RECONNAISSANCE INVESTIGATION OF TIN OCCURRENCES AT ROCKY MOUNTAIN (LIME PEAK), EAST-CENTRAL ALASKA

By P. Jeffrey Burton, J. Dean Warner, and James C. Barker

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UNITED STATES DEPARTMENT OF THE INTERIOR

Donald P. Hodel, Secretary

BUREAU OF MINES

Robert C. Horton, Director

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UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

cm	centimeter	mg	milligram
g	gram	pct	percent
lb	pound	ppm	parts per million
m	meter		

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ABSTRACT

Preliminary reconnaissance, during the period 1977 to 1983, in the Rocky Mountain (Lime Peak) area by the Bureau of Mines and the University of Alaska, Mineral Industry Research Laboratory indicates the Lime Peak pluton is a composite intrusion comprising at least three plutonic phases cut by two sets of north-trending dikes. Numerous occurrences of fault-controlled, tin-bearing greisen have been identified. The greisen is composed of quartz, chlorite, sericite, and minor amounts of fluorite, tourmaline, topaz, pyrite, chalcopyrite, and molybdenite; samples contain between 60 and 1560 ppm tin. Because there has been no systematic sampling the extent of the mineralization is unknown.

Stream sediment and panned concentrate samples contain anomalous metal concentrations over a region that is generally coincident with outcrops of the Lime Peak pluton. Two anomalous drainage areas in addition to several isolated anomalous samples comprise the larger anomalous region. Anomalous concentrations of tin, tungsten, columbium (niobium), and thorium occur in sediment or panned concentrate samples collected from streams draining the Lime Peak summit whereas anomalous concentrations of lead, zinc, uranium, thorium, copper, tin, and beryllium occur in samples from streams draining the northeastern periphery of the pluton.

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INTRODUCTION

Tin occurrences in the Lime Peak[4] area (fig. 1), northern Yukon-Tanana Upland, Alaska, were investigated during the summer of 1977 by the Bureau of Mines, during the summers of 1978 and 1979 by the lead author as part of a thesis investigation (1),[5] and during the summer of 1983 by the Bureau of Mines and the University of Alaska, Mineral Industry Research Laboratory (MIRL). This report has been compiled as part of an on-going Bureau program to assess Alaska's strategic and critical mineral reserves. Results of reconnaissance investigations in the Lime Peak area are presented here; results of more detailed work in 1984 will be presented at a later date.

[4]The name "Lime Peak" was recently changed to "Rocky Mountain". Because "Lime Peak" is more widely known it is used in this report.

[5]Underlined numbers in parentheses refer to items in the list of references preceding the appendixes.

ACKNOWLEDGMENTS

This report includes previously unpublished data that has been donated to the Bureau of Mines. Mapco Minerals Co. permitted use of results of reconnaissance geologic mapping of the Lime Peak area obtained in 1978. Results of regional stream sediment sampling by Union Carbide in 1974 are also included. In 1977, investigations were assisted by Florence Weber of the United States Geological Survey (USGS). These companies and individuals are thanked for their contributions.

LOCATION, ACCESS, AND PHYSIOGRAPHY

Lime Peak is located in the Circle (C-6) quadrangle, Alaska (fig. 1). It lies approximately 58 miles northeast of Fairbanks in the White Mountains. There is no road access to this area; however, the

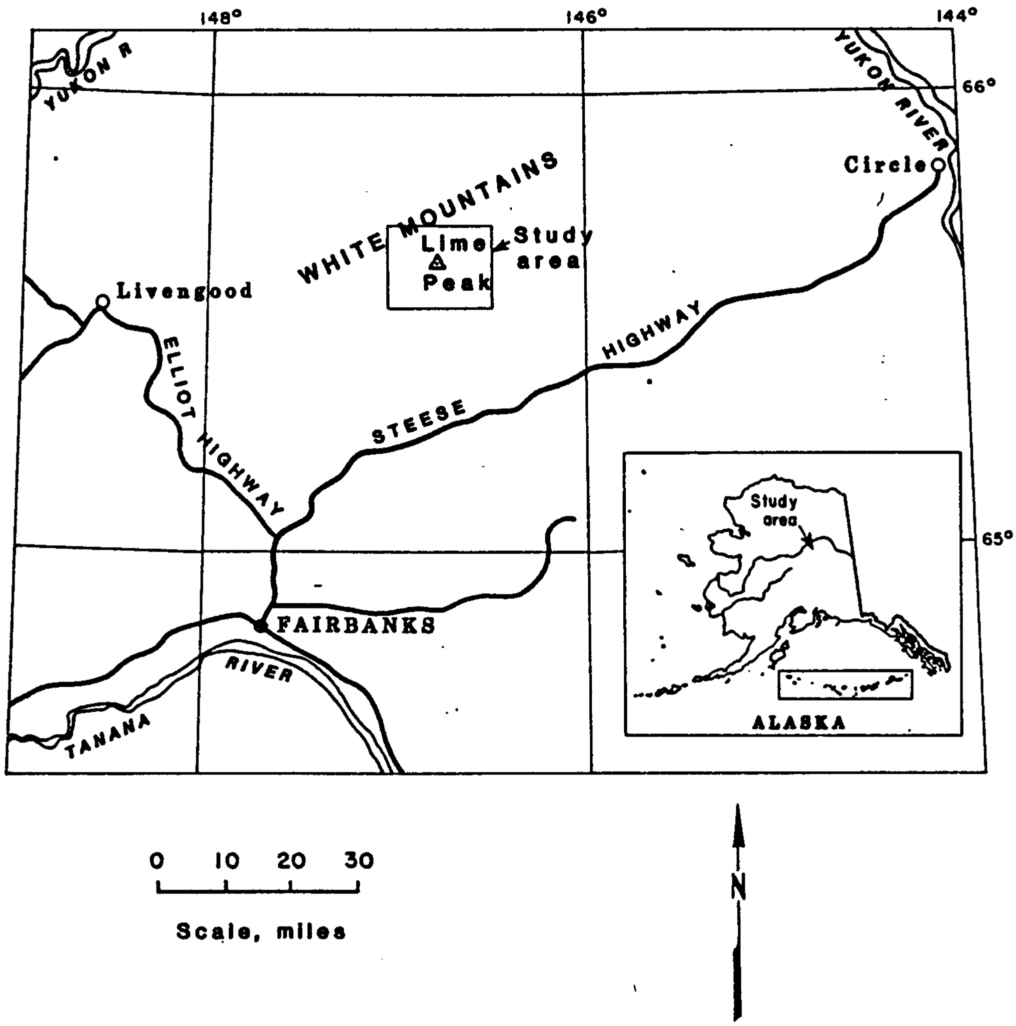


FIGURE 1. - Location map.

Steese Highway is located 30 miles to the southeast and existing winter trails extend into the area.

The terrain is characterized by moderately steep, tundra- and rubble-covered hillsides and tor-lined ridges. Elevations vary from approximately 2,500 ft in valley bottoms to 5,062 ft at the Lime Peak summit. Timberline in this region is at approximately 2,500 ft elevation.

LAND STATUS

The Lime Peak area lies within the White Mountain National Recreation Area, which is managed by the Bureau of Land Management (BLM) as authorized in 1980 by the Alaska National Interest Lands Conservation Act (PL 96-487). This area is currently (April 1984) closed to mineral entry.

PREVIOUS WORK

The Lime Peak area has been included in several previous geologic investigations. In 1913, Prindle (2) geologically mapped the region and identified the Lime Peak pluton as a porphyritic biotite granite. In 1937, Mertie (3) investigated the Yukon-Tanana Upland province and confirmed Prindle's description of the pluton. In the 1970's, several mineral exploration companies investigated the region for deposits of tin, uranium, tungsten, and other metals. During this period, Mapco Minerals Co. geologically mapped and diamond drilled a portion of the Lime Peak intrusion. Also during this period, Union Carbide conducted a regional stream sediment sampling survey that included the Lime Peak area. In 1978, the Bureau published a report on mineral deposits of the Tanana-Yukon Uplands that identified the Lime Peak pluton as tin-bearing (4). Most recently, in 1983, Menzie (5) reported results of stream sediment, panned concentrate, and rock sampling in the Lime Peak area.

Other mineral related studies that are relevant to the Lime Peak area have been conducted in the White Mountains. In 1973, Holm (6) investigated the Mount Prindle pluton which outcrops 10 miles southeast of, and is similar to, the Lime Peak pluton. In 1973, Foster and others (7) remapped the Yukon-Tanana Upland province and redefined much of the stratigraphy. In 1974, Geometrics, Inc. under contract to the U.S. Geological Survey (USGS), determined the aeromagnetic residual intensity of the eastern half of the Livengood quadrangle and all of the Circle Quadrangle and identified a magnetic high on the northwest side of the Lime Peak pluton (8). In 1977 the Bureau (9) identified anomalous concentrations of uranium in artesian springs and stream sediments in the Mount Prindle area. Most recently, in 1983, Foster and others (10) published a preliminary geologic map of the Circle Quadrangle.

