - 241
Total depth: 241
Dates drilled: 7/5-7/10 and 7/15-7/18/64

Drill Hole Footage			Core					Sludge		
			Recovery			Assay, Percent				
From	To	Dist.	Feet	Percent	Grams	Scan nBeO	Fluorite	Sample No.	Weight, grams	Scan nBeO percent
0.0	10.0	10.0	9.0	90						
10.0	11.0	1.0	1.0	100						
11.0	16.4	5.4	5.0	93				1	3159	0.03
16.4	18.0	1.6	1.6	100				2	1225	.01
18.0	19.6	1.6	1.2	75				3	1670	.03
19.6	22.2	2.6	2.5	96				4	2118	.03
22.2	25.1	2.9	1.8	62				5	2472	.02
25.1	26.4	1.3	1.2	93				6	1671	.01
26.4	28.0	1.6	1.5	94						
28.0	30.4	2.4	1.6	67				7	2399	.03
30.4	32.0	1.6	1.5	94				8	1557	.01
32.0	33.3	1.3	1.1	85				9	5251	.02
33.3	35.5	2.2	2.1	95				10		
35.5	37.7	2.2	2.1	95				11[1]	4058	.03
37.7	39.8	2.1	1.5	72						
39.8	43.1	3.3	1.4	42						
43.1	44.4	1.3	1.2	92						
44.4	48.0	3.6	3.2	89						
48.0	49.4	1.4	1.1	79				12	11224	.02
49.4	50.2	.8	.8	100						
50.2	51.2	1.0	.8	80						
51.2	53.6	2.4	1.2	50						
53.6	54.6	1.0	.8	80						
54.6	55.6	1.0	1.0	100						
55.6	57.9	2.3	2.0	87						
57.9	62.8)	9.3	8.9	96				13[1]	3950	.02
62.8	67.2)									
67.2	69.7	2.5	1.2	48	759	<0.01	2	14[1]	3836	.02
69.7	72.1	2.4	1.8	75	2284	<.01				
72.1	74.0	1.9	1.4	74						
74.0	75.3)	4.0	3.5	88	176	<.01				
75.3	78.0)				2049	.01				
78.0	84.4	6.4	6.1	95	4465	.02				
84.4	88.0	3.6	3.3	92				15[1]	4842	.01
88.0	93.1	5.1	4.0	79						
93.1	96.6	3.5	3.4	97						

TABLE 6. - Diamond-drill sampling data, hole 101 (continued)

Drill Hole Footage From	To	Dist.	Core: Recovery Feet	Per-cent	Grams	Assay, Percent: Scan nBeO	Fluorite	Sludge: Sample No.	Weight, grams	Scan nBeO percent
96.6	99.0	2.6	1.9	73	1443	0.03	4	16[1]	4287	0.02
99.0	101.0	2.0	1.9	95	1314	.05		17[1]		
101.0	103.2	3.0	2.0	67	1055	.03				
103.2	104.0				403	.01				
104.0	106.0	2.0	1.9	95	1539	.02				
106.0	113.0	7.0	6.8	97	7712	.02	1	18[1]	3901	.01
113.0	116.3	3.3	3.3	100						
116.3	119.3	3.0	2.9	97	4784	.01	.5	19[1]	3288	Trace
119.3	123.0	3.7	3.4	92						
123.0	126.9	3.9	3.4	87	2562	<.01		20[1]	3794	.02
126.9	128.0	3.1	2.6	84	626	.01				
128.0	130.0				1120	<.01				
130.0	134.5	4.5	2.3	51	1407	<.01	1	21[1]	2994	.01
134.5	137.8	3.5	2.9	83	1741	.01				
137.8	138.0				84	<.01				
138.0	138.4	3.0	2.2	73	151	.01	Trace	22[1]	1522	.01
138.4	139.5				489	.01				
139.5	141.0				873	.01				
141.0	143.0	2.0	1.5	75	5536	.01	1	37	1609	.02
143.0	148.0	5.0	3.4	68						
148.0	150.0	2.0	1.3	65				38	5583	.01
150.0	154.4	4.4	3.7	84						
154.4	161.0	6.6	6.6	100	4567	.01	2	39	2546	.02
161.0	162.3	1.3	1.1	85				40	743	.02
162.3	163.7	1.4	1.1	79	5195	.02	3	41	2190	.02
163.7	164.8	1.1	1.1	100						
164.8	168.0	3.2	2.9	91						
168.0	172.0	4.0	3.7	93				42	815	.01
172.0	174.0	2.0	1.4	70	4236	.03	5	43	924	.02
174.0	178.0	4.0	3.1	78						
178.0	182.0	4.0	3.0	75						
182.0	187.0	5.0	4.7	94	4323	.03	14			
187.0	191.2	5.0	3.9	78						
191.2	192.0				389	.58	55			
192.0	197.0	5.0	1.2	24	644	.22	Trace			
197.0	201.0	4.0	1.0	25	454	.12	20			
201.0	203.0	2.0	.7	35	327	.10				
203.0	204.5	1.5	.4	27	319	.05	15			
204.5	205.1	.6	.2	33						
205.1	206.7	1.6	.8	50	350	.15				
206.7	208.0	1.3	1.0	77	560	.03				
208.0	209.0	1.0	.8	80	1199	.01				
209.0	210.5	1.5	1.4	93						

TABLE 6. - Diamond-drill sampling data, hole 101 (continued)

Drill Hole Footage From	To	Dist.	Core Recovery Feet	Percent	Grams	Assay, Percent Scan nBeO	Fluorite	Sludge Sample No.	Weight, grams	Scan nBeO percent
210.5	212.5	2.0	1.7	85)	5107	0.04	) 14.5			
212.5	220.5	8.0	6.7	84)			)			
220.5	223.7)	4.5	3.0	67	1290	.03				
223.7	225.0)				573	.02	1			
225.0	227.3)	7.0	6.4	92	1149	.04	) 26			
227.3	228.3)				955	.03	)			
228.3	229.9)				854	.03	)			
229.9	231.2)				603	.14	)			
231.2	232.0)									
232.0	237.0	5.0	4.2	84						
237.0	238.0	1.0	1.0	100						
238.0	241.0	3.0	2.1	70						

1/ Sludge samples split as follows:

No.	Ratio
11	2 to 1
13	4 to 1
14	3 to 1
15	4 to 1
16	4 to 1
17	4 to 1
18	2 to 1
19	2 to 1
20	2 to 1
21	2 to 1
22	2 to 1.

TABLE 7. - Diamond-drill sampling data, hole 102

Hole 102
Location: Camp Creek, Lost River valley
Coordinates: Lat. 2020 N; Dep. 6012 E
Collar elevation: 383
Bearing: N 10° E
Dip: -70°

Hole size:
NX: 10
EXTRA: 100
AX:
Total depth: 110
Dates drilled: 7/11-7/15/64

Drill Hole Footage			Ore Inventory			Assay, Percent		Sludge		
From	To	Dist.	Feet	Percent	Grams	Scan nDeO	Fluorite	Sample No.	Weight, grams	Scan nDeO percent
0.0	5.0	5.0	0.0	0						
5.0	10.0	5.0	1.8	36						
10.0	11.0	1.0	.6	60						
11.0	12.5	1.5	1.2	80				23	599	0.03
12.5	14.0	1.5	1.3	87						
14.0	15.5	1.5	.6	40						
15.5	16.4	1.5	1.1	73	536	0.02	7	24	1112	.08
16.4	17.0				297	.09				
17.0	19.0	2.0	1.6	80	1215	.06				
19.0	20.5	1.5	.6	40	406	.04				
20.5	22.0	1.5	.2	13				25	2093	.11
22.0	24.0	2.0	.9	45			15			
24.0	25.0	2.0	.9	45	626	.07				
25.0	26.0				220	.09				
26.0	27.9	2.5	1.9	76	681	.04		27	4584	.15
27.9	28.5				418	.08				
28.5	30.0	1.5	1.5	100	1200	.24				
30.0	30.6	.6	.5	83	2114	.18	75	28	12709	.24
30.6	32.2	1.6	1.2	75						
32.2	34.2	2.0	1.4	70						
34.2	34.7	3.3	2.2	67	361	.15				
34.7	37.5				1132	.16				
37.5	41.0	3.5	3.1	89	2646	.22		29	4280	.21
41.0	41.8	5.0	4.7	94	635	.29	25	30	2402	.04
41.8	42.2				212	.04				
42.2	42.5				139	.11				
42.5	42.8				160	.02				
42.8	46.0				2446	.04				
46.0	47.7	5.0	4.5	90	1267	.06		31	3414	.09
47.7	49.0				958	.25				
49.0	51.0				1328	.03				
51.0	55.4	4.4	3.8	86	6181	.06	4	32	4916	.07
55.4	61.0	5.6	5.3	95				33	8080	.06

TABLE 7. - Diamond-drill sampling data, hole 102 (continued)

Drill Hole Footage			Core					Sluice		
			Recovery		Assay, Percent					
From	To	Dist.	Feet	Per-cent	Grams	Scan nBeO	Fluorite	Sample No.	Weight, grams	Scan nBeO percent
61.0	61.5)	5.0	5.0	100	330	<0.01	65	34	4928	0.23
61.5	63.2)				1257	.31				
63.2	66.0)				2576	.24				
66.0	67.3)	5.0	4.3	86	1370	.40		35	3214	.24
67.3	71.0)				2110	.40				
71.0	71.5	.5	.3	60	193	1.66	15	36	2587	.28
71.5	76.0	4.5	.6	13	514	.35				
76.0	76.2)	5.0	4.7	94	140	.01				
76.2	76.6)				227	.18				
76.6	81.0)									
81.0	81.5	.5	.5	100						
81.5	86.0	4.5	2.7	60						
86.0	91.0	5.0	3.3	66						
91.0	96.0	5.0	1.5	30						
96.0	97.0	1.0	.8	80						
97.0	101.0	4.0	3.9	98						
101.0	103.4	2.4	.9	38						
103.4	105.0	1.6	1.0	63						
105.0	108.2	3.2	.8	25						
108.2	110.0	1.8	1.4	78						

TABLE 6. - [illegible] hole 10[illegible]

Hole 10[illegible]
Location: Camp Creek, [illegible] River valley
Coordinates: Lat. 2702 N; Dep. 6350 E
Collar elevation: 496
Bearing: N 20° [illegible]
Dip: -70°

Hole size:
NX: 10
[illegible]: 169
AX:
Total depth: 179
Dates drilled: 7/10-7/23/64

Drill Hole Footage			Core Recovery		Core Analyses		Sludge		
From	To	Dist.	Feet	Percent	Scan nBeO	Fluoride	Sample No.	Weight, grams	Scan nBeO percent
0.0	10.0	10.0	0.0	0					
10.0	11.5	1.5	1.2	80					
11.5	12.8	1.3	.8	61					
12.8	15.0	2.2	1.1	50					
15.0	20.0	5.0	2.8	56			44	1357	0.02
20.0	22.0	2.0	1.4	70					
22.0	27.0	5.0	4.1	82			45	718	<.01
27.0	31.2	4.2	3.5	83					
31.2	33.3	2.1	1.6	76			46	3037	.02
33.3	38.0	4.7	2.9	62					
38.0	42.0	4.0	2.0	50					
42.0	44.0	2.0	2.0	100			47	8779	.03
44.0	49.0	5.0	2.6	52					
49.0	52.0	3.0	1.5	50					
52.0	54.0	2.0	1.2	60			48	2691	.02
54.0	57.0	3.0	2.5	83			49	7910	.01
57.0	61.0	4.0	1.0	25			50 1/	716	<.01
61.0	63.0	2.0	.6	30					
63.0	64.3	1.3	.2	15			51 1/	754	.01
64.3	66.5	1.7	1.2	71					
66.5	67.5	1.0	1.0	100					
67.5	72.0	4.5	2.1	47			52 1/	1788	<.01
72.0	74.5	2.5	2.0	80			53	1520	<.01
74.5	82.5	8.0	7.7	97					
82.5	88.1	5.6	4.2	75			54	1113	<.01
88.1	92.1	4.0	2.9	72			55	2191	<.01
92.1	97.3	5.2	5.2	100			56	5330	.01
97.3	100.0	2.7	0.0	0			57	3727	.01
100.0	102.0	2.0	1.8	90					
102.0	107.0	5.0	.9	18			58	7077	.02
107.0	109.0	2.0	.7	35					
109.0	110.0	1.0	.6	60					
110.0	110.6	.6	.4	66					
110.6	112.6	2.0	1.3	65					
112.6	116.5	3.9	3.9	100			60	4656	<.01
116.5	119.0	2.5	2.5	100					

TABLE 8. - Diamond-drill sampling data, hole 103 (continued)

Drill Hole Footage			Core					Sludge		
			Recovery			Assay, Percent				
From	To	Dist.	Feet	Percent	Grams	Scan nBeO	Fluorite	Sample No.	Weight, grams	Scan nBeO percent
119.0	120.5	1.5	1.5	100	1220	0.03	15	61	3710	0.07
120.5	121.2)	2.5	2.4	96	521	.04				
121.2	122.2)				739	.40				
122.2	123.0)				564	.01				
123.0	128.5	5.5	5.5	100				62	12189	.03
128.5	132.0	3.5	2.9	83						
132.0	135.0	3.0	3.0	100				64	10425	.01
135.0	142.0	7.0	6.5	93						
142.0	146.0	4.0	4.0	100				66	5553	.02
146.0	151.0	5.0	4.9	98				67	3895	.01
151.0	153.0	2.0	1.9	95				68	2601	.02
153.0	157.0	4.0	4.0	100				69		
157.0	159.0	2.0	2.0	100						
159.0	161.0	2.0	2.0	100						
161.0	165.0	4.0	4.0	100				70	3895	<.01
165.0	170.0	5.0	4.2	84				71	1720	.01
170.0	173.0	3.0	2.6	87				72		
173.0	179.0	6.0	5.7	95						

1/ Sludge samples split as follows:

No.	Ratio
50	2 to 1
51	8 to 1
52	4 to 1.