REGIONAL GEOLOGY

In general, the Lime Peak area is underlain by metasedimentary rocks of Precambrian to early Paleozoic age that form a series of thrust sheets that were probably juxtaposed as a result of complex right-lateral movement along the nearby Tintina fault (fig. 2; 1). These rocks were intruded in Late Cretaceous time by several plutons of biotite granite.

The Lime Peak pluton is hosted by three units of low-grade metasedimentary rocks that lie stratigraphically above units of the polymetamorphosed Precambrian Yukon Cataclastic Complex (11-12). The basal unit of the lower Paleozoic rocks is composed of quartzite, slate, and argillite and contains a distinctive intraformational conglomerate with pale blue quartz granules. The middle unit comprises intercalated slate, quartzite, siltsone and limestone. The uppermost unit consists of chert, phyllite,

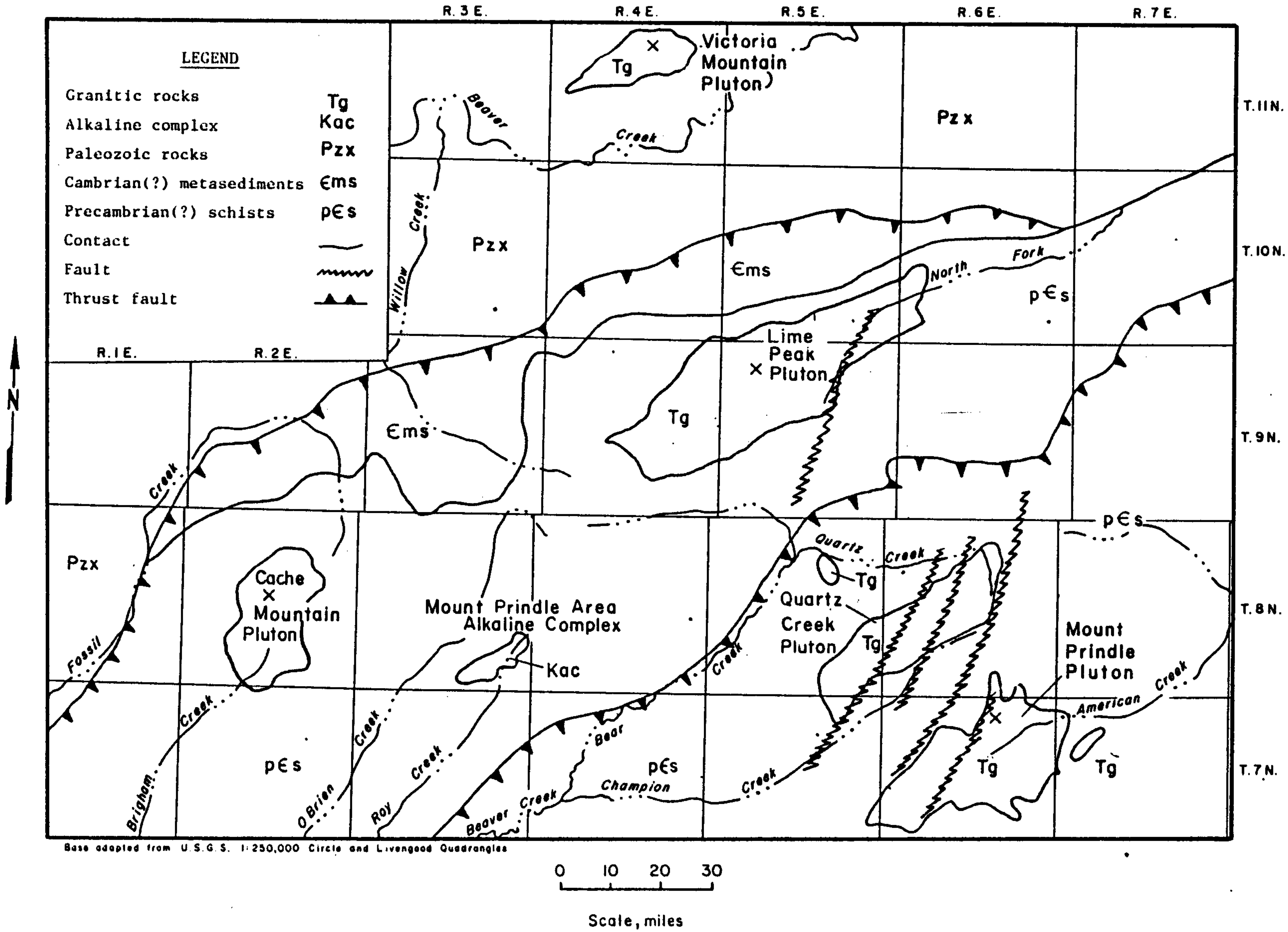


FIGURE 2. - Regional geology of the Lime Peak area.

and slate.

Biotite granite occurs in the White Mountains in five principal plutons: Cache Mountain, Lime Peak, Victoria Mountain, Quartz Creek, and Mount Prindle (fig. 2). The intrusions are predominantly medium- to coarse-grained porphyritic biotite granites. Subordinate rock types are latite, andesite, tourmaline granite, and pegmatite (1). Age dates from the Cache Mountain and Mount Prindle plutons cluster at 57 ± 2 m.y. (6). The Lime Peak and Quartz Creek plutons are undated but may be of similar early Tertiary age as suggested by lithologic similarities to these plutons.

The Lime Peak pluton is located 11 miles southwest of the Tintina fault, which is an extension of the Tintina Trench in Canada (13). Up to 200 miles of Late Cretaceous-early Tertiary right-lateral displacement is documented along this fault in Alaska (11, 13-15). Thrust faults in the Lime Peak Area (fig. 2) may have developed concurrently with movement on the Tintina fault.

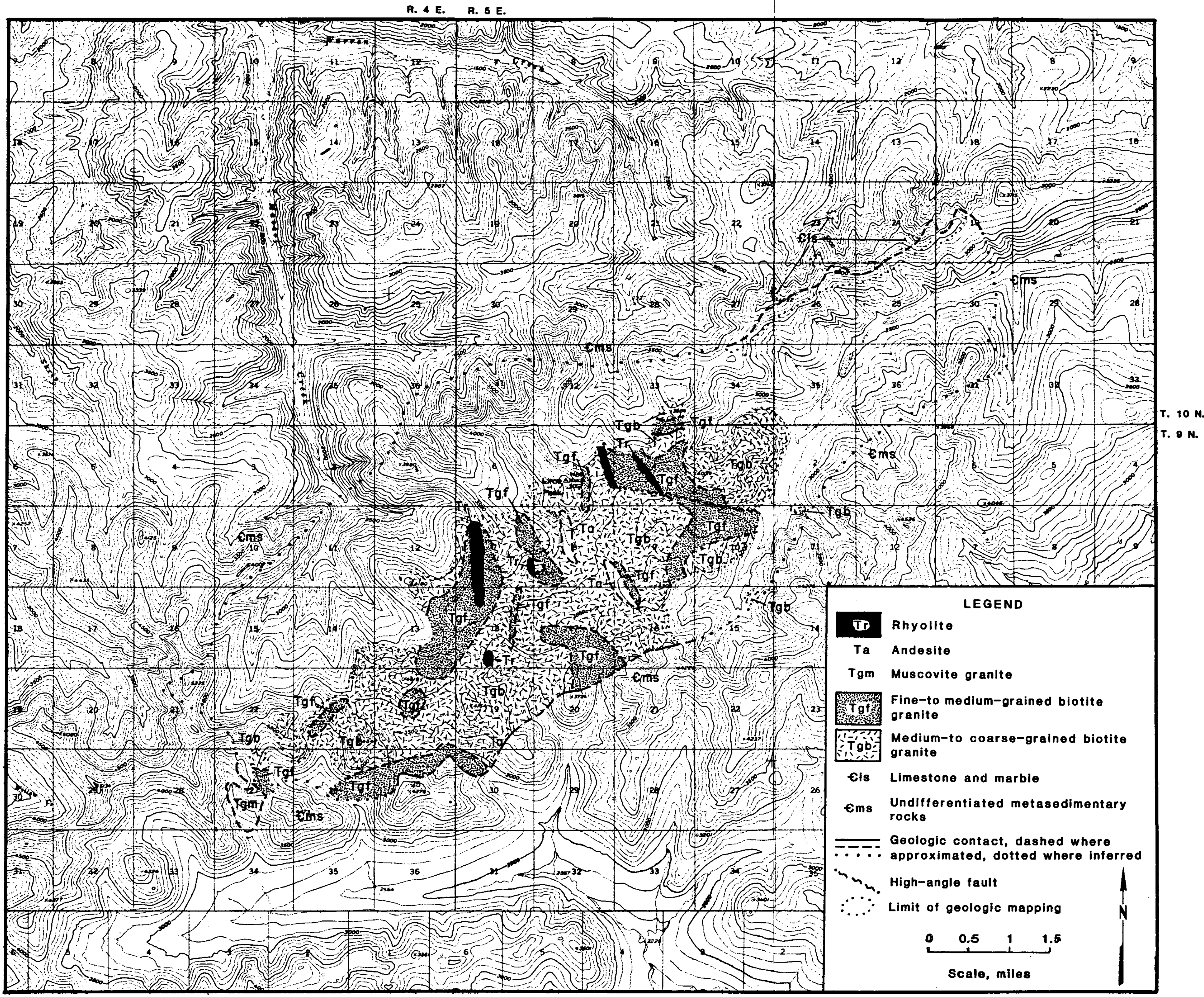
INVESTIGATIONS

Geology of the Lime Peak Pluton

The Lime Peak pluton outcrops over approximately 30 square miles and is elongate to the northeast, with a length approximately twice its width (fig. 3). The intrusion is exposed over more than 2,500 vertical feet with outcrop and rubble well exposed above 3,500 ft elevation. Because of tundra and colluvium cover, however, little is known of the geology at lower elevations. Contact relationships were mapped in the northeast, southwest, and south-central portions of the pluton and indicate the intrusion generally is conformable with the region's northeast-striking structural trend (fig. 2).