TABLE 9. - Diamond-drill sampling data, hole 104

Hole 104
Location: Camp Creek, Lost River valley
Coordinates: Lat. 2656 N; Dep. 7029 E
Collar elevation: 500
Bearing: N 12° E
Dip: -70°

Hole size:
NX: 16 feet
BNWL: 67 feet
AX: 55 feet
Total depth: 139 feet
Dates drilled: 7/23-7/25/64

Drill Hole Footage From	To	Dist.	Core Recovery Feet	Per-cent	Grams	Assay, Percent Scan nBeO	Fluorite	Sludge Sample No.	Weight, grams	Scan nBeO percent
0.0	16.0	16.0	0.0	0						
16.0	18.0	2.0	1.3	65	1061	0.04	23	73	4572	0.11
18.0	21.0	3.0	3.0	100	2371	.14				
21.0	30.0	9.0	8.3	92	6640	.29	35	74	3535	.21
30.0	35.0	5.0	4.7	94	3803	.31	65	75	2461	.24
35.0	38.0	3.0	1.6	53	1098	.13	40	76	2414	.14
38.0	40.0	2.0	1.3	65	835	.20				
40.0	41.5	1.5	1.5	100	2071	.17		77	3574	.14
41.5	43.0	1.5	1.5	100						
43.0	47.0	4.0	2.5	62	1884	.12				
47.0	52.0	5.0	4.4	88	5892	.13	15	78	2000	.05
52.0	55.0	3.0	3.0	100				79	1072	.11
55.0	56.5	1.5	1.1	74	2769	.11		80	1189	.05
56.5	58.7	2.2	2.2	100						
58.7	60.0	1.3	1.1	85	1281	.07	60	81	1516	.15
60.0	61.5	1.5	1.0	67						
61.5	65.3	3.8	2.8	74	2409	.37				
65.3	68.0	2.7	2.1	78	1598	.16		82	222	.04
68.0	72.0	4.0	3.3	83	2731	.18				
72.0	73.7	1.7	1.7	100	1244	.11	30			
73.7	76.3	2.6	2.3	89	1783	.05				
76.3	78.7	2.4	1.5	63	1162	.13				
78.7	82.0	3.3	1.8	55	1826	.29				
82.0	83.0	1.0	.8	80						
83.0	88.0	5.0	4.3	86	2588	.14	20	83	4053	.08
88.0	92.5	4.5	2.4	53	1396	.14		84	2267	.01
92.5	93.9	6.2	5.5	89	779	.44	15	85	2383	.04
93.9	98.7				2698	.02				
98.7	101.0	3.3	2.7	82	1103	.02				
101.0	102.0				533	.13				
102.0	103.5	1.5	1.1	73	990	.86	45	86	3168	.42
103.5	104.3	3.5	2.9	83						
104.3	107.0				1571	.47				
107.0	109.4	7.5	6.8	91	1254	.19	55	87	3311	.05
109.4	110.9				849	.08				
110.9	112.7				1068	.22				
112.7	114.5				1053	.09				

TABLE 9. - Diamond-drill sampling data, hole 104 (continued)

Drill Hole Footage From	To	Dist.	Core Recovery Feet	Percent	Grams	Assay, Percent ScaO Fluorite		Sludge Sample No.	Weight, grams	ScaO percent
114.5	120.0	5.5	4.8	87	3015	0.08	7	88	2481	0.05
120.0	121.7)	6.0	5.5	92	883	.02		89	3149	.05
121.7	126.0)				2508	.07				
126.0	133.0	7.0	6.7	96				90	2117	.08
133.0	139.0	6.0	6.0	100				91	1559	.03

TABLE 10. - Diamond-drill sampling data, hole 105

Hole 105
Location: Camp Creek, Lost River valley
Coordinates: Lat. 2738 N; Dep. 6822 E
Collar elevation: 473
Bearing: N 18° E
Dip: -70°

Hole size:
NX: 12
EXEL: 110
AX:
Total depth: 122
Dates drilled: 7/25-7/28/64

Drill Hole Footage			Core Recovery			Core Assay, Percent		Sludge		
From	To	Dist.	Feet	Percent	Grams	Scan nBeO	Fluorite	Sample No.	Weight, grams	Scan nBeO percent
5.0	10.5	5.5			5844	0.10	40			
10.5	11.0	.5	0.3	60	300	.04	15			
11.0	14.5	3.5	1.4	40	1353	.07				
14.5	16.5	2.0	.5	25	295	.05		92	2634	0.09
16.5	18.2	5.5	3.9	71	1334	.05				
18.2	22.0				1804	.13	65			
22.0	24.5	2.5	2.4	96	4465	.44		93	6541	.34
24.5	28.0	3.5	3.5	100						
28.0	32.0	4.0	3.5	88	2911	.07	25	94	3331	.25
32.0	33.0	9.0	9.0	100	717	.09		95	9019	.13
33.0	41.0				6463	.04				
41.0	46.7	7.5	7.2	96	4487	.05	30			
46.7	48.5				1037	.35				
48.5	50.3	3.5	3.0	86	933	.15	20	96	4375	.10
50.3	51.3				501	.04				
51.3	52.0				943	.04				
52.0	53.3	5.0	5.0	100	904	.07	25	97	3569	.14
53.3	54.1				733	.13				
54.1	57.0				2083	.16				
57.0	60.0	3.0	2.6	87	3319	.02		98	7121	.05
60.0	62.0	2.0	2.0	100						
62.0	63.8	1.8	1.1	58	1100	.07	45	99	3460	.14
63.8	64.5	2.7	1.4	52						
64.5	66.5				459	.10				
66.5	67.8	2.5	2.5	100	923	.22		100	2131	.08
67.8	69.0				1239	.04				
69.0	70.0	1.0	.6	60						
70.0	71.0	5.0	5.0	100	762	.02	35	101	700	.09
71.0	72.0				677	.29				
72.0	73.0				707	.24				
73.0	75.0				1783	.05				
75.0	78.4	3.4	2.3	68	1705	<.01	1	102	4001	.05
78.4	79.1	2.0	2.0	100	540	<.01		103	1649	<.01
79.1	80.4				794	<.01				

TABLE 10. - Diamond-drill sampling data, hole 105 (continued)

Drill Hole Footage From	To	Dist.	Core Recovery Feet	Per-cent	Gram	Assay, Percent Scan nBaO	Fluorite	Sludge Sample No.	Weight, grams	Scan nBaO percent
80.4	81.1)	3.6	3.6	100	527	0.01	)	) 104	2597	0.03
81.1	84.0)				2358	.02	_)	_)		
84.0	87.0	3.0	2.7	90	2087	.15	) 65	) 105	6068	.22
87.0	90.0	3.0	.6	20	449	.10	)	_)		
90.0	91.5	1.5	0.0	0)	792	.13	)	) 106	7706	.16
91.5	93.2	1.7	1.2	71)			_)	_)		
93.2	95.5	2.3	.3	13	288	.37	) 60	107	6318	.19
95.5	98.1	2.6	1.3	50	925	.16	)	108	5814	.25
98.1	98.6	.5	.5	100)	641	.16	)	) 109	8192	.27
98.6	99.0)	1.8	1.7	95)			)	)		
99.0	100.4)				1000	.09	)	)		
100.4	101.6	1.2	.4	33	244	.27	)	)		
101.6	102.0)	3.1	2.4	78	260	.41	)	)		
102.0	104.7)				1595	.04	_)	_)		
104.7	107.0	2.3	2.2	96	1716	.03	) 2	110	2695	.10
107.0	109.2	2.2	2.1	96)	3879	.01	)	) 111	4395	.11
109.2	112.0	2.8	2.8	100)			_)	_)		
112.0	117.0	5.0	4.3	86	3544	.05	) 2	112	5527	.09
117.0	122.0	5.0	4.6	92	3709	.02	_)	113	4207	.09

TABLE 11. - Diamond-drill sampling data, hole 106

Hole 106
Location: Camp Creek, Lost River valley
Coordinates: Lat. 2541 N; Dep. 7281 E
Collar elevation: 518
Bearing: N 18° E
Dip: -70°

Hole size:
NX: 14
EXTRA: 143
AX:
Total depth: 157
Dates drilled: 7/28-7/29/64

Drill Hole Footage			Core					Sludge		
			Recovery		Assay, Percent					
From	To	Dist.	Feet	Percent	Grams	Scan nBaO	Fluorite	Sample No.	Weight, grams	Scan nBaO percent
0.0	10.0	10.0	0.0	0						
10.0	14.0	4.0			4172	0.08				
14.0	15.0)	3.0	2.0	67	648	.05	20	114	3751	0.02
15.0	17.0)				806	.13				
17.0	17.4)	2.0	1.8	90	187	.17				
17.4	19.0)				1312	.05				
19.0	22.0	3.0	2.4	80	1963	.09		115	3208	.09
22.0	23.0	1.0	1.0	100	818	.33				
23.0	23.4)	9.0	8.8	98	272	.10	25	116	1271	.05
23.4	25.5)				1727	.03				
25.5	26.1)				457	.15				
26.1	30.7)				3668	.02				
30.7	32.0)				1102	.31				
32.0	34.0	2.0	.8	40	544	.17		117	5856	.22
34.0	34.5)	2.5	2.1	84	337	.02				
34.5	36.5)				1364	.02				
36.5	37.2)	5.5	5.5	100	555	.02	5	118	1213	.05
37.2	41.0)				3360	.02				
41.0	42.0)				749	.08				
42.0	45.5)	5.0	4.6	92	2546	.26	55	119	9559	.17
45.5	47.0)				1145	.26				
47.0	47.7)	5.0	3.7	74	447	.10		120	7802	.12
47.7	49.9)				1644	.08				
49.9	52.0)				1100	.17				
52.0	53.5	1.5	1.3	87	955	.25	15	121	6593	.13
53.5	57.0	3.5	2.1	60	1698	.09				
57.0	60.1)	5.0	3.5	70	2119	.06		122	6376	.07
60.1	62.0)				562	.17				
62.0	65.5	3.5	2.0	57	1554	.18	40	123	4997	.28
65.5	68.5	3.0	2.3	77	1734	.08				
68.5	70.3)	3.5	3.3	94	1265	.05	15	124	11692	.22
70.3	71.3)				808	.05				
71.3	72.0)				482	.07				
72.0	77.0	5.0	2.9	58	1969	.47	60			

TABLE 11. - Diamond-drill sampling results, hole 106 (continued)

Drill Hole Footage From	To	Diam.	Core Recovery Feet	Recovery Percent	Grams	Assay, Percent ScanBeO	Fluorite	Sludge Sample No.	Weight, grams	ScanBeO percent
77.0	78.6	2.0	2.0	100	1123	0.29	15	125	12227	0.16
78.6	79.0				2166	.05				
79.0	82.0	3.0	2.5	83						
82.0	83.0	1.0	.6	60	1471	.02	15	126	3403	.05
83.0	84.7	1.7	1.4	82						
84.7	89.0	5.0	5.0	100	3638	.04		127	9471	.06
89.0	89.7				577	.11				
89.7	90.0	5.0	4.6	92	285	.16	25	128	5974	.09
90.0	94.7				3475	.09				
94.7	96.3	3.0	1.8	60	986	.05		129	9424	.12
96.3	97.0				464	.16				
97.0	98.8	1.8	.9	50	632	.06				
98.8	101.0	2.2	1.4	63	1053	.02	15	130	6004	.19
101.0	103.3	2.3	2.1	91	1597	.14				
103.3	104.5	4.2	2.5	60	885	.32		131	2798	.10
104.5	107.5				1273	.08				
107.5	110.0	2.5	1.1	44	793	.04	10	132	8356	.03
110.0	111.2	1.2	.6	50	318	.13				
111.2	112.2	3.8	1.7	42	200	.01		133	7243	.12
112.2	115.0				930	.13				
115.0	116.4	3.0	2.6	87	959	.10	10	134	3833	.04
116.4	118.0				2065	.05				
118.0	119.4	1.4	1.2	86						
119.4	123.0	3.6	3.2	89	2479	.04		135	4756	.04
123.0	127.0	4.0	4.0	100	3361	.19	14	136	5151	.11
127.0	128.9	5.0	4.6	92	1991	.05		137	5862	.05
128.5	130.5				561	.28				
130.5	132.0				1195	.03				
132.0	134.0	2.0	1.3	65	2485	.05	15	133	3301	.09
134.0	136.3	2.3	1.8	78						
136.3	141.3	5.0	4.9	98	3877	.06		139	0	.00
141.3	143.0	1.7	1.0	59	723	.13	10	140	7924	.11
143.0	146.0	3.0	.5	17	358	.01				
146.0	147.0	1.0	.7	70	513	.03				
147.0	148.6	1.6	1.2	75	971	.04	10	141	4345	.07
148.6	150.0	1.4	1.3	93	977	.12				
150.0	152.1	7.0	5.1	73	1085	.13		142	4145	.08
152.1	154.7				1544	.04				
154.7	157.0				732	.04				

TABLE 12. - Diamond-drill sampling data, hole 107

Hole 107
Location: Camp Creek, Lost River valley
Coordinates: Lat. 2541 N; Dep. 7261 E
Collar elevation: 518
Bearing:
Dip: Vertical