The Lime Peak pluton is a composite intrusion comprising at least three plutonic phases. The most abundant rock type is medium- to coarse-grained, equigranular to porphyritic, biotite granite (Tgb) that contains approximately 35 pct smokey quartz, 40 pct orthoclase, 20 pct albitic plagioclase, 5 pct biotite, and trace to minor amounts of fluorite, apatite, and zircon. Plagioclase, quartz, and biotite occur as subhedral, embayed crystals surrounded by larger anhedral orthoclase phenocrysts. The Tgb unit commonly forms tors that line ridgetops in the Lime Peak area. Leucocratic, fine-grained, hypidiomorphic granular, seriate biotite granite (Tgf) forms the second intrusive phase and is found along the margins of, and in scattered outcrops within, the Lime Peak pluton (fig. 3). Contact relationships are obscure, but this rock may represent a more highly evolved phase of the intrusion or a chilled portion of the Tgb unit. Third, a small body of moderately coarse-grained equigranular muscovite granite (Tgm) composed of approximately 40 pct smokey quartz, 30 pct albitic plagioclase, 25 pct orthoclase, 4 pct muscovite, up to 2 pct tourmaline, and minor amounts of fluorite crops out at the southwestern end of the Lime Peak pluton. Tourmaline and fluorite occur in miarolitic cavities, and plagioclase occurs as euhedral laths surrounded by anhedral quartz, orthoclase, and muscovite.

Dikes and small bodies of porphyritic rhyolite to quartz latite (Tr) and andesite (Ta) are common in the area just south of the Lime Peak summit (fig. 3). These dikes cut both the Tgf unit and the Tgb unit. The rhyolite (Tr) is composed of equal amounts of subhedral to euhedral quartz, orthoclase, and albitic plagioclase and minor irregularly shaped biotite phenocrysts in a fine matrix of quartz, orthoclase, and muscovite. The phenocrysts make up 60 pct of this rock, and fluorite occurs



Base adapted from U.S.G.S. 1:63,360 Circle (C-6) Quadrangle.

FIGURE 3. - Reconnaissance geologic map of the Lime Peak area.

rarely in miarolitic cavities. The andesite (Ta) is dark green to gray and commonly contains phenocrysts of potassium feldspar.

Rocks adjacent to the intrusion have undergone contact metamorphism. Argillaceous rocks have been hornfelsed and are banded gray, olive green, purple, and red. Calcareous rocks are now marble with green to gray calc-silicate layers.

Major-Oxide Analyses

Table 1 shows the major-oxide and normative mineral compositions of various phases of the Lime Peak pluton. Samples Ci53, Ci38, and Ci41 represent the Tgb unit, whereas samples Ci42 and Ci59 represent the Tr and Tgm units, respectively. Samples of the Tgf unit were not obtained for major-oxide analyses.

Samples (Ci53, Ci38, and Ci41) of the Tgb unit show very uniform compositions. The three samples contain between 74 to 75 pct SiO_2, 12.3 to 12.7 pct Al_2O_3, 0.80 to 0.85 pct CaO, 2.7 to 3.0 pct Na_2O, and 5.5 to 5.8 pct K_2O. Total normative quartz, albite, and orthoclase for all three samples (differentiation index of Thorton and Tuttle, (16)) is between 90.3 and 92.3 pct. Samples Ci38 and Ci41 also contain normative corundum.

In comparison, samples of the Tgm unit (Ci59) and Tr unit (Ci42) contain lower SiO_2, CaO, and K_2O concentrations but higher Al_2O_3 and Na_2O concentrations than samples of the Tgb unit (table 1). Additionally, differentiation indexes are either higher (Tgm unit) or lower (Tr unit), and in both normative anorthite is significantly lower than values in samples from the Tgb unit. Also, neither the Tgm unit nor the Tr unit contains normative corundum.

TABLE 1. - Major-oxide and normative compositions of the Lime Peak pluton

Rock type....	Medium- to coarse-grained biotite granite (Tgb)			Rhyolite (Tr)	Muscovite granite (Tgm)
Sample[1]......	Ci53	Ci38	Ci41	Ci42	Ci59
		Major oxide analyses[2] (weight percent)			
SiO_2.........	75.00	74.00	74.50	71.50	74.00
Al_2O_3.......	12.30	12.70	12.30	14.80	13.60
Fe_2O_3[3].......	2.15	2.50	2.20	.90	1.20
MgO..........	.05	.15	.10	ND	ND
CaO..........	.85	.85	.80	.70	.50
Na_2O.........	3.00	2.70	2.70	5.80	4.40
K_2O..........	5.50	5.70	5.80	4.40	4.80
LOI..........	.51	.75	.76	.54	.58
TiO_2.........	.05	.15	.10	ND	ND
P_2O_5.........	.03	.04	.03	.02	.04
MnO..........	.04	.03	.04	.13	.06
Total......	99.48	99.57	99.33	98.79	99.18
		Normative Mineral Composition[4] (weight percent)			
quartz.......	34.25	33.82	34.35	14.52	28.63
corundum.....	NP	.62	.15	NP	NP
orthoclase...	32.53	33.72	34.31	26.03	28.36
albite.......	25.46	22.82	22.82	49.02	37.20
anorthite....	3.75	3.96	3.93	1.32	2.22
enstatite....	.18	.38	.25	.78	.13
ferrosilite..	.79	.98	.66	.40	.48
wollastonite.	.20	NP	NP	.90	NP
magnetite....	1.71	2.00	1.76	.58	.96
ilmenite.....	.10	.29	.19	.10	.10
apatite......	.09	.06	.04	.03	.06
Total......	99.06	98.65	98.46	93.68	98.14

ND Not detected.

NP Not present.

[1]Sample descriptions given in text and in table B-1, appendix B.

[2]Analyses performed by Bondar-Clegg, Inc., Lakewood, CO.

[3]Total Fe measured as Fe_2O_3.

[4] $FeO:Fe_2O_3$ calculated as 1:1 wt pct ratios.

STREAM SEDIMENT AND PANNED CONCENTRATE SAMPLING

Methods

Locations of 62 stream sediment and 60 panned concentrate samples collected during the 1977 and 1983 Bureau and MIRL field investigations and the 1974 Union Carbide reconnaissance are shown in Figure 4. Results of analyses are given in appendix A. The three sample suites are differentiated by prefixes to the map location numbers; the prefix "Be" is used for the 1977 Bureau investigations, "Ci" is used for the 1983 Bureau and MIRL investigations, and "CP" is used for 1974 Union Carbide reconnaissance.

Stream sediment and panned concentrate samples were obtained with a steel shovel from silty gravels taken from either the center of the active channel of smaller creeks or from the leading edge of gravel bars on larger streams. For stream sediment samples, approximately 0.5 lb of silt was placed directly into water-resistant paper bags, air-dried, and screened at minus 80 mesh. The minus 80-mesh fraction was then pulverized prior to atomic absorption, fluorometric, emission spectrographic, or colorimetric analyses (table 2). Panned concentrates were collected with a 14-inch (35.6 cm) pan that was heap-filled and carefully panned untill nearly all low-specific gravity minerals were removed. For the Ci and CP samples, the concentrated heavy mineral fractions were then air-dried in the laboratory, weighed, and pulverized for analyses by X-ray fluorescence or atomic absorption techniques, respectively. For the Be samples, on the other hand, the concentrate was magnetically separated, and the non-magnetic minerals were further concentrated with bromoform, which has a specific gravity of 2.85. The denser nonmagnetic concentrate was then pulverized to minus 200 mesh and analyzed by semi-quantitative optical emission spectrographic methods.

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CaO..........	.85	.85	.80	.70	.50
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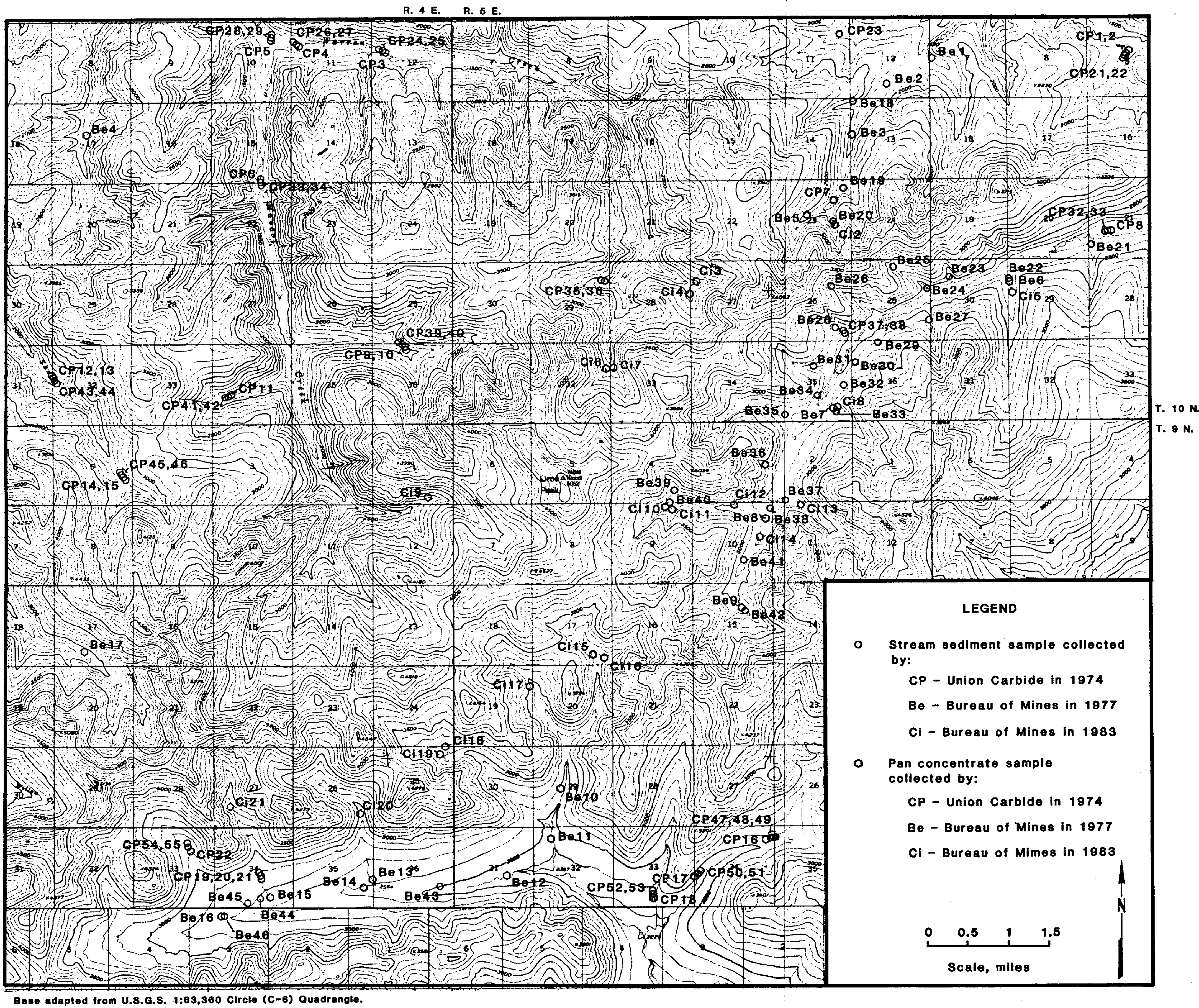


FIGURE 4. - Stream sediment and panned concentrate sample location map.

TABLE 2. - Methods of trace-element analyses for different sample suites

Sample suite	Elements	Analytical method[1]
Ci rock samples[2]	Au, Ag	FA
	F	SIE
	W	C
	Th	R
	U	F
	Nb	XRF
	Sn, Li, Rb, Cu	AA
	40 elements	ES
Be rock samples[2]	Ag, Pb, Zn, Cu, Mo	AA
CP rock samples[3]	Au, Ag	FA
	Cu, Pb, Zn, Mo	AA
	W	C
	U	F
Ci pan concentrate samples[2]	Sn, W, Nb, Ta	XRF
Be pan concentrate samples[2]	Cu, Pb, Zn, Mo, W	AA
Be stream sediment samples[2]	Th	R
	U	F
	24 elements	ES
CP stream sediment samples[2]	Ag, Cu, Pb, Zn, Mo, W	AA
	U	F

[1]FA - fire assay; C - colorimetry; F- fluorometry; AA - atomic absorption; ES - emission spectrography; R - radiometric; SIE - specific ion electrode; XRF - X-ray fluorescence.

[2]Analyses by the Bureau of Mines Reno (NV) Research Center.

[3]Analyses by Bondar-Clegg, Inc., Vancouver, BC, Canada.

Tables 3 and 4 give minimum concentrations of elements considered anomalous in stream sediment and panned concentrate samples from the Lime Peak area. These threshold values were chosen at relatively high concentrations so as to include only those values most likely to indicate significant mineralization. Because of differences in mode of collection and analyses between the three sample suites, the analytical results are not directly comparable. Therefore differing methods have been used to determine anomalous threshold values. These methods are also summarized on tables 3 and 4.

Values for tin, tungsten, and niobium (columbium) in Be and Ci panned concentrate samples were converted to weight per pan volume (mg/pan) measurements by methods described by Barker (18). The resultant measurement is a measure of the total amount of a particular metal contained in a sample. This measurement gives a more realistic assessment of the anomalous nature and allows for comparison between the different sample populations Calculated weight per pan volume measurements are listed in table A-3. Anomalous levels of niobium, tin, and tungsten and highly anomalous levels of tin and tungsten were chosen by inspection of these values.

Results

At the levels given in tables 3 and 4, the Lime Peak area contains anomalous metal concentrations in stream sediment and panned concentrate samples over an approximately 3- by 10-mile, northeast-trending region (fig. 5). This region is generally coincident to outcrops of the Lime Peak pluton. Anomalous concentrations of copper, lead, silver, zinc, tin, thorium, uranium, barium, molybdenum, boron, niobium, lanthanum, tantalum, gold, and beryllium were variously found in stream sediment or panned

TABLE 3. - Anomalous threshold values in stream sediment samples. Elements not listed are present in concentrations that are either less than the 98th percentile of values or are within the background population of values on histograms presented by Barker and Hall (17).

Element	Value (ppm)	Determination[1]
Ag.....	6	98th percentile of Be samples.
B......	300	Do.
Ba.....	5,000	Do.
Be.....	16	Do.
Pb.....	301	Do.
Cu.....	300	Do.
Sn.....	20	Visual inspection of Be data.
Zn.....	300	Do.
Mo.....	20	Do.
U......	80	Do.
Th.....	100	Do.
W......	30	Do.

[1]Anomalous levels are based on 1,048 samples collected from igneous and metasedimentary terranes of central and northern Alaska (17).

TABLE 4. - Anomalous threshold values (in mg/pan or ppm) in panned concentrate samples. Elements not listed are present in concentrations considered less than anomalous by Barker and Hall (17).