Hole size:
NX: 14
BXHL: 184
AX:
Total depth: 198
Dates drilled: 7/29-7/31/64

Drill hole footage			Core recovery		Core assay, percent		Sludge		
From	To	Dist.	Feet	Percent	Grams	Scan nBeO	Fluorite	Sample No.	Weight, grams	Scan nBeO percent
0.0	14.0	14.0			1525	0.00	35			
14.0	16.0	2.0	1.6	80	1322	.20	15	143	6628	0.12
16.0	16.7)	4.0	3.8	95	635	.23				
16.7	19.0)				1783	.02				
19.0	19.7)				511	.34				
19.7	20.0)				216	.04				
20.0	22.0	2.0	1.3	65	927	.03		144	4755	.01
22.0	24.0	2.0	2.0	100	1503	.02				
24.0	25.2)	4.0	2.0	50	833	.25	30	145	6142	.07
25.2	28.0)				735	.16				
28.0	28.6)	4.0	3.8	90	410	<.01		146	5492	.22
28.6	32.0)				2743	.23				
32.0	35.2)	5.0	4.8	96	2269	<.01	20	147	6431	.13
35.2	37.0)				1625	.12				
37.0	37.6)	2.0	1.0	50	276	.05		148	6457	.10
37.6	39.0)				572	.14				
39.0	42.0	3.0	1.7	57	1308	.11				
42.0	43.3	1.3	.5	38	422	.22	20	149	6698	.11
43.3	44.0	.7	.7	100)	1833	.17				
44.0	45.0	1.0	.9	90)						
45.0	46.0)	2.0	1.7	85)						
46.0	47.0)				619	.01				
47.0	48.7	1.7	.9	53	673	.17		150	5634	.03
48.7	52.0	3.3	3.3	100	2740	.01				
52.0	53.5	1.5	.9	60)	2115	.11	5	151	7606	.06
53.5	55.0)	2.2	1.8	82)						
55.0	55.7)		)		873	.07				
55.7	57.0	1.3	1.2	93)						
57.0	59.0	2.0	1.7	85)	2557	.05		152	4546	.04
59.0	60.6)	3.0	3.0	100)						
60.6	62.0)				1277	.16				
62.0	63.0)	10.3	9.8	98	620	.09	20	153	10098	.15
63.0	64.6)				1031	.16				
64.6	65.7)				804	.04				
65.7	68.1)				1944	.03				
68.1	70.8)				2779	.24				
70.8	72.0)				679	.04				

TABLE 12. - Diamond-drill sampling at Mt. Hope 107 (continued)

Drill Hole Footage From	To	Dist.	Core Recovery Feet	Per-cent	Grams	Assay, Percent Scan nBs0	Bluebite	Sludge Sample No.	Weight, grams	Scan nBs0 percent
72.0	74.2)	5.0	5.0	100	1687	0.05	35	154	7904	0.18
74.2	77.0)				2538	.59				
77.0	78.0)	5.0	4.9	98	633	.30		155	4337	.08
78.0	80.7)				2261	.11				
80.7	82.0)				918	.21				
82.0	82.8)	5.0	5.0	100	655	.03	15	156	3137	.03
82.8	83.6)				714	.13				
83.6	87.0)				2838	.03				
87.0	88.7)	5.0	4.7	94	1461	.22		157	5156	.11
88.7	91.5)				2832	.03				
91.5	92.0)				300	.34				
92.0	94.0)	5.0	5.0	100	1798	.60	40	158	9008	.22
94.0	94.8)				640	.11				
94.8	95.7)				741	.14				
95.7	96.9)				904	.03				
96.9	97.0)				157	.22				
97.0	97.2)	5.0	5.0	100	154	.24		159	5547	.11
97.2	102.0)				3693	.11				
102.0	102.3)	5.0	5.0	100	246	.14	40	160	3465	.28
102.3	103.6)				1061	.45				
103.6	104.5)				632	.14				
104.5	105.2)				652	.24				
105.2	105.8)				474	.08				
105.8	107.0)				1139	.43				
107.0	107.3)	5.0	1.1	22	238	.08		161	6409	.10
107.3	108.3)				596	.03				
108.3	109.5)				734	.32				
109.5	112.0)				1980	.04				
112.0	117.0	5.0	4.9	98	4058	.14	25	162	5793	.11
117.0	122.0	5.0	4.8	96	4040	.09		163	6775	.08
122.0	123.3)	5.0	5.0	100	965	.05	15	164	6447	.05
123.3	127.0)				2894	.04				
127.0	130.0	3.0	2.8	93	2095	.03		165	6628	.06
130.0	132.0	2.0	1.6	80	1214	.16				
132.0	136.0	4.0	3.9	97	2957	.10	25	166	4839	.11
136.0	138.8)	3.5	2.1	60	1273	.24		167	6939	.12
138.8	139.5)			)	1828	.09				
139.5	142.0	2.5	1.8	72)						
142.0	145.0)	3.5	3.4	97	2888	.09	25	168	4539	.09
145.0	145.5)				522	.24				
145.5	147.5	2.0	1.5	75	1110	.16				
147.5	151.5	4.0	2.5	63	1902	.10		169	7862	.19

TABLE 12. - Diamond-drill [illegible] data, hole 107 (continued)

Drill Hole Footage			Core Recovery			Core Anal., Percent		Sluice		
From	To	Dist.	Feet	Percent	Grams	Seam nBeO	Fluorite	Sample No.	Weight, grams	Seam nBeO percent
151.5	152.6)	3.0	2.6	87	718	0.26	15	170	2452	0.04
152.6	154.5)				2286	.08				
154.5	158.0	3.5	2.0	57	1467	.01		171	4735	.05
158.0	162.0	4.0	1.9	48	1422	.08		172	5505	.07
162.0	163.4	1.4	1.1	79)	4241	.23	30	173	7251	.15
163.4	168.0	4.6	4.5	98)						
168.0	168.5)	4.0	3.2	80	315	.28		174	2994	.09
168.5	172.0)				2281	.09				
172.0	174.0	2.0	1.3	65)	2198	.04	3	175	6094	.04
174.0	177.0	3.0	1.9	63)						
177.0	179.2	2.2	1.1	50	886	.03		176	4596	.03
179.2	182.6	3.4	2.4	71	1666	<.01				
182.6	185.0	2.4	1.8	42	600	.01		177	2969	.02
								178	280	.03
185.0	186.0	1.0	0.0	0	0			179	1818	.11
186.0	187.2	1.2	1.0	83	737	.09	45	180	5939	.12
187.2	188.0	.8	.6	75	378	.07				
188.0	191.0	3.0	1.8	60	1283	.22				
191.0	192.0	1.0	.8	80	552	.05	15	181	4063	.09
192.0	192.4)	.7	.7	100	298	.04				
192.4	192.7)				237	.66				
192.7	194.5	1.8	1.3	72)	1268	.11				
194.5	198.0	3.5	.9	26)				182	4938	.06

TABLE 16. - Diamond-drill sampling data, hole 103

Hole 103
Location: Camp Creek, Lost River valley
Coordinates: Lat. 2022 N; Dep. 6000 E
Collar elevation: 455
Bearing: N 15° E
Dip: -70°

Hole size:
NX: 15
BXWL: 197
AX:
Total depth: 210
Dates drilled: 8/1-8/6/64

Drill Hole Footage			Core Recovery		Core	Core Assay, percent		Sludge		
From	To	Dist.	Feet	Per-cent	Gross	Scan nBeO	Fluorite	Sample No.	Weight, grams	Scan nBeO percent
0.0	10.0	10.0	0.0	0						
10.0	10.3)	5.0	1.0	20	210	0.19	35	183	1346	0.05
10.3	15.0)				400	.15				
15.0	15.7)	3.0	2.2	73	478	.12				
15.7	18.0)				1172	.08				
18.0	20.0	2.0	1.3	65	572	.06				
20.0	25.0	5.0	4.0	80	3204	.04	7	184	1932	.04
25.0	27.5	2.5	1.8	72	1427	.05		185	2246	.05
27.5	30.3	2.8	2.4	86	1531	.07				
30.3	32.4	2.1	1.3	62	846	.21	15	186	2159	.09
32.4	33.0	.6	.6	100)	2777	.07				
33.0	36.5	3.5	2.0	80)						
36.5	38.5	2.0	1.1	55	1711	.07		187	4206	.04
38.5	42.0	3.5	3.0	86	2116	.02				
42.0	46.5	4.5	2.4	53	2646	.11	15	188	4007	.10
46.5	50.0	3.5	3.1	89	2273	.07		189	6916	.05
50.0	52.0	2.0	2.0	100	1502	.01				
52.0	57.0	5.0	4.7	94	3556	.02	5	190	2864	.05
57.0	59.0	2.0	2.0	100)	3773	.03		191	4257	.04
59.0	62.0	3.0	2.9	97)						
62.0	67.0	5.0	5.0	100	4123	<.01	20	192	4101	.04
67.0	69.7)	5.0	4.2	84	2111	.02		193	4442	.32
69.7	72.0)				1156	.51				
72.0	74.2	2.2	2.2	100	1496	.01	10	194	4896	.06
74.2	77.6	3.4	3.2	94	2500	.02				
77.6	79.7)	4.4	4.3	98	1506	.08		195	3483	.11
79.7	81.0)				1052	.23				
81.0	82.0)				794	.02				
82.0	87.0	5.0	5.0	100	3033	.02	13	196	2397	.05
87.0	89.0	2.0	1.5	75	1198	.02		197	2103	.07
89.0	90.4	1.4	1.3	93)	1467	.13				
90.4	91.0	.6	.6	100)						
91.0	93.0	2.0	2.0	100)	1156	.05	3	198	1079	.03
93.0	95.0	2.0	2.0	100)						
95.0	99.4	4.4	3.6	82	2873	.05				
99.4	101.0	1.6	1.1	69)	2210	.03		199	3224	.04
101.0	102.5	1.5	1.5	100)						
102.5	104.5	2.0	1.5	75)						

TABLE 13. - [illegible] from hole 103 (continued)

Drill hole footage			Core			Assay, percent		Core		
From	To	Feet	Feet	Percent	Copper	Beam mass	Pluorite	Sample No.	Weight, grams	Beam mass percent
104.5	106.5	2.0	1.5	75	1134	0.04	5	203	3108	0.03
106.5	108.5	2.0	2.0	100	1110	.12				
108.5	112.0	3.5	3.1	89	2468	.04		201	2052	.03
112.0	114.0	2.0	2.0	100	1717	.05		202	4965	.13
114.0	115.0	1.0	.6	60	611	.03	27			
115.0	120.0	5.0	3.8	76	2137	.07				
120.0	122.0	2.	2.0	100)	3514	.11		203	2700	.09
122.0	124.0	2.0	2.0	100)						
124.0	129.0	5.0	5.0	100	3057	.03	6	204	3530	.08
129.0	132.0	3.0	2.9	97)	3580	.10		205	6262	.07
132.0	135.5)	5.0	5.0	100)						
135.5	137.0)				952	.05				
137.0	140.0)	5.0	4.6	92	2250	.03	3	206	3054	.05
140.0	142.0)				1390	.04				
142.0	147.0	5.0	4.7	94	3012	.03		207	3952	.04
147.0	148.0)	5.0	4.8	96	507	.09	15	208	3599	.11
148.0	149.1)				719	.11				
149.1	152.0)				1998	.11				
152.0	157.0	5.0	5.0	100	3923	.10		209	3925	.07
157.0	162.0	5.0	4.4	88	3158	.04	9	210	3488	.04
162.0	166.5)	5.0	4.3	86	2801	.05		211	3567	.09
166.5	167.0)				113	.03				
167.0	170.5)	5.0	4.3	86	1366	.04	8	212	2904	.10
170.5	172.0)				1022	.10				
172.0	177.0	5.0	3.8	76	2547	.03		213	2575	.04
177.0	180.5	3.5	1.7	49	1011	.12	25	214	1737	.12
180.5	182.5	2.0	1.9	95	1208	.03				
182.5	186.0	3.5	2.1		1362	.32	55	215	1208	.19
186.0	190.0	4.0	2.3	57	1405	.06	.15	216	1305	.07
190.0	191.0	1.0	1.0	100)	1068	.06	4	217	3032	.05
191.0	191.7)	3.0	3.0	100)						
191.7	194.0)				1508	.03				
194.0	196.0	2.0	1.0	50	950	.03		218	2106	.03
196.0	201.0	5.0	4.2	84	3107	.04				
201.0	205.0	4.0	1.7	42	1074	.03				
205.0	208.0	3.0	2.3	77	1645	.04				
208.0	210.0	2.0	2.0	100	1821	.03				

TABLE 14. - [illegible] hole 10[illegible]

Hole 10[illegible]
Location: Camp Creek, Lost River valley
Coordinates: Lat. 2300 N; Dep. 7696 E
Collar elevation: 400
Bearing: N 16° E
Dip: -30°