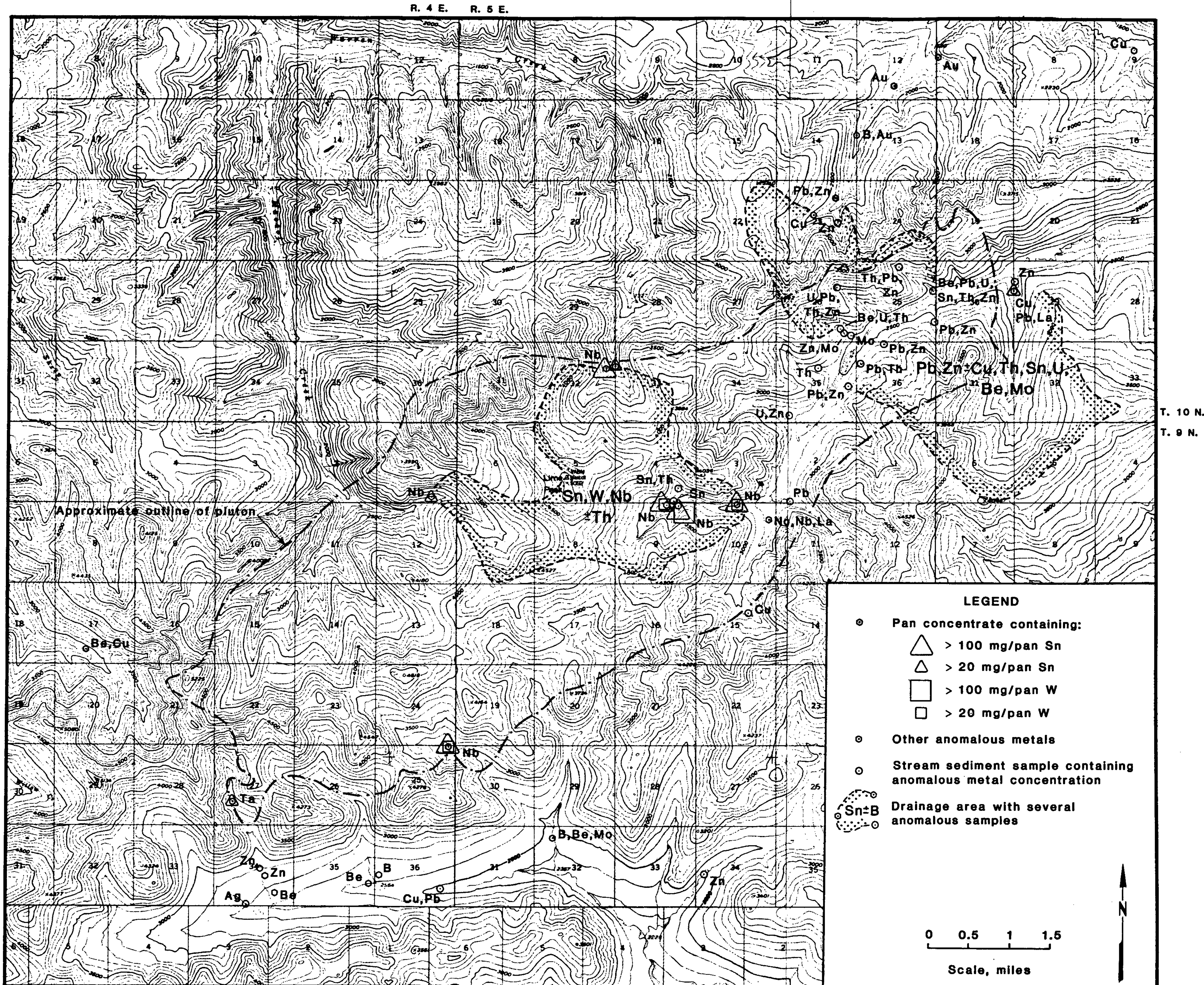
Element	Value	Determination
Sn:		
(very anomalous)...	100 mg/pan	Visual inspection of data.[1]
(anomalous)........	20 mg/pan	Do.
W:		
(very anomalous)...	100 mg/pan	Do.
(anomalous)........	20 mg/pan	Do.
Nb..................	1.2 mg/pan	Do.
B..................	[2]2,500 ppm	98th percentile of Be samples.[3]
Be..................	[2]40 ppm	Do.
Cu..................	[2]1,000 ppm	Do.
La..................	[2]9,000 ppm	Do.
Pb..................	[2]3,400 ppm	Do.
Au..................	detectable	Visual inspection of Be data.[3]
Mo..................	75 ppm	Do.
Ta..................	100 ppm	Visual inspection of Ci data.[4]
Cu (CP samples)......	100 ppm	Visual inspection of CP data.[4]
Pb (CP samples)......	70 ppm	Do.
Zn (CP samples)......	350 ppm	Do.

[1]Table B-1, appendix B.
[2]Determined for nonmagnetic fraction of heavy mineral concentrate.
[3]Anomalous levels are based on 527 pan concentrate samples collected from igneous and metasedimentary terranes of central and northern Alaska (17), some of which are presented in table A-1, appendix A.
[4]Table A-1, appendix A.

concentrate samples.

Two distinct anomalous areas, each containing several adjacent drainages containing anomalous metal concentrations, can be defined within the anomalous region (fig. 5). Samples collected from the central portion of the pluton, define an area containing anomalous concentrations of niobium and thorium and anomalous to very anomalous concentrations of tin and tungsten. Tin values in the area range from 20 to 50 ppm in stream sediment samples and from 43.6 to 561.8 mg/pan in pan concentrate samples. No tungsten was detected in stream sediment samples but values range from 24.7 to 101.4 mg/pan in panned concentrate samples. Six of seven panned concentrate samples from the area also contain anomalous concentrations of niobium, with values ranging between 1.2 and 5.5 mg/pan. Samples collected from the northeastern portion of the Lime Peak pluton define the second anomalous drainage area (fig. 5). Stream sediment and panned concentrate samples collected from drainages heading near the intrusive contact contain anomalous concentrations of lead, zinc, uranium, thorium, beryllium, barium, molybdenum, copper, and tin. The southern limit of this anomalous area is unknown because of lack of sample data.

An isolated tin-tungsten-niobium panned concentrate sample anomaly also occurs approximately two miles southwest of the western anomalous area and anomalous concentrations of copper, lead, zinc, molybdenum, tin, silver, boron, beryllium, gold, and tantalum occur elsewhere in samples from streams draining the periphery of the pluton. Most of these anomalies occur on the southern or southwestern margin of the pluton, however the gold anomalies occur in the headwaters of Moose Creek, on the northeastern margin of the pluton.



Base adapted from U.S.G.S. 1:63,360 Circle (C-6) Quadrangle.

FIGURE 5. - Interpretative geochemical map showing locations of anomalous samples and outlines of anomalous drainages.

ROCK SAMPLING

Methods

Thirty-nine rock samples were collected for analyses by the Bureau and MIRL in 1977 and 1983, and four were collected by Union Carbide in 1974. Like the stream sediment and panned concentrate samples, these sample suites are differentiated by the prefixes "Be" (1977 Bureau), "Ci" (1983 Bureau), and "CP" (1974 Union Carbide).

Rock samples consist of random chips generally collected within a few feet of the sample station, unless otherwise noted. Rocks were pulverized and analyzed by procedures listed in table 2. Analytical results are presented in appendix B. Descriptions of samples listed in table B-1 are taken from field notes, supplemented in some cases by thin section examination. Locations of rock samples are shown in Figure 6.

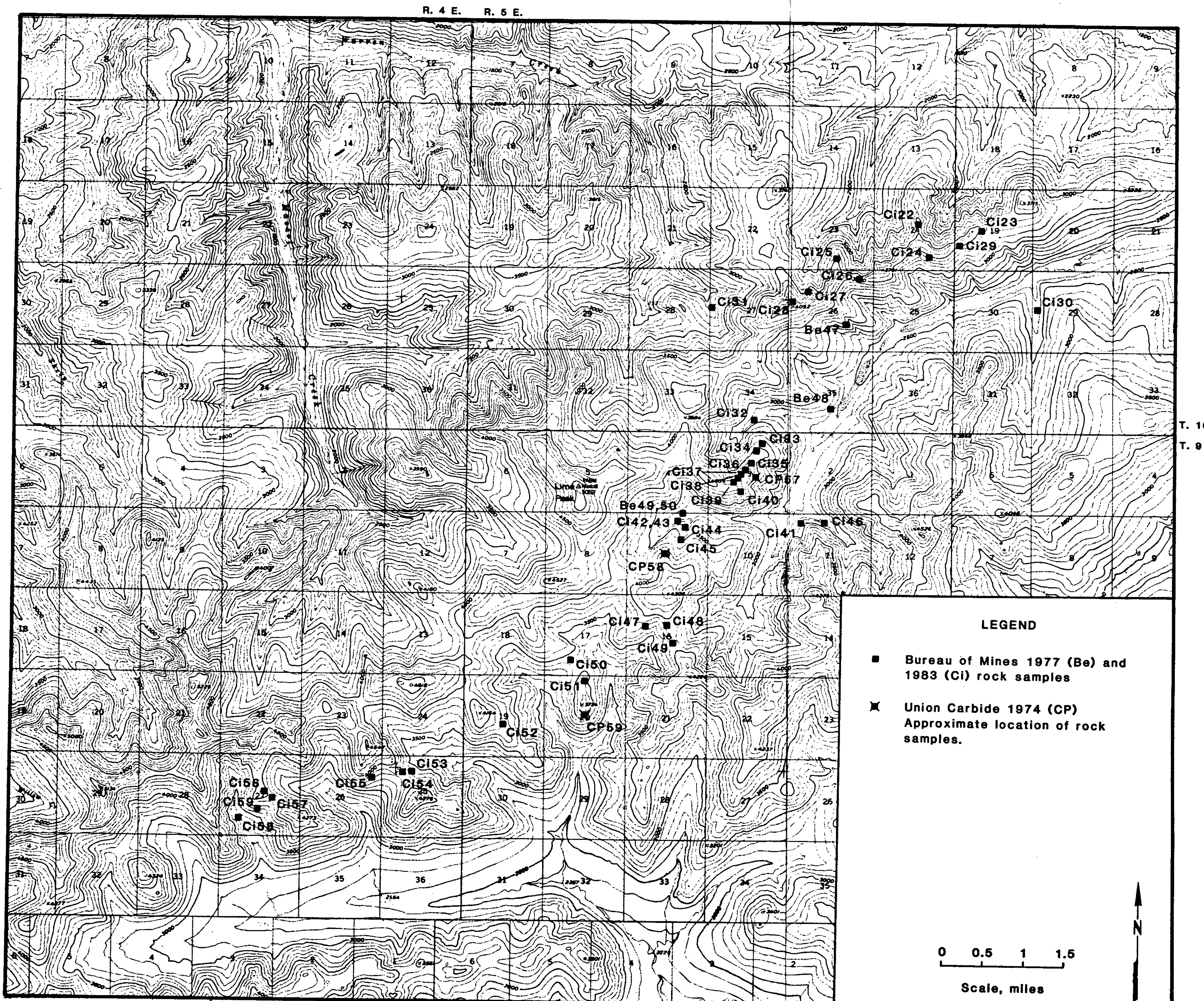
The limited number of rock sample analyses precluded statistical determination of anomalous threshold values. Therefore, anomalous values were arbitrarily chosen by inspection of data given in appendix B.