Hole size:
NX: 20
BXM: 137
AX: 33
Total depth: 190
Dates drilled: 8/6-8/9/64

Drill hole footage			Core Recovery		Core [illegible]			Sludge		
From	To	[illegible]	Feet	Percent	Grams	Scan BeO	Fluorite	Sample No.	Weight, grams	Scan BeO percent
0.0	20.0	20.0	0.0	0						
20.0	25.0	5.0	1.2	30	752	<0.01	Trace			
25.0	30.0	5.0	.3	6	175	<.01		221	3052	0.05
30.0	32.0	2.0	.8	40)	693	.11	2	222	13450	.11
32.0	34.0)	3.0	.8	27)						
34.0	35.0)				280	.04				
35.0	36.0	1.0	.5	50)	2043	.04		223	5501	.03
36.0	40.0	4.0	2.2	55)						
40.0	41.5)	2.0	1.3	65	720	.06	15	224	6649	.20
41.5	42.0)			)	2273	.03				
42.0	45.0)	4.0	3.4	85)						
45.0	46.0)				697	.03				
46.0	50.0	4.0	3.9	98	2093	.04		225	7344	.23
50.0	52.0	2.0	1.5	75	1134	1.03	34	226	2574	.12
52.0	52.3)	5.0	3.7	74	225	.22				
52.3	57.0)				2716	.03				
57.0	57.8)	3.0	2.3	77	500	[illegible]	35			
57.8	59.7)				515	.22				
59.7	60.0)				815	.11				
60.0	61.3)	3.0	2.6	87	968	.23				
61.3	63.0)				1100	.34				
63.0	63.6)	5.0	3.7	86	511	.02	30	228	3248	.32
63.6	64.0)				410	.50				
64.0	68.0)				1670	.19				
68.0	69.7)	4.0	3.4	85	1240	.72		229	1584	.09
69.7	72.0)				1633	.67				
72.0	74.0	2.0	1.3	65)	1556	.39	50	230	3073	.32
74.0	76.0	2.0	1.0	50)						
76.0	77.2)	4.0	3.3	83	953	.34		231	2495	.13
77.2	80.0)				1020	.05				
80.0	80.[illegible])	2.0	1.5	75	596	.13	15	232	4078	.10
80.[illegible]	82.0)			)	957	.25				
82.[illegible]	82.6)	5.0	4.6	92)						
82.6	87.0)				2091	.02				
87.0	90.0	3.0	2.3	77)	1337	.02		233	3390	.14
90.0	91.3)	3.5	2.8	80)						
91.3	93.5)				1580	.34				

TABLE 14. - Chemical data on drill core from hole DH-2 (continued)

Drill hole features			Recovery			Data			Cores		
				Per-		Assay, percent					
From	To	Dist.	Feet	cent	Grams	Scan nBeO	Fluorite	Sample No.	Weight, grams	Scan nBeO percent
93.5	94.0	5.0	4.6	92	376	0.10	35	234	2613	0.10
94.0	98.5				3247	.07				
98.5	102.0	5.0	2.7	54	1100	.11		235	3137	.11
102.0	103.5				902	.05				
103.5	106.0	2.5	1.2	48	810	.25	35	236	2208	.11
106.0	108.0	2.0	1.3	65	890	.03				
108.0	111.4	5.0	4.2	84	2702	.03		237	1515	.09
111.4	113.0				1213	.14				
113.0	118.0	5.0	4.4	88	3079	.00	70	238	3892	.35
118.0	123.0	5.0	5.0	100	4034	.39		239	1723	.35
123.0	124.2	5.0	4.9	98	1040	.13	20	240	1571	.11
124.2	128.0				2900	.05				
128.0	129.7	2.0	1.8	90	1232	.05		241	2228	.06
129.7	130.0				231	.12				
130.0	135.0	5.0	5.0	100	4254	.01				
135.0	140.0	5.0	4.1	82	3240	.02	8	242	1500	.03
140.0	141.1	5.0	4.9	98	727	.01		243	1706	.06
141.1	141.8				497	.10				
141.8	144.6				2043	.04				
144.6	145.0				700	.12				
145.0	145.2	4.0	3.8	95	90	.20	5	244	1148	.05
145.2	149.0				2407	.03				
149.0	154.3	6.0	5.3	94	3313	.00	15	245	1038	.04
154.3	155.0				658	.42				
155.0	156.4	4.0	1.9	95	1046	.38	30			
156.4	157.0				355	.16				
157.0	161.0	5.0	4.2	84	2103	.04	20	246	2218	.07
161.0	162.0				825	.15				
162.0	162.6	5.0	4.4	88	379	.21				
162.6	166.0				1903	.12				
166.0	167.0				429	.20				
167.0	167.9	4.0	2.0	50	407	.17	20	247	1813	.09
167.9	171.0				720	.04				
171.0	173.0	4.0	2.5	62	1346	.07	2	248	1220	.06
173.0	175.0									
175.0	178.0	3.0	1.5	50	750	<.01		249	2127	.03
178.0	180.0	2.0	1.5	75	805	.03				
180.0	185.0	5.0	2.6	52	1622	.03	3	250	1810	.03
								251	2046	.04
185.0	190.0	5.0	3.1	62	1520	.02		252	2107	.06

TABLE 15. - [illegible] hole 110

Hole 110
Location: Camp Creek, [illegible] River valley
Coordinates: Lat. [illegible]7 N; Dep. 2059 E
Collar elevation: 445
Bearing: N 15° E
Dip: -[illegible]°

Hole size:
[illegible]: 10
[illegible]: 94
[illegible]: 46
Total depth: 150
Dates drilled: 8/10-8/12/64

Drill hole footage			Core [illegible]					Sludge		
From	To	Dist.	Feet	Percent	Count	[illegible]	[illegible]	Sample No.	Weight, grams	Scan [illegible] percent
0.0	5.0	5.0	0.0	0	0					
5.0	10.0	5.0	1.7	35	0					
10.0	12.5	2.5	1.8	72	1117	0.07	25	253	4203	0.20
12.5	13.0	4.5	2.4	53	954	.09				
13.0	17.0				1113	.15				
17.0	22.0	5.0	4.7	94	3704	.03	1	254	4250	.03
22.0	24.0	3.0	2.5	84	1195	.41	45	255	1020	.16
24.0	25.0				783	.04				
25.0	30.0	5.0	4.3	86	3400	<.01	.5	256	5162	.02
30.0	32.0	2.0	1.7	85	1395	.03	15	257	4036	.24
32.0	33.0	1.0	.6	60	371	.56				
33.0	36.0	3.0	2.0	67	2100	<.01				
36.0	39.0	[illegible]	3.0	100	1951	.01	1	258	4150	.05
39.0	41.5	2.5	1.9	76						
41.5	47.0	5.5	5.0	91	4027	.01		259	2043	.02
47.0	52.0	5.0	5.0	100	4015	<.01	3	260	1109	.12
52.0	57.0	5.0	4.4	88	[illegible]	.06		261	3518	.03
57.0	62.0	5.0	5.0	100	4004	.02	2	262	3796	.03
62.0	64.2	5.0	5.0	100	1910	.11	15	263	4409	.09
64.2	67.0				2400	.11				
67.0	72.0	5.0	4.8	96	2340	.11		264	4625	.10
72.0	73.0	5.0	4.9	98	1540	.54	45	265	3572	.25
73.0	77.0				2042	.17				
77.0	80.1	5.0	4.8	96	3405	.10	15	266	3073	.06
80.1	82.0				1011	.04				
82.0	87.0	5.0	5.0	100	4128	.02		267	2877	.03
87.0	92.0	5.0	4.7	94	3888	.11	15	268	4405	.10
92.0	94.0	5.0	5.0	100	1895	.31	80	269	5830	.13
94.0	97.0				2462	.07	3			
97.0	102.0	5.0	4.7	94	3813	.06	4	270	2682	.05
102.0	104.0	2.0	2.0	100	1774	.04	2	271	1774	.06
104.0	104.4	5.0	3.4	68	920	.02				
104.4	109.0				1691	.07	5			
109.0	114.0	5.0	5.0	100				272	1010	.05
114.0	119.0	5.0	4.0	80				273	1484	.03
119.0	124.0	5.0	2.0	40				274	2500	.02

TABLE 15. - [illegible] hole 110 (continued)

Drill hole footage: From	To	Dist.	Core: Recovery: Feet	Per-cent	Grams	Core: [illegible]: Sample No.	[illegible]	Sludge: Sample No.	Weight, grams	Scan nBeO percent
124.0	126.0	2.0	1.1	55				275	1207	0.05
126.0	130.0	4.0	3.8	95						
130.0	135.0	5.0	5.0	100				276	2223	.05
135.0	140.0	5.0	4.4	88				277	2384	.01
140.0	145.0	5.0	4.7	94				278	2716	.02
145.0	150.0	5.0	4.8	96				279	2676	.01

TABLE [illegible]. - [illegible] Hole 111

Hole 111
Location: Camp Creek, Lost River valley
Coordinates: [illegible] 2713 N; Dep. 7043 E
Collar elevation: 461
Bearing: [illegible] 10° [illegible]
Dip: -43°

Hole size:
[illegible]: 10
[illegible]: 197
[illegible]:
[illegible]: 207
Dates drilled: [illegible]-8/24/64

Drill Hole Footage			[illegible]			[illegible]		Sludge		
From	To	Dist.	[illegible]	[illegible]	[illegible]	Scan [illegible]	[illegible]	Sample No.	Weight, grams	Scan BeO percent
0.0	10.0	10.0	0.0	0	0					
10.0	15.0	5.0	1.7	34	1360	0.10	9	280	5934	0.10
15.0	20.0	5.0	1.1	22	757	.0[illegible]		281	6270	.05
20.0	25.0	5.0	3.2	64	[illegible]	[illegible]	4	282	3914	.09
25.0	30.0	5.0	4.4	88	3600	.04		283	7015	.07
30.0	35.0	5.0	3.5	70	2[illegible]	.20	30	284	4753	.13
35.0	40.0	5.0	3.4	60	[illegible]	.17		285	5728	.17
40.0	45.0	5.0	4.1	82	3141	.10	20	286	4127	.13
45.0	50.0	5.0	3.9	78	2[illegible]	.05	4	287	4043	.06
50.0	55.0	5.0	3.[illegible]	60	2[illegible]	.0[illegible]		288	2784	.08
55.0	60.0	[illegible]	2.4	4[illegible]	1[illegible]		30	289	4429	.0[illegible]
60.0	62.0	2.0	1.2	60	6[illegible]	.[illegible]	20	290	2[illegible]	.10
62.0	67.5	5.5	5.5	100	4[illegible]	.[illegible]				
67.5	69.1)	5.0	5.0	100	[illegible]	.[illegible]	13	291	2[illegible]	.07
69.1	69.6)				2[illegible]	.[illegible]				
69.6	72.5)				2[illegible]	.[illegible]				
72.5	75.[illegible]	5.0	4.7	94	2[illegible]	.[illegible]		292	3337	.08
75.5	75.9)				[illegible]	.[illegible]				
75.9	77.5)				11[illegible]	.07				
77.5	82.5	5.0	4.8	96	[illegible]	.10	15	293	2[illegible]	.[illegible]
82.5	88.0	5.5	5.6	9[illegible]	4[illegible]	.08		294	3345	.10
88.0	93.0	5.0	4.6	92	3[illegible]	.08	4	295	2771	.08
93.0	98.0	5.0	5.0	100	3[illegible]	.0[illegible]		296	[illegible]25	.08
98.0	101.8)	[illegible]	5.0	100	[illegible]	.07	4	297	3236	.07
101.8	103.0)				[illegible]	.0[illegible]				
103.0	108.0	5.0	4.[illegible]	9[illegible]	3[illegible]	.06		298	3457	.05
108.0	113.[illegible]	5.0	4.[illegible]	9[illegible]	3[illegible]	.05	8	299	[illegible]	.0[illegible]
113.0	118.0	5.0	4.8	96	[illegible]	.0[illegible]		300	3640	.06
118.0	123.0	5.0	4.[illegible]	9[illegible]	4025	.14	13	301	3370	.09
123.0	124.3)	5.0	4.9	[illegible]	[illegible]	.0[illegible]		302	3356	.09
124.3	125.4)				[illegible]	.19				
125.4	128.0)				214[illegible]	.[illegible]				
128.0	129.1)	5.0	5.0	100	[illegible]	.20	30	303	2470	.12
129.1	133.0)				3307	.14				

TABLE 10. - [illegible] (continued)

Drill Hole Footage			Core: Recovery			Core: Assay, Percent		Sludge		
From	To	Dist.	Feet	Per-cent	Grams	Iron [illegible]	Fluorite	Sample No.	Weight, grams	[illegible] percent
133.0	136.0	3.0	2.4	80	[illegible]	0.07	20	304	4744	0.08
136.0	140.0	4.0	3.8	[illegible]						
140.0	143.0	3.0	3.0	100	[illegible]	.10		305	4604	.10
143.0	148.0	5.0	4.4	88						
148.0	153.0	5.0	5.0	100	4076	.11	40	306	3682	.08
153.0	158.0	5.0	4.5	90	4681	.14		307	3221	.11
158.0	163.0	5.0	4.7	94	3000	.10	40	308	3287	.06
163.0	168.0	5.0	4.7	[illegible]	3033	.15		309	3469	.09
168.0	173.0	5.0	4.9	[illegible]	[illegible]	.10	35	310	3235	.11
173.0	178.0	5.0	4.5	90	3744	.19		311	3765	.12
178.0	180.0	2.0	1.3	(65)	[illegible]	.08	12	312	4414	.08
180.0	185.0	5.0	5.0	100						
185.0	187.5	2.5	1.7	68	2563	.14	5	313	4558	.06
187.5	190.0	2.5	2.0	80						
190.0	192.5	2.5	1.6	64	1099	.08	10	314	3124	.06
192.5	195.0	2.5	1.8	72	1255	.08				
195.0	196.0	5.0	3.7	74	[illegible]	.07		315	3731	.11
196.0	200.0				2200	.12	40			
200.0	202.6	5.0	5.0	100	1343	[illegible]		316	2975	.09
202.6	205.0				2023	[illegible]				
205.0	207.0	2.0	1.9	95	1420	.10		317	2007	.08

[illegible] Hole 112

Hole 112
Location: Camp Creek, Lost River valley
Coordinates: Lat. [illegible] N, Dep. [illegible] E
Collar elevation: [illegible]
Bearing: S 10° [illegible]
Dip: -[illegible]°

Hole size.
[illegible]: 10
[illegible]: 140
[illegible]: 22
Total depth: 173
[illegible]: [illegible]-6/15/64

Drill Hole Footage From	To	Feet	[illegible] Feet	Per-cent	[illegible]	[illegible]	[illegible]	Sample No.	Weight, grams	Scan eU3O8 percent
0.0	10.0	10.0	[illegible]	0						
10.0	11.0)	5.0	2.2	44	[illegible]	<0.01	10	318	5500	0.06
11.0	15.0)				[illegible]	.0[illegible]				
15.0	16.5	1.5	.8	5[illegible]	1400	.0[illegible]		319	7232	.07
16.5	17.5)	3.5	[illegible]	[illegible]						
17.5	20.0)				[illegible]	.0[illegible]				
20.0	24.5	4.5	[illegible].7	[illegible]	[illegible]	.0[illegible]	15	320	7363	.02
24.5	29.5	5.0	4.1	[illegible]	[illegible]	.0[illegible]		321	7042	.04
29.5	31.0)	5.0	4.3	[illegible]	[illegible]	.0[illegible]	25	322	[illegible]	.17
31.0	35.0)				[illegible]	.1[illegible]				
35.0	40.0	5.0	[illegible]	[illegible]	[illegible]	.0[illegible]	[illegible]	323	5783	.06
40.0	41.2	1.2	[illegible]	[illegible])	1104	[illegible]		324	[illegible]	.04
41.2	42.0)	5.0	[illegible]	[illegible])						
42.0	43.5)				[illegible]	<.0[illegible]				
43.5	44.1)				[illegible]	.0[illegible]				
44.1	45.0)				[illegible]	.0[illegible]				
45.0	49.[illegible])	6.0	5.[illegible]	9[illegible]	[illegible]	.0[illegible]	[illegible]	325	6978	.04
49.[illegible]	50.5)				[illegible]	.17				
50.5	51.0)				379	.1[illegible]				
51.0	56.0	5.0	5.0	100	[illegible]	[illegible]		326	5715	.02
56.0	61.0	5.0	5.0	100	[illegible]	.0[illegible]	[illegible]	327	6478	.05
61.0	66.0	5.0	5.0	100	3775	.0[illegible]		328	[illegible]	.05
66.0	69.5)	5.0	4.5	90	1945	.04	20	329	[illegible]	.11
69.5	71.0)				973	.17				
71.0	76.0	5.0	[illegible]	70	[illegible]	.0[illegible]		330	5298	.00
76.0	81.0	5.0	4.3	[illegible]	[illegible]	.0[illegible]	5	331	54[illegible]	.06
81.0	85.0)	5.0	[illegible]	70	2400	.10		332	[illegible]	.06
85.0	86.0)				[illegible]	.02				
86.0	91.0	5.0	3.3	66	[illegible]	.05	[illegible]	333	6276	.09
91.0	96.0	5.0	2.9	58	1770	.0[illegible]		334	4046	.05
96.0	101.0	5.0	5.0	100	[illegible]	.02	5	335	3556	.06
101.0	106.0	5.0	4.1	[illegible]	[illegible]	.0[illegible]		336	4737	.06
106.0	111.0	5.0	5.0	100	[illegible]	.0[illegible]	5	337	[illegible]	.05
111.0	116.0	5.0	4.7	94	3705	.04		338	1784	.05

TABLE 17. - [illegible] (continued)

Drill hole footage			Core recovery			Core analyses, percent		Sample		
From	To	Dist.	Feet	Per-cent	Grams	Scan. nDeO	Fluorite	Sample No.	Weight, grams	Scan nDeO percent
116.0	121.0	5.0	3.7	74	1001	0.11	20	339	1908	0.08
121.0	124.0	3.0	1.6	53	500	.04		340	1721	.05
124.0	129.0	5.0	2.2	44	1376	.12	20	341	2947	.15
129.0	133.0	4.0	2.5	63	1513	.03		342	1366	.07
133.0	136.0	3.0	1.7	57)	2553	.06	25	343	6645	.08
136.0	138.7	2.7	2.2	(81)						
138.7	139.3)	2.8	1.6	57	626	.10		344	7061	.07
139.3	141.5)			)	2094	.06				
141.5	144.5	3.0	2.0	67)						
144.5	148.2)	5.5	4.1	75	1998	.07	20	345	5150	.08
148.2	148.9)				647	.19				
148.9	150.0)				535	.15				
150.0	150.7	.7	.7	100)	2780	.11	15	346	10249	.03
150.7	153.2	2.5	1.5	60)						
153.2	158.0	4.8	1.8	38)						
158.0	161.0	3.0	3.0	100)	5506	.06	4	347	6470	.03
161.0	165.0	4.0	3.7	93)						
165.0	170.0	5.0	3.7	74	3256	.03		348	5586	.03

TABLE 17. - [illegible] drill [illegible] Hole 113

Hole 113
Location: Camp Creek, Lost River valley
Coordinates: Lat. 3027 N; Dep. 6000 E
Collar elevation: 547
Bearing: N 10° E
Dip: -70°

Hole size:
EX: 20
BXWL: 45
AX: 20
Total depth: 85
Dates drilled: 6/15-6/17/64

Drill hole footage From	To	Total	Core recovery Feet	Percent	Counts	BeO	[illegible]	Sample No.	Weight, grams	Scan BeO percent
0.0	10.0	10.0	1.5	15						
10.0	15.0	5.0	1.0	[illegible]	[illegible]	<0.01	0.5			
15.0	20.0	5.0	2.5	50	[illegible]	.[illegible]	15			
20.0	24.0	4.0	2.4	60	[illegible]	.14				
24.0	27.5	3.5	1.6	46	[illegible]	.25	[illegible]	349	4930	0.13
27.5	30.0	2.5	[illegible]	[illegible]	[illegible]	.21				
30.0	32.0	2.0	1.5	75	[illegible]	.07	15	350	[illegible]	.07
32.0	36.0	4.0	2.0	50	1146	.06				
36.0	36.5	.5	.5	100)	[illegible]	.09		351	5541	.12
36.5	40.0	3.5	[illegible]	100)						
40.0	43.0	[illegible]	3.0	100	[illegible]	.05	25	352	3008	.08
43.0	44.0)	5.0	[illegible]	[illegible]	[illegible]	.17				
44.0	45.5)				[illegible]	.70				
45.5	48.0)				[illegible]	.0[illegible]	29			
48.0	52.0	4.0	[illegible]	[illegible]	[illegible]	.[illegible]		353	[illegible]	.19
52.0	53.7)	5.0	5.0	100	[illegible]	.0[illegible]	15	354	2216	.03
53.7	55.7)				1007	.0[illegible]				
55.7	57.0)				[illegible]	.0[illegible]				
57.0	59.0	2.0	[illegible]	[illegible])	3255	.01	1	355	1443	.02
59.0	62.0	3.0	2.0	[illegible])						
62.0	65.0	3.0	1.7	57	1344	<.01		356	503	.01
65.0	70.0	5.0	1.3	[illegible]	611	.01	1	357	[illegible]	.04
70.0	75.0	5.0	3.4	60	2030	.04		358	[illegible]	.01
75.0	80.0	5.0	3.9	70)	2002	.02	6	359	1497	.03
80.0	85.0	5.0	1.4	28)				360	1071	.03

[illegible]

Three diamond-drill holes in the Boundary Zone cross cut a section across the Rapid River Pride Zone. The original plan was to drill one long hole, but the ground conditions encountered made it more practical to drill a series of short holes. Hole locations are shown on figure 3; drill-hole logs and analyses are given in tables 19 through 21. A series of additional chemical analyses are in table 22.

TABLE 13. - Diamond-drill core-hole data, Hole 114

Hole 114
Location: Bertie-Maple area, Lost River valley (Fig. 3)
Collar elevation: 555
Bearing: N 15° W
Dip: -65°

Hole size:
NX: 15
BNTL: 77
AX: 60
Total depth: 152
Dates drilled: 8/17-8/21/64

Drill Hole Footage			Core Footage			Assays, Percent			Sludge		
From	To	Feet	Rock	Sulfide zone	Grams	Scan nReO	Mineralogy		Sample No.	Weight, grams	Scan nReO percent
0.0	15.0	15.0	1.5	10							
15.0	17.0	2.0	1.8	90					361	4376	0.04
17.0	19.5	2.5	1.1	44							
19.5	21.0	1.5	1.0	67							
21.0	23.0	2.0	1.8	90					362	3563	.04
23.0	26.5	3.5	2.2	63							
26.5	29.5	3.0	2.5	83					363	2287	.04
29.5	32.0	2.5	2.5	100							
32.0	33.5	1.5	1.5	[illegible]					364	3497	.02
33.5	34.5	1.0	1.0	100							
34.5	37.0	2.5	1.0	40							
37.0	40.0	3.0	1.0	33					365	4076	.01
40.0	42.0	2.0	.6	30							
42.0	43.5	1.5	1.0	67					366	3182	.02
43.5	46.0	2.5	1.9	76							
46.0	48.5	2.5	2.4	96					367	2923	.02
48.5	50.0	1.5	.7	47							
50.0	52.0	2.0	1.9	95	5552	0.03		15	368	3868	.09
52.0	57.0	5.0	4.6	92							
57.0	58.5	1.5	1.3	87	3431	.04		2	369	3782	.05
58.5	60.0	1.5	1.1	74							
60.0	62.0	2.0	2.0	100							
62.0	64.0	2.0	1.9	95	3091	<.01			370	5787	.03
64.0	65.5	1.5	.7	47							
65.5	69.3	3.8	2.4	63							
69.3	72.0	2.7	1.0	37	888	.05		7	371	3563	.05
72.0	74.6	2.6	1.4	54	1003	.05					
74.6	77.0	2.4	2.3	96	1757	.14			372	3804	.07
77.0	78.1	4.0	2.1	53	641	.02					
78.1	81.0				964	.01		9			
81.0	83.4	2.4	.8	33	476	.07			373	3564	.09
83.4	85.0	1.6	1.2	75	914	.11		8			
85.0	88.0	3.0	.8	27	805	.06					
88.0	89.0	1.0	.7	70	503	.03					
89.0	90.0	1.0	1.0	100	700	.04					
90.0	92.0	2.0	1.1	55	931	.08					

TABLE 19. - Diamond-drill sampling data, hole 114 (continued)

Drill Hole Footage			Core					Sludge		
			Recovery			Assay, Percent				
From	To	Dist.	Feet	Percent	Grams	Scan nBeO	Fluorite	Sample No.	Weight, grams	Scan nBeO percent
92.0	97.0	5.0	1.7	34	1093	0.13	40	374	1982	0.09
97.0	102.0	5.0	1.1	22	788	.16	60	375	4523	.14
102.0	107.0	5.0	1.4	28	874	.20		376	2978	.11
107.0	112.0	5.0	2.4	48	1546	.05	55	377	4733	.10
112.0	117.0	5.0	2.5	50	1793	.17	55	378	3237	.11
117.0	120.0	3.0	2.4	80	1664	.08	45	379	1914	.09
120.0	122.0	2.0	.8	40	595	.04	55			
122.0	124.0	2.0	0.0	0				380	3428	.17
124.0	126.0	2.0	.4	20	195	.06	70			
126.0	130.0	4.0	.1	2	39	<.15	65	381	4150	.21
130.0	131.0	1.0	.4	40	1091	.06	20	382	4477	.11
131.0	136.0	5.0	1.4	28						
136.0	141.0	5.0	2.1	42	1184	.07	8	383	3006	.08
141.0	146.0	5.0	2.3	46	1245	.05		384	2207	.08
146.0	151.0	5.0	1.0	20	559	.15	10	385	4524	.10
151.0	152.0	1.0	.5	50	289	.14				

TABLE 20. - Diamond-drill sampling data, hole 115

Hole 115
Location: Bessie-Maple area, Lost River valley (fig. 3)
Collar elevation: 350
Bearing: N 15° W
Dip: -45°

Hole size:
NX: 16
BXWL: 69
AX:
Total depth: 85
Dates drilled: 8/21-8/23/64

Drill Hole Footage From	To	Dist.	Core Recovery Feet	Per-cent	Grams	Assay, Percent Scan nBeO	Fluorite	Sludge Sample No.	Weight, grams	Scan nBeO percent
0.0	16.0	16.0	0.0	0						
16.0	17.0	2.0	1.0	50	332	0.06	45	386	5688	0.17
17.0	18.0				274	.16				
18.0	20.0	2.0	.8	40	622	.04				
20.0	20.5	.5	.4	80	233	.16		387	3867	.23
20.5	21.0	3.5	1.6	46	537	.73				
21.0	24.0				526	.05	15			
24.0	26.0	2.0	.4	20	1485	.15		388	4033	.13
26.0	27.0	1.0	.9	90						
27.0	28.0	1.0	.5	50						
28.0	29.0	1.0	.7	70						
29.0	31.0	2.0	1.2	60	732	.23	25	389	2327	.10
31.0	32.0	1.0	.4	40	231	.10				
32.0	32.3	1.5	1.4	93	154	.07				
32.3	33.5				800	.07				
33.5	35.0	1.5	1.1	73	728	.14	31			
35.0	37.0	2.0	1.6	80	1123	.10				
37.0	40.0	3.0	1.2	40	850	.15	60	390	8627	.21
40.0	42.0	2.0	1.5	75	1331	.10				
42.0	44.5	2.5	1.6	64	1155	.03		391	5153	.06
44.5	47.0	2.5	.8	32	583	.02				
47.0	50.0	3.0	.7	23	372	<01	10	392	7597	.03
50.0	53.0	3.0	0.0	0						
53.0	55.0	2.0	.5	25	296	.05	65	393	10176	.20
55.0	57.5	2.5	.5	20	282	.21	65			
57.5	58.5	1.0	.4	40	276	.53	70	394	5449	.36
58.5	60.0	1.5	.7	47	448	.17				
60.0	61.0	1.0	.5	50	250	.38				
61.0	62.0	1.0	.2	20	99	.40		395	10633	.20
62.0	63.5	1.5	.1	7	89	.37				
63.5	64.0	.5	.1	20	25	.30				
64.0	64.5	.5	.3	60	183	.10	13			
64.5	65.0	.5	.1	20	82	.22				
65.0	65.5	.5	.2	40	99	.14				