Results

Anomalous metal concentrations in rock samples collected from the Lime Peak area are associated with two styles of mineralization: skarn, developed near the contact zone of the Lime Peak pluton; and greisen, developed within the Lime Peak pluton. Samples of skarn, collected from near the northern and southeastern intrusive contacts (samples Ci28 and Ci46), contain elevated to anomalous concentrations of tin and tungsten. The highest values were detected in iron-stained, magnetite-pyrrhotite-pyroxene skarn rubble, one sample (Ci46) of which contained 220 ppm Sn and 100 ppm W.

Greisen[6] was observed in rubble and in outcrop over much of the central

[6]The abundance of chlorite at Lime Peak indicates the alteration described here does not fall under the classical definition of "greisen" (19). In the context of this report, the term refers to zones of tin mineralization.



Base adapted from U.S.G.S. 1:63,360 Circle (C-6) Quadrangle.

FIGURE 6. - Rock sample location map.

and southeastern portions of the Lime Peak pluton. The greisen is typically composed of millimeter- to half-meter-wide manganese-stained, quartz-chlorite veins enclosed within an alteration envelope of chlorite, sericite, quartz, and locally, fluorite. Topaz, blue tourmaline, pyrite, chalcopyrite, and molybdenite have also been identified in greisen at Lime Peak. The veins occur both in sheeted zones and along faults and are probably the source of cassiterite found in the surrounding drainages. Table 5 shows the major-oxide composition of one sample of greisen.

Samples of greisen collected from scattered occurrences within the Lime Peak pluton contain elevated to anomalous values of tin and other metals (table B-1). Tin values range from 60 to 1,560 ppm. The highest values are from samples Ci32, Ci36, and Ci37. Corresponding tungsten values in greisen samples are generally low; the highest value is 140 ppm W, found in sample Ci44. All but one of the greisen samples also contain detectable concentrations of silver, and many of the samples contain elevated values of uranium. Anomalous copper, lead, and zinc concentrations have also been detected.

Because there has been no systematic sampling of the greisen zones, the extent of mineralization is unknown. Seven samples from different occurrences of greisen along a ridge in Sec. 3 T. 9 N., R 5 contained an average of 610 ppm Sn and 2.36 ppm Ag with ranges of 220 to 1,000 ppm Sn and 0.370 to 4.843 ppm Ag. Although rock samples contain anomalous concentrations of tin, analyses completed to date do not indicate economic ore-grade material.

DISCUSSION

Stream sediment and panned concentrate anomalies indicate potential for additional mineralization. Anomalous concentrations of lead, zinc, and

TABLE 2. - Methods of trace-element analyses for different sample suites

Sample suite	Elements	Analytical method[1]
Ci rock samples[2]	Au, Ag	FA
	F	SIE
	W	C
	Th	R
	U	F
	Nb	XRF
	Sn, Li, Rb, Cu	AA
	40 elements	ES
Be rock samples[2]	Ag, Pb, Zn, Cu, Mo	AA
CP rock samples[3]	Au, Ag	FA
	Cu, Pb, Zn, Mo	AA
	W	C
	U	F
Ci pan concentrate samples[2]	Sn, W, Nb, Ta	XRF
Be pan concentrate samples[2]	Cu, Pb, Zn, Mo, W	AA
Be stream sediment samples[2]	Th	R
	U	F
	24 elements	ES
CP stream sediment samples[2]	Ag, Cu, Pb, Zn, Mo, W	AA
	U	F

[1]FA - fire assay; C - colorimetry; F- fluorometry; AA - atomic absorption; ES - emission spectrography; R - radiometric; SIE - specific ion electrode; XRF - X-ray fluorescence.

[2]Analyses by the Bureau of Mines Reno (NV) Research Center.

[3]Analyses by Bondar-Clegg, Inc., Vancouver, BC, Canada.

Tables 3 and 4 give minimum concentrations of elements considered anomalous in stream sediment and panned concentrate samples from the Lime Peak area. These threshold values were chosen at relatively high concentrations so as to include only those values most likely to indicate significant mineralization. Because of differences in mode of collection and analyses between the three sample suites, the analytical results are not directly comparable. Therefore differing methods have been used to determine anomalous threshold values. These methods are also summarized on tables 3 and 4.

Values for tin, tungsten, and niobium (columbium) in Be and Ci panned concentrate samples were converted to weight per pan volume (mg/pan) measurements by methods described by Barker (18). The resultant measurement is a measure of the total amount of a particular metal contained in a sample. This measurement gives a more realistic assessment of the anomalous nature and allows for comparison between the different sample populations Calculated weight per pan volume measurements are listed in table A-3. Anomalous levels of niobium, tin, and tungsten and highly anomalous levels of tin and tungsten were chosen by inspection of these values.

Results

At the levels given in tables 3 and 4, the Lime Peak area contains anomalous metal concentrations in stream sediment and panned concentrate samples over an approximately 3- by 10-mile, northeast-trending region (fig. 5). This region is generally coincident to outcrops of the Lime Peak pluton. Anomalous concentrations of copper, lead, silver, zinc, tin, thorium, uranium, barium, molybdenum, boron, niobium, lanthanum, tantalum, gold, and beryllium were variously found in stream sediment or panned

TABLE 3. - Anomalous threshold values in stream sediment samples. Elements not listed are present in concentrations that are either less than the 98th percentile of values or are within the background population of values on histograms presented by Barker and Hall (17).

Element	Value (ppm)	Determination[1]
Ag.....	6	98th percentile of Be samples.
B......	300	Do.
Ba.....	5,000	Do.
Be.....	16	Do.
Pb.....	301	Do.
Cu.....	300	Do.
Sn.....	20	Visual inspection of Be data.
Zn.....	300	Do.
Mo.....	20	Do.
U......	80	Do.
Th.....	100	Do.
W......	30	Do.

[1]Anomalous levels are based on 1,048 samples collected from igneous and metasedimentary terranes of central and northern Alaska (17).

TABLE 4. - Anomalous threshold values (in mg/pan or ppm) in panned concentrate samples. Elements not listed are present in concentrations considered less than anomalous by Barker and Hall (17).

Element	Value	Determination
Sn:		
(very anomalous)...	100 mg/pan	Visual inspection of data.[1]
(anomalous)........	20 mg/pan	Do.
W:		
(very anomalous)...	100 mg/pan	Do.
(anomalous)........	20 mg/pan	Do.
Nb..................	1.2 mg/pan	Do.
B...................	[2]2,500 ppm	98th percentile of Be samples.[3]
Be..................	[2]40 ppm	Do.
Cu..................	[2]1,000 ppm	Do.
La..................	[2]9,000 ppm	Do.
Pb..................	[2]3,400 ppm	Do.
Au..................	detectable	Visual inspection of Be data.[3]
Mo..................	75 ppm	Do.
Ta..................	100 ppm	Visual inspection of Ci data.[4]
Cu (CP samples)......	100 ppm	Visual inspection of CP data.[4]
Pb (CP samples)......	70 ppm	Do.
Zn (CP samples)......	350 ppm	Do.

[1]Table B-1, appendix B.
[2]Determined for nonmagnetic fraction of heavy mineral concentrate.
[3]Anomalous levels are based on 527 pan concentrate samples collected from igneous and metasedimentary terranes of central and northern Alaska (17), some of which are presented in table A-1, appendix A.
[4]Table A-1, appendix A.

concentrate samples.

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DISCUSSION

Stream sediment and panned concentrate anomalies indicate potential for additional mineralization. Anomalous concentrations of lead, zinc, and

TABLE 5. - Major-oxide composition of greisen sample

(weight percent)

Sample	Ci 44
SiO_2	65.00
Al_2O_3	14.00
Fe_2O_3	9.70
MgO	.05
CaO	1.20
Na_2O	.10
K_2O	2.50
LOI	2.26
TiO_2	.05
P_2O_5	.01
MnO	.34
Total	95.21

copper in samples from streams draining the northeastern and southwestern contact of the Lime Peak pluton (fig. 5) may have been derived from skarn and replacement mineralization. Anomalous concentrations of tin, tungsten, niobium, molybdenum, and thorium in stream sediment or panned concentrate samples collected from streams draining the Lime Peak summit area are apparently derived from greisen mineralization. The potential for placer tin in the gravels of the larger streams is indicated, but has not yet been tested.