TABLE 20. - Diamond-drill sampling data, hole 115 (continued)

Drill Hole Footage			Core					Sludge		
			Recovery			Assay, Percent				
From	To	Dist.	Feet	Percent	Grams	Scan BeO	Fluorite	Sample No.	Weight, grams	Scan BeO percent
65.5	67.0	1.5	1.2	80	582	<0.01		396	2842	0.11
67.0	68.0	1.0	.8	80	264	.04				
68.0	69.5	1.5	.5	33	326	.79	75			
69.5	70.5	1.0	.7	70	386	.25		397	3973	.14
70.5	72.0	1.5	1.0	67	794	.31				
72.0	73.0	1.0	.8	80	498	.29				
73.0	75.0	2.0	1.0	50	710	.33				
75.0	75.5	.5	.3	60	200	.45		398	4282	.11
75.5	76.0	.5	0.0	0						
76.0	77.0	1.0	0.0	0						
77.0	79.0	2.0	0.0	0						
79.0	82.0	3.0	.8	27	340	.04	4	399	3343	.13
82.0	85.0	3.0	1.2	40	466	.01				

TABLE 21. - Diamond-drill sampling data, hole 116

Hole 116
Location: Bessie-Maple area, Lost River valley (fig. 3)
Collar elevation: 335
Bearing: N 15° W
Dip: -40°

Hole size:
NX: 10
BXWL: 80
AX: 72
Total depth: 162
Dates drilled: 8/23-8/25/64

Drill Hole Footage			Core					Sludge		
			Recovery			Assay, Percent				
From	To	Dist.	Feet	Percent	Grams	Scan nBeO	Fluorite	Sample No.	Weight, grams	Scan nBeO percent
0.0	16.0	16.0	1.6	10						
16.0	18.0	2.0	.5	25	190	0.04	3	400	726	0.03
18.0	20.0	2.0	.8	40	445	.03				
20.0	22.0	2.0	.5	25	606	.01		401	6258	.06
22.0	25.0	3.0	.7	23						
25.0	27.5	2.5	.8	32	1465	<01	Trace	402	6869	.05
27.5	30.0	2.5	1.5	60						
30.0	33.0	3.0	.4	13	536	<01		403	892	.04
33.0	37.5	4.5	.5	11						
37.5	40.0	2.5	.5	20	276	.02	6			
40.0	41.0	1.0	.5	50	318	<01		404	8243	.04
41.0	42.5	1.5	.1	67						
42.5	44.0	1.5	0.0	0						
44.0	49.0	5.0	.8	16	464	<01	.5	405	9395	.11
49.0	51.6	2.6	1.4	54	927	<01		406	10722	.04
51.6	55.5	3.9	1.2	31	762	<01	Trace			.05
55.5	60.0	4.5	1.1	25	666	<01		407	8547	.04
60.0	62.5	2.5	1.2	48	1872	.01	5	408	8940	.04
62.5	68.0	5.5	1.6	29						
68.0	73.0	5.0	.8	16	408	.10		409	4109	.07
73.0	78.0	5.0	.7	14	324	.06	13	410	4586	.05
78.0	82.0	4.0	1.7	42	1154	.01				
82.0	86.0	4.0	1.7	42	974	.01		411	316	.02
86.0	90.0	4.0	.8	20	568	<01	1			
90.0	92.5	2.5	.5	20	205	.01		412	2944	.04
92.5	96.0	3.5	.2	6	102	<01				
96.0	100.0	4.0	1.1	28	563	.01	Trace	413	1312	.02
100.0	104.0	4.0	.8	20	391	.03		414	549	.01
104.0	107.0	3.0	.7	23	881	.01	4	416	305	<01
107.0	109.0	2.0	1.1	35						
109.0	113.0	4.0	3.4	85	1804	<01				
113.0	118.0	5.0	2.0	40	1118	.01				
118.0	120.0	2.0	.2	10	112	.37	75			
120.0	122.0	2.0	0.0	0						
122.0	124.0	2.0	.4	20	215	.10				

TABLE 21. - Diamond-drill sampling data, hole 116 (continued)

Drill Hole Footage			Core					Sludge		
			Recovery			Assay, Percent				
From	To	Dist.	Feet	Percent	Grams	Scan nBeO	Fluorite	Sample No.	Weight, grams	Scan nBeO percent
124.0	129.5	5.5	1.7	31	893	0.02				
129.5	133.2	2.7	1.7	63	948	.01				
133.2	136.6	4.4	1.7	39	887	.01				
136.6	140.0	3.4	2.4	71	1463	<.01				
140.0	145.0	5.0	3.1	62	739	.02				
145.0	150.0	5.0	4.3	86	2566	.01				
150.0	153.0	3.0	3.0	100	1817	<.01				
153.0	156.0	3.0	2.6	87	1572	<.01				
156.0	159.0	3.0	2.3	77	1264	<.01				
159.0	162.0	3.0	3.0	100	1787	<.01				

TABLE 22. - Additional chemical analyses, Bessie-Maple area

Hole No.	Footage		Assay 1/							
			Percent						Oz/ton	
	From	To	CaF_2	Sn	W	Pb	Zn	Cu	Au	Ag
114	107.0	112.0	71.9	0.14	<0.005	<0.02	<0.01	<0.01	Nil	0.12
114	112.0	117.0	59.2	.09	<.005	.16	2.28	.05	Nil	.88
114	117.0	120.0	42.1	.19	<.005	.05	7.42	.18	Nil	1.48
114	120.0	122.0	41.1	.41	<.005	.05	7.67	.34	Nil	2.30
115	29.0	33.5	32.8	.05	<.005	.22	1.89	.06	Nil	1.00
115	53.0	55.0	60.7	.05	<.005	<.02	<.01	<.01	Nil	Nil
115	55.0	57.5	64.0	.02	<.005	<.02	<.01	<.01	Nil	Nil
115	57.5	64.0	70.5	.02	<.005	<.02	<.01	<.01	Nil	.14
116	109.0	113.0	5.2	.01	<.005	<.02	<.01	<.01	Nil	Nil
116	113.0	118.0	7.7	.01	<.005	<.02	<.01	<.01	Nil	Nil
116	122.0	124.0	14.6	.10	<.005	.27	2.17	.07	Nil	.22
116	124.0	129.5	4.6	.01	<.005	<.02	.19	<.01	Nil	Nil
116	129.5	133.2	3.5	.03	<.005	<.02	<.01	<.01	Nil	Nil
116	133.2	136.6	4.2	.02	<.005	<.02	<.01	<.01	Nil	Nil
116	136.6	140.0	1.8	.03	<.005	<.02	<.01	<.01	Nil	Nil
116	140.0	145.0	12.8	.02	<.005	<.02	<.01	<.01	Nil	Nil
116	145.0	150.0	2.8	<.01	<.005	<.02	<.01	<.01	Nil	Nil
116	150.0	153.0	2.3	<.01	<.005	<.02	<.01	<.01	Nil	Nil
116	153.0	156.0	1.92	<.01	<.005	<.02	.05	<.01	Nil	.14
116	156.0	159.0	2.4	<.01	<.005	<.02	.03	<.01	Nil	Nil
116	159.0	162.0	1.9	.01	<.005	<.02	.05	<.01	Nil	.10

1/ CaF_2 - fluorite
Sn - tin
W - tungsten
Pb - lead
Zn - zinc
Cu - copper
Au - gold
Ag - silver.

Petrographic Analyses

by

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The principal minerals in diamond-drill core samples were identified and the approximate amounts were estimated. Results are in tables 23 and 24.

TABLE 23. - Principal minerals in diamond-drill core samples, Camp Creek deposit1/

DDH No.	Footage From	Footage To	Minerals, percent Calcite	Diaspore	Dolomite	Fluorite	Goethite	Mica + chlorite	Pyrite
101	67.2	84.4	95	-	T	2	T	3	-
101	96.0	106.0	90	-	-	4	T	6	-
101	106.0	116.3	85	-	-	1	-	14	T
101	116.3	123.0	80	-	-	1	-	19	-
101	123.0	130.0	80	-	-	-	T	20	-
101	130.0	138.0	90	-	-	1	-	9	-
101	138.0	141.0	80	-	-	T	-	20	-
101	141.0	154.4	80	-	-	1	T	19	-
101	154.4	162.3	80	-	-	2	-	18	-
101	162.3	172.0	75	-	-	3	-	22	-
101	172.0	182.0	80	-	5	5	-	10	-
101	182.0	191.2	T	1	80	14	-	5	-
101	191.2	192.0	T	5	-	55	-	40	-
101	192.0	197.0	25	T	-	T	-	75	-
101	197.0	203.0	42	T	-	20	-	35	-
101	203.0	210.5	65	-	-	15	-	20	-
101	210.5	220.5	-	1	70	14	-	15	-
101	220.5	225.0	-	-	95	1	T	4	-
101	225.0	231.2	15	-	55	26	T	4	-
102	15.5	20.5	90	T	-	7	-	3	-
102	22.0	30.0	25	-	-	15	-	60	-
102	30.0	41.0	5	-	-	75	-	20	-
102	41.0	51.0	60	T	1	25	-	14	-
102	51.0	61.0	75	-	20	4	-	1	-
102	61.0	71.0	1	-	2	65	-	32	-
102	71.0	76.6	30	T	50	15	-	5	-
103	119.0	123.0	84	1	-	15	-	-	-
104	16.0	21.0	70	1	3	23	-	3	-
104	21.0	30.0	60	T	1	35	-	4	-
104	30.5	35.0	15	-	T	65	-	20	-
104	35.0	47.0	35	-	-	40	-	25	-
104	47.0	58.7	37	-	2	15	-	45	1
104	58.7	72.0	25	3	-	60	-	12	-
104	72.0	83.0	55	-	-	30	-	15	-
104	83.0	92.5	25	T	-	20	-	55	-
104	92.5	102.0	70	T	-	15	-	15	-
104	102.0	107.0	5	T	-	45	-	50	-
104	107.0	114.5	10	-	-	55	-	35	-
104	114.5	126.0	13	T	-	7	-	80	-
105	5.0	10.0	50	3	T	40	T	7	-
105	10.5	18.2	70	3	2	15	-	10	-

TABLE 23. - Principal minerals in diamond-drill core samples, Camp Creek deposit (continued)[1/]

DDH No.	Footage From	Footage To	Minerals, percent: Calcite	Diaspore	Dolomite	Fluorite	Goethite	Mica + chlorite	Pyrite
105	18.2	28.0	5	25	-	65	T	5	-
105	28.0	41.0	50	7	5	25	-	13	-
105	41.0	48.5	50	2	10	30	T	8	-
105	48.5	52.0	75	1	-	20	T	4	-
105	52.0	62.0	60	1	-	25	-	14	-
105	62.0	70.0	35	3	-	45	T	17	-
105	70.0	75.0	45	10	-	35	T	10	-
105	75.0	84.0	90	T	-	1	T	9	-
105	84.0	93.2	25	T	-	65	-	10	-
105	93.2	104.7	20	1	-	60	1	18	-
105	104.7	112.0	90	T	-	2	-	8	T
105	112.0	122.0	90	-	-	2	-	8	-
106	14.0	23.0	70	-	-	20	-	10	-
106	23.0	36.5	55	-	-	25	-	20	-
106	36.5	42.0	75	-	-	5	-	20	T
106	42.0	52.0	20	-	-	55	-	25	-
106	52.0	62.0	55	-	-	15	-	30	-
106	62.0	68.5	45	1	-	40	T	14	-
106	68.5	72.0	75	-	-	15	-	10	-
106	72.0	77.0	T	2	-	60	T	38	-
106	77.0	82.0	65	-	-	15	-	20	-
106	82.0	89.7	70	-	-	15	-	15	-
106	89.7	98.8	60	-	-	25	-	15	-
106	98.8	107.5	75	1	-	15	-	9	-
106	107.5	115.0	40	T	-	10	-	50	-
106	115.0	123.0	85	T	-	10	T	5	-
106	123.0	132.0	80	1	-	14	-	5	-
106	132.0	141.3	70	-	-	15	T	15	-
106	141.3	147.0	65	-	-	10	-	25	-
106	147.0	157.0	70	T	T	10	T	20	-
107	0.0	14.0	30	T	-	35	T	35	F
107	14.0	24.0	55	-	T	15	T	30	T
107	24.0	32.0	40	-	5	30	T	25	F
107	32.0	42.0	45	-	T	20	-	35	T
107	42.0	52.0	35	T	-	20	-	45	T
107	52.0	62.0	30	-	-	5	T	65	T
107	62.0	72.0	70	1	-	20	T	9	-
107	72.0	82.0	50	1	-	30	-	19	-
107	82.0	92.0	60	T	T	15	T	25	T
107	92.0	102.0	45	1	T	40	-	14	T
107	102.0	112.0	25	5	-	40	-	30	-
107	112.0	122.0	45	T	1	25	-	29	T
107	122.0	132.0	70	T	-	15	T	15	-

TABLE 23. - Principal minerals in diamond-drill core samples, Camp Creek deposit (continued)1/

DDH No.	Footage		Minerals, percent						
	From	To	Calcite	Diaspore	Dolomite	Fluorite	Goethite	Mica + chlorite	Pyrite
107	132.0	142.0	55	3	-	25	T	17	-
107	142.0	151.5	50	-	-	25	T	25	-
107	151.5	162.0	60	-	-	15	T	25	T
107	162.0	172.0	55	-	1	30	T	14	T
107	172.0	185.0	60	-	T	3	T	37	T
107	186.0	191.0	30	4	-	45	T	21	-
107	191.0	198.0	60	T	-	15	T	25	-
108	10.0	20.0	55	6	F	35	T	4	-
108	20.0	30.3	80	3	1	7	-	9	-
108	30.3	42.0	75	2	1	15	T	7	-
108	42.0	52.0	70	2	-	15	T	13	-
108	52.0	62.0	85	T	1	5	T	9	-
108	62.0	72.0	60	2	1	20	T	17	-
108	72.0	82.0	75	1	T	10	T	14	-
108	82.0	91.0	50	2	5	13	-	30	-
108	91.0	104.5	80	T	1	3	T	16	-
108	104.5	114.0	85	1	1	5	-	8	-
108	114.0	124.0	55	1	2	27	T	15	-
108	124.0	137.0	80	1	T	6	T	13	T
108	137.0	147.0	80	T	T	3	T	17	T
108	147.0	157.0	75	1	T	15	T	9	T
108	157.0	167.0	75	1	T	9	T	15	T
108	167.0	177.0	75	T	T	8	T	17	-
108	177.0	182.5	45	-	T	25	T	30	-
108	182.5	186.0	18	2	-	55	T	25	-
108	186.0	190.0	30	-	-	15	T	55	-
108	190.0	210.0	36	-	-	4	T	60	-
109	20.0	30.0	85	-	-	T	T	15	T
109	30.0	40.0	43	-	-	2	T	55	T
109	40.0	50.0	70	T	-	15	T	15	T
109	50.0	57.0	50	1	-	34	T	15	-
109	57.0	63.0	45	-	-	35	T	20	-
109	63.0	72.0	55	1	-	30	T	14	-
109	72.0	80.0	40	2	-	50	T	8	-
109	80.0	93.5	70	T	-	15	T	15	-
109	93.5	103.5	55	T	-	30	T	15	-
109	103.5	113.0	25	T	-	35	T	40	-
109	113.0	123.0	6	4	-	70	F	20	-
109	123.0	135.0	60	1	-	20	-	19	-
109	135.0	145.0	80	T	-	8	T	12	-
109	145.0	149.0	70	-	-	5	T	25	-
109	149.0	155.0	60	T	-	15	F	25	-
109	155.0	157.0	10	-	-	30	F	60	T

TABLE 23. - Principal minerals in diamond-drill core samples, Camp Creek deposit (continued)[1/]

DDH No.	Footage From	Footage To	Minerals, percent: Calcite	Diaspore	Dolomite	Fluorite	Goethite	Mica + chlorite	Pyrite
109	157.0	167.0	40	-	-	20	T	40	T
109	167.0	171.0	45	T	-	20	T	35	T
109	171.0	180.0	75	-	-	2	T	23	-
109	180.0	190.0	32	-	-	3	F	65	-
110	10.0	17.0	30	T	-	25	-	45	T
110	17.0	22.0	25	-	T	1	-	74	T
110	22.0	25.0	8	T	-	45	T	47	-
110	25.0	30.0	75	-	-	1	-	24	T
110	30.0	36.0	70	1	-	15	T	14	-
110	36.0	47.0	75	-	-	1	-	24	T
110	47.0	57.0	32	T	-	3	-	65	T
110	57.0	62.0	65	-	-	2	-	33	T
110	62.0	72.0	25	-	T	15	-	60	T
110	72.0	77.0	35	1	T	45	-	19	-
110	77.0	87.0	35	-	T	15	-	50	T
110	87.0	92.0	30	-	T	15	-	55	T
110	92.0	94.0	5	T	T	80	-	15	T
110	94.0	97.0	70	T	-	3	T	27	-
110	97.0	102.0	75	-	T	4	T	21	T
110	102.0	104.4	80	-	T	2	-	18	-
110	104.4	109.0	45	-	-	5	T	50	T
111	10.0	20.0	36	T	-	9	T	55	-
111	20.0	30.0	16	-	-	4	T	80	-
111	30.0	40.0	33	2	-	30	T	35	-
111	40.0	45.0	34	1	-	20	F	45	T
111	45.0	55.0	16	-	-	4	T	80	T
111	55.0	60.0	3	-	-	30	T	67	-
111	60.0	67.5	30	T	-	20	T	50	T
111	67.5	77.5	30	2	T	13	T	55	-
111	77.5	88.0	20	T	-	15	T	65	-
111	88.0	98.0	46	T	-	4	T	50	T
111	98.0	108.0	60	-	-	4	T	36	T
111	108.0	118.0	60	T	-	8	T	32	T
111	118.0	128.0	55	T	-	13	T	32	T
111	128.0	133.0	15	T	-	30	T	55	T
111	133.0	148.0	30	T	-	20	T	50	T
111	148.0	158.0	40	T	T	40	T	20	T
111	158.0	168.0	30	T	T	40	T	29	1
111	168.0	178.0	40	T	T	35	T	25	T
111	178.0	185.0	42	-	-	12	1	45	T
111	185.0	190.0	15	-	-	5	T	80	T
111	190.0	196.0	30	-	-	10	T	60	-
111	196.0	207.0	5	T	-	40	T	55	T

TABLE 23. - Principal minerals in diamond-drill core samples, Camp Creek deposit (continued)[1/]

DDH No.	Footage From	Footage To	Minerals, percent Calcite	Diaspore	Dolomite	Fluorite	Goethite	Mica + chlorite	Pyrite
112	10.0	20.0	60	-	-	10	T	30	-
112	20.0	29.5	10	-	-	15	T	75	-
112	29.5	35.0	5	-	-	25	T	70	-
112	35.0	45.0	15	-	-	5	T	80	-
112	45.0	56.0	35	T	-	10	T	55	-
112	56.0	66.0	34	1	-	25	-	40	-
112	66.0	76.0	25	T	-	30	T	45	-
112	76.0	86.0	25	T	-	5	T	70	-
112	86.0	96.0	54	-	-	1	T	45	-
112	96.0	106.0	65	T	T	5	T	30	-
112	106.0	116.0	65	T	-	5	T	30	-
112	116.0	124.0	40	-	-	20	-	40	-
112	124.0	133.0	20	-	-	20	T	60	-
112	133.0	144.5	35	-	-	25	T	40	-
112	144.5	150.0	25	-	-	20	T	55	-
112	150.0	158.0	40	-	-	15	T	45	-
112	158.0	170.0	1	-	-	4	T	95	-
113	10.0	15.0	15	-	14	1	T	70	-
113	15.0	24.0	9	1	20	35	T	35	-
113	24.0	30.0	10	T	5	30	T	55	-
113	30.0	40.0	40	-	15	15	T	30	-
113	40.0	45.5	45	T	-	25	T	30	-
113	45.5	52.0	45	1	T	29	-	25	-
113	52.0	57.0	1	-	70	15	T	14	-
113	57.0	65.0	9	-	-	1	T	90	-
113	65.0	75.0	29	-	-	1	T	70	-
113	75.0	85.0	22	-	-	8	F	70	-

1/ Numerals - percent
F - 0.1 - 0.5 percent
T - less than 0.1 percent.

TABLE 24. - Principal minerals in diamond-drill core samples, Bessie-Maple area

DDH No.	Footage From	Footage To	Minerals, percent: Calcite	Diaspore	Dolomite	Fluorite	Mica + chlorite 1/	Sulfides	Other
114	50.0	57.0	-	1	80	15	4	T 2/	-
114	57.0	69.3	7	1	90	2	-	-	-
114	69.3	78.1	-	T	93	7	T	-	-
114	78.1	83.4	-	1	85	9	5	T 2/	-
114	83.4	92.0	-	T	90	8	2	T 2/	-
114	92.0	97.0	-	1	56	40	3	T 2/	-
114	97.0	107.0	-	5	25	60	5	T 2/	5 2/
114	107.0	112.0	-	20	T	55	8	2 2/	15 2/
114	112.0	117.0	-	10	20	55	5	10 2/	-
114	117.0	120.0	-	5	15	45	10	15 2/	-
114	120.0	122.0	-	3	2	55	20	20 2/	-
114	124.0	126.0	-	10	-	70	11	9 2/	-
114	126.0	130.0	-	2	-	65	12	1 2/	20 2/
114	130.0	136.0	-	T	-	20	9	1 2/	70 2/
114	136.0	146.0	-	T	T	8	16	1 2/	75 2/
114	146.0	152.0	-	T	T	10	19	1 2/	70 2/
115	16.0	21.0	15	2	33	45	5	-	T 2/
115	21.0	29.0	25	2	55	15	3	T 2/	-
115	29.0	33.5	-	2	64	25	1	8 2/	-
115	33.5	37.0	-	4	65	31	T	-	-
115	37.0	47.0	-	2	30	60	8	T 2/	T 2/
115	47.0	50.0	-	-	2	10	-	-	88 2/
115	53.0	55.0	-	9	2	65	20	-	4 2/
115	55.0	57.5	-	8	T	65	25	-	2 2/
115	57.5	64.0	-	8	-	70	22	-	-
115	64.0	68.0	-	-	2	13	25	-	60 2/
115	68.0	75.5	-	10	1	75	14	T 2/	-
115	79.0	85.0	22	-	1	4	3	T 2/	70 2/
116	16.0	25.0	76	-	T	3	1	-	20 2/
116	25.0	37.5	50	-	T	T	2	-	48 2/
116	37.5	42.5	50	T	3	6	1	-	40 2/
116	44.0	51.6	33	-	1	1	-	-	65 2/
116	51.6	60.0	15	-	T	T	-	T 2/	85 2/
116	60.0	73.0	5	-	T	5	-	T 2/	90 2/
116	73.0	86.0	5	-	2	13	-	T 2/	80 2/
116	86.0	96.0	25	-	14	1	-	T 2/	60 2/
116	96.0	104.0	12	-	3	T	T	T 2/	85 2/
116	104.0	109.0	10	-	T	4	21	T 2/	65 2/
116	118.0	120.0	1	-	-	75	15	2 2/	7 2/

1/ Includes zinnwaldite and kaolin.

2/ DDH 114, 50.0-57.0, trace pyrite.
DDH 114, 78.1-83.4, trace pyrite.
DDH 114, 83.4-92.0, trace pyrite.
DDH 114, 92.0-97.0, trace pyrite.
DDH 114, 97.0-107.0, 5 percent sellaite, trace pyrite.
DDH 114, 107.0-112.0, 15 percent sellaite, 2 percent pyrite, trace arsenopyrite.
DDH 114, 112.0-117.0, 8 percent sphalerite, 2 percent pyrite, trace chalcopyrite.
DDH 114, 117.0-120.0, 15 percent sphalerite, trace arsenopyrite, trace chalcopyrite.
DDH 114, 120.0-122.0, 10 percent sphalerite, 7 percent pyrite, 2 percent stannite, 1 percent arsenopyrite, trace chalcopyrite, trace galena.
DDH 114, 124.0-126.0, 8 percent sphalerite, 1 percent pyrite.
DDH 114, 126.0-130.0, 15 percent unknown, 5 percent sellaite, 1 percent pyrite.
DDH 114, 130.0-136.0, 70 percent shaly material with carbon, 1 percent pyrite.
DDH 114, 136.0-146.0, 75 percent shaly material with carbon, 1 percent pyrite.
DDH 114, 146.0-152.0, 70 percent shaly material with carbon, 1 percent pyrite.
DDH 115, 16.0-21.0, trace goethite, trace scheelite.
DDH 115, 21.0-29.0, trace pyrite.
DDH 115, 29.0-33.5, 3 percent arsenopyrite, 2 percent pyrite, 2 percent sphalerite, 1 percent galena, trace chalcopyrite.
DDH 115, 37.0-47.0, trace pyrite, trace sellaite.
DDH 115, 47.0-50.0, 80 percent shaly material and/or altered igneous rock, 7 percent quartz, 1 percent goethite.
DDH 115, 53.0-55.0, 2 percent ankerite, 2 percent sellaite, trace quartz.
DDH 115, 55.0-57.5, 2 percent ankerite, few sellaite.
DDH 115, 64.0-68.0, 55 percent shaly material and/or altered igneous rock, 5 percent quartz.
DDH 115, 68.0-75.5, trace pyrite.
DDH 115, 79.0-85.0, 70 percent shaly material and/or altered igneous rock, trace pyrite.
DDH 116, 16.0-25.0, 20 percent shaly material with carbon.
DDH 116, 25.0-37.5, 48 percent shaly material with carbon.
DDH 116, 37.5-42.5, 40 percent shaly material with carbon, trace sellaite.
DDH 116, 44.0-51.6, 65 percent shaly material with carbon.
DDH 116, 51.6-60.0, 85 percent shaly material with carbon, trace pyrite.
DDH 116, 60.0-73.0, 90 percent shaly material with carbon, trace pyrite.
DDH 116, 73.0-86.0, 80 percent shaly material with carbon, trace pyrite.
DDH 116, 86.0-96.0, 60 percent shaly material with carbon, trace pyrite.
DDH 116, 96.0-104.0, 85 percent shaly material with carbon, trace pyrite.
DDH 116, 104.0-109.0, 65 percent shaly material with carbon, trace pyrite.
DDH 116, 118.0-120.0, 7 percent sellaite, 2 percent pyrite.