Isolated beryllium, boron, tin, tungsten, niobium, molybdenum, and tantalum stream sediment and pan concentrate anomalies from the southwestern portion of the Lime Peak pluton (fig. 5) may also have been derived from greisen mineralization or from pegmatites. Although not observed, mineralogically complex pegmatites may be the source of several beryl [$Be_3Al_2(Si_6O_8)$] crystals that were found in creek gravels in in north-central Sec. 26, T. 9 N., R. 4 E. Anomalous levels of boron may be due to the presence of tourmaline within either the pegmatites, greisen, or muscovite granite (Tgm unit). The anomalous level of tantalum (140 ppm in sample Ci15) may be due to either the adjacent Tgm unit or a complex pegmatite.

SUMMARY AND RECOMMENDATIONS

Preliminary reconnaissance in the Lime Peak area indicates the Lime Peak pluton to be a composite intrusion comprising at least three texturally and compositionally distinct plutonic phases that are cut by at least two compositionally distinct sets of north-trending dikes.

Numerous occurrences of manganese-stained, quartz-chlorite $\pm$ sericite $\pm$ fluorite greisen have been identified. These occurrences are generally localized along faults but also locally comprise wide sheeted zones.

Samples of greisen contain anomalous concentrations of tin, however, because there has been no systematic sampling, the extent of mineralization is unknown. Seven samples from an area with numerous greisen zones in the central and north-central portion of Sec. 3, T 9 N, R 5 E contain an average of 610 ppm Sn and 2.36 ppm Ag. Other samples of greisen, from the southeastern and southern portions of the Lime Peak pluton, contain up to 570 ppm Sn. Although rock samples contain anomalous concentrations of tin, analyses completed to date do not indicate economic ore-grade material.

Stream sediment and panned concentrate samples contain highly anomalous metal concentrations over a region that is generally coincident with outcrops of the Lime Peak pluton. Anomalous concentrations of tin, tungsten, and niobium occur in streams draining the Lime Peak summit area whereas anomalous concentrations of lead, zinc, uranium, thorium, copper, tin, and beryllium occur in streams draining the northeastern contact of the pluton. Numerous, additional anomalous concentrations of beryllium, copper, zinc, silver, boron, molybdenum, niobium, tin, and tantalum occur as isolated stream sediment or pan concentrate anomalies in the southern and southwestern portions of the pluton.

Preliminary results presented here indicate that addditional work in the Lime Peak area is warranted. Of priority importance is completion of geologic mapping in the Lime Peak summit area and stream sediment and panned concentrate sampling along the northwestern periphery of the intrusion. Follow-up of isolated stream sediment, panned concentrate, and rock sample anomalies in the southern and central portion of the intrusion is also needed. Future detailed work should include systematic mapping and sampling of greisen zones. Additionally, bulk samples of gravels from the headwaters of the North Fork Preacher Creek, Mascot Creek, and other creeks draining the Lime Peak summit, should be collected and tested for economic concentrations of placer tin.

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APPENDIX A.--PANNED CONCENTRATE AND STREAM SEDIMENT SAMPLE ANALYTICAL RESULTS

TABLE A-1. - Results of analyses[1] of panned concentrate samples

Map no.....	Be1[2]	Be2	Be3	Be4	Be5	Be6	Be7	Be8
Field no...	Be1355	Be1354	Be1352	Be2289	Be1099	Be1167	Be1160	Be1158
Ag...ppm...	3	2	3	5	10	10	10	15
Au...ppm...	500	700	1,000	N	N	N	N	N
B....ppm...	G	G	3,000	150	2,000	1,000	2,000	2,000
Ba...ppm...	10	7	7	G	2,000	5,000	N	N
Be...ppm...	N	L	N	L	10	20	20	20
Bi...ppm...	N	N	N	N	L	L	L	L
Ce...ppm...	N	30	30	N	N	N	N	100,000
Co...ppm...	500	1,500	1,500	70	100	50	N	100
Cr...ppm...	150	300	300	1,500	2,000	2,000	1,000	2,000
Cu...ppm...	L	L	L	300	1,000	1,000	500	500
La...ppm...	15	15	15	1,000	N	10,000	7,000	20,000
Mo...ppm...	N	N	N	15	20	20	20	300
Nb...ppm...	200	200	300	L	L	200	500	1,000
Ni...ppm...	200	300	300	150	200	2,000	200	2,000
Pb...ppm...	N	N	N	150	2,000	5,000	700	2,000
Sb...ppm...	N	N	N	N	N	N	N	L
Sn...ppm...	700	500	700	N	200	50,000	5,000	5,000
V....ppm...	100	300	200	300	1,000	1,000	500	5,000
W....ppm...	L	L	L	N	L	L	5,000	700
Ta...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Y....ppm...	N	N	N	N	200	2,000	2,000	10,000
Zr...ppm...	1,000	G	G	1,000	G	G	G	G
Zn...ppm...	1,500	1,500	1,500	1,000	2,000	2,000	1,000	1,000
Map no.....	Be9	Be10	Be11	Be12	Be13	Be14	Be15	Be16
Field no...	Be1151	Be1063	Be1018	Be1010	Be1008	Be1007	Be1006	Be1003
Ag...ppm...	10	1	10	2	L	L	2	5
Au...ppm...	N	N	N	N	N	N	N	N
B....ppm...	300	500	5,000	2,000	10,000	2,000	2,000	700
Ba...ppm...	5,000	N	N	N	N	N	N	N
Be...ppm...	10	10	50	15	20	50	100	10
Bi...ppm...	L	L	N	N	N	L	200	L
Ce...ppm...	N	N	20,000	N	N	N	N	N
Co...ppm...	50	N	50	10	10	20	70	70
Cr...ppm...	1,000	1,000	2,000	1,000	500	1,000	1,000	1,500
Cu...ppm...	1,000	150	500	200	150	200	1,000	500
La...ppm...	N	N	N	N	N	N	N	N
Mo...ppm...	20	N	200	20	20	20	50	50
Nb...ppm...	L	L	200	200	200	200	200	200
Ni...ppm...	200	150	2,000	100	200	100	500	2,000
Pb...ppm...	500	700	2,000	300	1,000	200	1,000	500
Sb...ppm...	N	N	500	N	N	N	N	N
Sn...ppm...	100	200	1,000	5,000	300	10,000	7,000	1,000
V....ppm...	1,000	50	200	100	L	100	100	100
W....ppm...	L	N	L	L	L	L	200	2,000
Ta...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Y....ppm...	500	500	1,000	1,000	700	700	700	500
Zr...ppm...	G	1,000	G	G	G	G	G	1,000
Zn...ppm...	2,000	2,000	2,000	1,000	1,000	1,000	2,000	2,000

[1]G - greater than detection limit; L - detected; N - not detected; NA - not analyzed.

[2]Data for samples with Be prefix from Barker and Hall (18). As and Pt below detection limits. Analyses by emission spectrography performed by Mineral Industry Research Laboratory (MIRL) University of Alaska, Fairbanks, AK.

Results of analyses[1] of panned concentrate samples--Continued

Map no.....	Be17	CP1[3]	CP2	CP3	CP4	CP5	CP6	CP7
Field no...	Be1088	CP2988	CP2990	CP1548	CP1779	CP1542	CP1768	CP3022
Ag...ppm...	10	<5	<5	<5	<5	<5	<5	<5
Au...ppm...	N	NA	NA	NA	NA	NA	NA	NA
B....ppm...	700	NA	NA	NA	NA	NA	NA	NA
Ba...ppm...	L	NA	NA	NA	NA	NA	NA	NA
Be...ppm...	100	NA	NA	NA	NA	NA	NA	NA
Bi...ppm...	L	NA	NA	NA	NA	NA	NA	NA
Ce...ppm...	N	NA	NA	NA	NA	NA	NA	NA
Co...ppm...	100	NA	NA	NA	NA	NA	NA	NA
Cr...ppm...	1,000	NA	NA	NA	NA	NA	NA	NA
Cu...ppm...	1,000	75	100	75	65	50	55	65
La...ppm...	N	NA	NA	NA	NA	NA	NA	NA
Mo...ppm...	50	10	15	5	5	5	5	10
Nb...ppm...	200	NA	NA	NA	NA	NA	NA	NA
Ni...ppm...	150	NA	NA	NA	NA	NA	NA	NA
Pb...ppm...	2,000	10	40	20	30	20	35	70
Sb...ppm...	N	NA	NA	NA	NA	NA	NA	NA
Sn...ppm...	1,000	NA	NA	NA	NA	NA	NA	NA
V....ppm...	200	NA	NA	NA	NA	NA	NA	NA
W....ppm...	L	<10	<10	10	<10	18	16	<10
Ta...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Y....ppm...	700	NA	NA	NA	NA	NA	NA	NA
Zr...ppm...	500	NA	NA	NA	NA	NA	NA	NA
Zn...ppm...	2,000	75	165	50	145	75	143	350
Map no.....	CP8	CP9	CP10	CP11	CP12	CP13	CP14	CP15
Field no...	CP1503	CP5893	CP5895	CP1761	CP2963	CP3013	CP2839	CP2842
Ag...ppm...	<5	NA	NA	<5	<5	<5	<5	<5
Au...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
B....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Ba...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Be...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Bi...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Ce...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Co...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Cr...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Cu...ppm...	85	30	25	65	60	75	85	75
La...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Mo...ppm...	5	<5	<5	5	15	10	5	5
Nb...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Ni...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Pb...ppm...	30	45	45	35	20	35	55	50
Sb...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Sn...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
V....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
W....ppm...	<10	<10	12	19	<10	<10	<10	<10
Ta...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Y....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Zr...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Zn...ppm...	100	135	130	120	130	130	195	160

[1]G - greater than detection limit; L - detected; N - not detected; NA - not analyzed.