Preliminary Metallurgical Tests

Bulk specimens of representative material were selected from the Camp Creek deposit (table 25). Using the berylometer on individual pieces without regard to mass, the material in the bulk specimens was sorted into four grades: High, medium, low, and reject. The high, medium, and low grade material was analyzed (table 26). The high and medium grade specimens were included in one composite which will be termed the "composite sample." The low grade material will be referred to hereafter as the "low-grade sample."

TABLE 25. - Approximate beryllium content of bulk specimens, Camp Creek deposit

Specimen	Sample, Kg.	Weight of sorted products, 1/ Kg.				
		Reject	Total saved	Grades Saved		
				High	Med.	Low
9-25-1	19.96	16.78	3.18			3.18
9-25-2	24.04	11.87	12.17		1.47	10.70
9-25-3	21.90	4.02	17.88	7.19	5.95	4.74
9-25-4	26.14	3.32	22.82	10.20	6.20	6.42

1/ Sorted products:
Standard sample 0.11 percent BeO yields 10 counts per minute average.
Grades: High, over 75 counts per minute; medium, 25 to 75 counts per minute; low, 10 to 25 counts per minute; reject, less than 10 counts per minute.

TABLE 26. - Analyses of composite samples prepared for preliminary metallurgical tests[1/]

Number	Description	BeO	CaO	MgO	Al_2O_3	SiO_2	F.	$CaCo_3$	Fe	Sn
Al 12-1	Camp Creek High[2/]	1.09	47.2	0.9	17.4	7.0	31.2	2.0	0.70	<0.01
Al 12-2	Camp Creek Medium	.68	42.4	1.2	20.6	9.2	27.2	2.5	.76	<.01
Al 12-3	Camp Creek Low	.31	44.0	2.2	13.7	9.4	17.4	32.8	.72	<01

1/ Analyses made at the Bureau of Mines Salt Lake City Metallurgy Research Center.

2/ Sample Al 12-1 from Camp Creek was submitted for microscopic examination. The sample was crushed to minus 60 mesh and screened through plus 325 mesh. Only the minus 60 plus 325 mesh fraction was examined (70 percent of the sample by weight). The major mineral identified was fluorite--about 70-80 percent of the sample by weight. The remainder of the sample consisted of sericite and chrysoberyl. The chrysoberyl occurred as very fine cryptocrystalline grains, as single coarse grains, and as tabular grains having a sheaf-like structure. Over 70 percent of the chrysoberyl was locked with sericite and/or fluorite at minus 60 plus 325 mesh. This sample of chrysoberyl gave an x-ray diffraction pattern identical to that of Virgin Mt. chrysoberyl, but it showed a slight variation in optical properties. The Alaskan chrysoberyl also exhibited a bright yellow-green fluorescence.

Laboratory Concentration Tests

by

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Preliminary beneficiation studies have been completed on two beryllium ore samples from the Camp Creek area of the Lost River valley, Seward Peninsula. The samples were (1) a composite of high- and medium-grade BeO ores high in fluorite and low in calcite, and (2) a low-grade ore containing about equal quantities of fluorite and calcite. The following table gives the chemical analysis of the high-grade composite and the low-grade individual sample.

TABLE 27. - Chemical analysis, beryllium ore samples

	BeO	CaO	$CaCO_3$	CaF_2	F	Al_2O_3	SiO_2
Composite sample	0.89	44.8	2.3	60.3	29.2	19.0	8.1
Low-grade sample	.31	44.0	32.8	35.7	17.4	13.7	9.4

Limited microscopic examination of the ores showed that the following minerals were present: Chrysoberyl, fluorite, calcite, tourmaline, diaspore, and sericite. The chrysoberyl occurs as very fine cryptocrystalline grains, as single coarse grains, and as tabular grains having sheaf-like structure. A study of the samples, crushed to minus 60 mesh and sized on 325 mesh, showed that over 70 percent of the chrysoberyl in the minus 60 plus 325 mesh fraction was locked with sericite and/or fluorite.

On the composite sample, a heavy-liquid separation of a minus 20 plus 325-mesh fraction was made in TBE (tetrabromoethane, sp. gr. 2.95). The sink fraction obtained above was separated by elutriation into heavy and light fractions. The following table shows the results of heavy-liquid separation and elutriation. Although separated individually, the respective products from various sized fractions were combined for tabulation and evaluation.

Only a slight concentration of the beryllium was obtained by heavy-liquid separation. However, there was some concentration of quartz in the float fraction produced by sink-float separation.

TABLE 28. - Heavy-liquid separation and elutriation

	Weight, percent	Assay, percent				
		BeO	CaF_2	SiO_2	Al_2O_3	$CaCO_3$
Minus 20 plus 325 mesh						
TBE[1/] float on 2.95 sp gr	5.02	0.42	12.6	30.7	27.9	8.0
TBE[1/] sink elut light	37.87	.90	60.2	7.3	18.4	1.4
TBE[1/] sink elut heavy	38.18	.93	60.5	6.4	18.8	1.3
Minus 325 mesh	18.93	.62	65.9	6.2	14.7	2.0
Calculated head	100.0	.83	59.0	7.9	18.3	1.8

	Weight, percent	Distribution, percent				
		BeO	CaF_2	SiO_2	Al_2O_3	$CaCO_3$
Minus 20 plus 325 mesh						
TBE[1/] float on 2.95 sp gr	5.02	2.5	1.7	19.5	7.7	22.3
TBE[1/] sink elut light	37.87	40.7	38.5	34.5	38.1	29.3
TBE[1/] sink elut heavy	38.18	42.7	39.0	31.2	39.0	27.4
Minus 325 mesh	18.93	14.1	20.8	14.8	15.2	21.0
Calculated head	100.0	100.0	100.0	100.0	100.0	100.0

1/ Tetrabromethane, sometimes known as acetylene tetrabromide.

Laboratory flotation studies were also made on the two samples. The test samples were stage ground to minus 150 mesh and, subsequently, froth floated by means of the various known beryllium flotation procedures. In the following table are the results obtained and reagents used in flotation of the composite sample by means of the sulfide-heat procedure.

TABLE 29. - Flotation of composite sample by sulfide-heat procedure.

	Weight, percent	Assay BeO, percent	Distribution BeO, percent
Concentrate	76.4	0.68	63.6
Tailing	23.6	1.28	36.4
Calculated head	100.0	.82	100.0

Reagent quantities in pounds per ton

	Conditioning and heating	Conditioning	Flotation
NaF	4.0		
Na_2S	5.0		
Oleic acid		0.18	
Temperature	to 49° C		
Minutes	20	2	5
pH	10.1		

The results obtained by this treatment were very poor. Fluorite was concentrated in the froths, but chrysoberyl was not. Microscopic examination of the products showed that the latter was not completely liberated.

Other methods of flotation used on the composite sample and the respective results were (1) fluoride-Calgon, 60 percent of the beryllium recovered in a concentrate that assayed 1.01 percent BeO; (2) petroleum sulfonate, 14 percent of the beryllium recovered in a 1.37 percent BeO concentrate; (3) acid-fluoride, 20 percent recovery at 1.45 percent BeO; and (4) modified fluoride-lignin, 77 percent of the beryllium at 1.43 percent BeO grade.

The low-grade sample contained 32.8 percent $CaCO_3$, and this quantity of calcite present in the sample limited the flotation procedure that could be used on the sample to the fluoride-Calgon and the sulfide-heat procedures.

Fluoride-Calgon flotation procedure results and reagent consumptions are given in the following table. The ore was stage ground to minus 150 mesh in preparation for flotation.

TABLE 30. - Flotation of low-grade ore by the fluoride-Calgon procedure

	Weight, percent	Assay BeO, percent	Distribution BeO, percent
Concentrate 1	32.3	0.30	35.0
Concentrate 2	42.6	.31	47.7
Tailing	25.1	.19	17.3
	100.0	.28	100.0

Reagent quantities in pounds per ton

	Conditioning 1	Concentrate 1	Concentrate 2
NaF	4.0		
Calgon	2.25		
Oleic acid		2	1
Turpentine		4	2
Time, minutes	15	2	2
pH	9.6		

Only slight concentration is shown in the results of flotation by the fluoride-Calgon procedure. When the sulfide-heat procedure was used, the concentrate assayed only 0.25 percent BeO and contained 44 percent of the beryllium.

In summary, the chrysoberyl ores from the Lost River valley were very refractory to heavy-liquid separation, and the methods of beryllium flotation tried. The large quantities of fluorite and calcite and the intimate association of chrysoberyl with fluoride and sericite preclude simple concentration. It appears that extensive test work and possibly combination processing by flotation and chemical extraction will be required. Such work may be justified if relatively large reserves are available, but probably should not be undertaken until such data are available.

SPECTROGRAPHIC ANALYSES

Seven composite samples of diamond-drill core were analyzed spectrographically by the U.S. Geological Survey, Branch of Analytical Laboratories, Denver, Colorado. Sample descriptions are in table 31; sample analyses are in table 32.

TABLE 31. - Description of composite samples for spectrographic analyses

USBM No.	Sample Name	Composite Ratio, grams per foot	Hole No.	Footage From	Footage To
65-1022	Camp Creek Composite No. 1	1.0	101	182.0	231.2
		1.0	102	22.0	76.6
		1.0	103	119.0	123.0
		1.0	113	15.0	52.0
65-1023	Camp Creek Composite No. 2	.5	108	10.0	210.0
		.5	105	10.5	104.7
65-1024	Camp Creek Composite No. 3	.5	104	21.0	126.0
		.5	111	10.0	190.0
		.5	112	20.0	150.0
65-1025	Camp Creek Composite No. 4	.5	106	14.0	157.0
		.5	107	14.0	198.0
65-1026	Camp Creek Composite No. 5	.5	109	30.0	180.0
		.5	110	10.0	102.0
65-1027	Bessie-Maple Composite No. 6	1.0	114	50.0	152.0
		1.0	115	16.0	75.5
65-1028	Bessie-Maple Composite No. 7	5.0	116	124.0	140.0

TABLE 32. - Semiquantitative spectrographic analysis[1/]

USBM No.	65-1022	65-1023	65-1024	65-1025	65-1026	65-1027	65-1028
USGS No.	65-ASn-10	65-ASn-11	65-ASn-12	65-ASn-13	65-ASn-14	65-ASn-15	65-ASn-16
Lab. No.	D117301	D117302	D117303	D117304	D117305	D117306	D117307
Aluminum	M	7.0	M	M	7.0	M	1.5
Arsenic	0	0	0	0	0	0.3	0
Barium	.015	.003	.01	.007	.005	.007	.002
Beryllium	.03	.02	.02	.02	.015	.015	.0015
Boron	.2	.02	.15	.15	.1	.01	.003
Cadmium	0	0	0	0	0	.005	0
Calcium	M	M	M	M	M	M	M
Cerium	<1	<1	<1	<1	<1	<1	<1
Chromium	.002	.0015	.005	.003	.003	.002	.002
Copper	.002	.001	.0015	.002	.0015	.015	.003
Gallium	.001	0	.0007	.001	.0007	.0007	.0005
Iron	.5	.3	.7	.7	.5	1.5	.7
Lead	.02	.002	.005	.007	.005	.03	.007
Lithium	+	+	+	+	+	+	+
Magnesium	3.0	1.0	1.5	1.5	1.5	5.0	1.5
Manganese	.2	.05	.1	.07	.07	.2	.015
Nickel	.0007	.0005	.0015	.0015	.001	.001	.001
Potassium	2.0	1.5	3.0	3.0	2.0	2.0	1.5
Scandium	0	0	.0007	.0007	0	0	0
Silicon	3.0	1.5	3.0	3.0	3.0	3.0	1.5
Silver	.00015	.0001	.0001	0	0	.0003	0
Sodium	1.0	.7	.7	.7	1.0	.15	.1
Strontium	.03	.1	.15	.15	.1	.02	.05
Tin	.015	.005	.007	.01	.007	.03	.007
Titanium	.02	.02	.05	.05	.03	.05	.03
Vanadium	.003	.002	.003	.003	.005	.005	.003
Ytterbium	0	0	0	0	.0001	0	0
Yttrium	0	0	0	0	.001	0	0
Zinc	.03	0	0	0	0	.3	.03
Zirconium	.0015	.001	.003	.002	.002	.003	.0015

1/ Results are reported in percent to the nearest number in the series 1, 0.7, 0.5, 0.3, 0.2, 0.15, and 0.1, etc.; which represent approximate midpoints of group data on a geometric scale. The assigned group for semiquantitative results will include the quantitative value about 30 percent of the time.

Symbols used are:

M - major constituent--greater than 10 percent

0 - looked for but not detected

- not looked for

< - with number less than number shown--here usual detectabilities do not apply

+ - the presence of lithium obtained by the 6-step spectrographic method cannot be further evaluated until present techniques are modified.

Following elements sought but not detected in any sample: P, Au, Bi, Co, Ge, Hf, Hg, In, La, Mo, Nb, Pd, Pt, Re, Sb, Ta, Te, Th, Tl, V, and W.

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