[3]Data for samples with CP prefix from Union Carbide 1974 reconnaissance. Cu, Pb, Zn, and Sn analyses by atomic absorption, and W by colorimetry techniques performed by Bondar-Clegg, Inc., Vancouver, BC, Canada.

Results of analyses[1] of panned concentrate samples--Continued

Map no.....	CP16	CP17	CP18	CP19	CP20	CP21	CP22	Ci1[4]
Field no...	CP1236	CP1251	CP1331	CP5603	CP5606	CP5604	CP803	Ci21286
Ag...ppm...	<5	<5	<5	NA	NA	NA	<5	NA
Au...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
B....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Ba...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Be...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Bi...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Ce...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Co...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Cr...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Cu...ppm...	65	55	50	45	50	45	80	NA
La...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Mo...ppm...	10	10	10	<5	<5	<5	10	NA
Nb...ppm...	NA	NA	NA	NA	NA	NA	NA	<70
Ni...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Pb...ppm...	20	50	30	45	60	40	55	NA
Sb...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Sn...ppm...	NA	NA	NA	NA	NA	NA	NA	<100
V....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
W....ppm...	<10	33	16	<10	19	<10	14	<200
Ta...ppm...	NA	NA	NA	NA	NA	NA	NA	<60
Y....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Zr...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Zn...ppm...	75	320	12	315	370	360	215	NA

Map no.....	Ci2	Ci3	Ci4	Ci5	Ci6	Ci7	Ci8	Ci9
Field no...	Ci21287	Ci21288	Ci21289	Ci21284	Ci21411	Ci21412	Ci21285	Ci21410
Ag...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Au...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
B....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Ba...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Be...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Bi...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Ce...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Co...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Cr...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Cu...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
La...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Mo...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Nb...ppm...	<70	<70	<70	<70	370	150	<70	300
Ni...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Pb...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Sb...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Sn...ppm...	400	<100	<100	1,600	30,000	6,700	2,100	5,200
V....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
W....ppm...	<200	<200	<200	500	1,500	1,800	1,600	2,100
Ta...ppm...	<60	<60	<60	80	70	<60	<60	80
Y....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Zr...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Zn...ppm...	NA	NA	NA	NA	NA	NA	NA	NA

[1]G - greater than detection limit; L - detected; N - not detected; NA - not analyzed.

[4]Data for samples with Ci prefix collected by the Bureau in 1983. Sn, W, Nb, and Ta analyses by X-ray fluorescence techniques performed by the Bureau's Reno (NV) Research Center.

Results of analyses[1] of panned concentrate samples--Continued

Map no.....	Ci10	Ci11	Ci12	Ci13	Ci14	Ci15
Field no...	Ci21294	Ci21296	Ci21291	Ci21293	Ci21292	Ci21387
Ag...ppm...	NA	NA	NA	NA	NA	NA
Au...ppm...	NA	NA	NA	NA	NA	NA
B....ppm...	NA	NA	NA	NA	NA	NA
Ba...ppm...	NA	NA	NA	NA	NA	NA
Be...ppm...	NA	NA	NA	NA	NA	NA
Bi...ppm...	NA	NA	NA	NA	NA	NA
Ce...ppm...	NA	NA	NA	NA	NA	NA
Co...ppm...	NA	NA	NA	NA	NA	NA
Cr...ppm...	NA	NA	NA	NA	NA	NA
Cu...ppm...	NA	NA	NA	NA	NA	NA
La...ppm...	NA	NA	NA	NA	NA	NA
Mo...ppm...	NA	NA	NA	NA	NA	NA
Nb...ppm...	430	710	130	<70	<70	<70
Ni...ppm...	NA	NA	NA	NA	NA	NA
Pb...ppm...	NA	NA	NA	NA	NA	NA
Sb...ppm...	NA	NA	NA	NA	NA	NA
Sn...ppm...	19,000	72,000	12,000	1,100	<100	200
V....ppm...	NA	NA	NA	NA	NA	NA
W....ppm...	5,100	13,000	2,600	5,100	<200	300
Ta...ppm...	70	70	<60	70	<60	<60
Y....ppm...	NA	NA	NA	NA	NA	NA
Zr...ppm...	NA	NA	NA	NA	NA	NA
Zn...ppm...	NA	NA	NA	NA	NA	NA
Map no.....	Ci16	Ci17	Ci18	Ci19	Ci20	Ci21
Field no...	Ci21386	Ci21385	Ci21413	Ci18716	Ci21300	Ci21299
Ag...ppm...	NA	NA	NA	NA	NA	NA
Au...ppm...	NA	NA	NA	NA	NA	NA
B....ppm...	NA	NA	NA	NA	NA	NA
Ba...ppm...	NA	NA	NA	NA	NA	NA
Be...ppm...	NA	NA	NA	NA	NA	NA
Bi...ppm...	NA	NA	NA	NA	NA	NA
Ce...ppm...	NA	NA	NA	NA	NA	NA
Co...ppm...	NA	NA	NA	NA	NA	NA
Cr...ppm...	NA	NA	NA	NA	NA	NA
Cu...ppm...	NA	NA	NA	NA	NA	NA
La...ppm...	NA	NA	NA	NA	NA	NA
Mo...ppm...	NA	NA	NA	NA	NA	NA
Nb...ppm...	80	180	<70	910	<70	130
Ni...ppm...	NA	NA	NA	NA	NA	NA
Pb...ppm...	NA	NA	NA	NA	NA	NA
Sb...ppm...	NA	NA	NA	NA	NA	NA
Sn...ppm...	400	1,200	1,200	14,000	1,800	3,600
V....ppm...	NA	NA	NA	NA	NA	NA
W....ppm...	300	1,000	1,000	4,000	400	<200
Ta...ppm...	<60	<60	<60	60	<60	140
Y....ppm...	NA	NA	NA	NA	NA	NA
Zr...ppm...	NA	NA	NA	NA	NA	NA
Zn...ppm...	NA	NA	NA	NA	NA	NA

[1]G - greater than detection limit; L - detected; N - not detected; NA - not analyzed.

TABLE A-2. - Results of analyses[1] of stream sediment samples

Map no.....	Be18[2]	Be19	Be20	Be21	Be22	Be23	Be24	Be25
Field no...	Be1353	Be1351	Be1100	Be1169	Be1168	Be1116	Be1115	Be1114
Fe...pct...	5	3.5	2	2	20	3	2	2
Mg...pct...	3.5	3.5	3	5	7	3	3	3
Ca...pct...	5	5	2	5	7	5	7	7
Na...pct...	G	G	G	G	G	G	G	G
K....pct...	NA	NA	NA	NA	NA	NA	NA	NA
Ti...pct...	1.0	G	0.7	1	G	0.7	1	1
Mn...ppm...	1,500	1,500	5,000	5,000	G	3,000	5,000	5,000
Ag...ppm...	2	2	L	L	2	2	2	2
B....ppm...	100	100	70	70	100	100	150	100
Ba...ppm...	N	L	N	N	N	N	N	N
Be...ppm...	2	2	2	L	2	10	20	20
Bi...ppm...	N	L	5	5	5	L	L	L
Co...ppm...	N	N	N	N	N	L	N	N
Cr...ppm...	300	1,000	300	1,000	2,000	200	500	100
Cu...ppm...	20	15	30	50	50	70	70	70
Ga...ppm...	1.5	2	1.5	1	2	2	10	7
La...ppm...	N	N	N	N	N	N	N	N
Mo...ppm...	N	N	L	N	N	L	L	L
Ni...ppm...	100	100	70	500	500	150	300	70
P....ppm...	L	L	L	L	500	2,000	500	1,000
Pb...ppm...	50	50	N	L	100	L	300	500
Pd...ppm...	N	N	N	N	N	N	N	N
V....ppm...	150	150	150	200	500	300	500	300
Sn...ppm...	N	N	N	N	N	N	30	N
W....ppm...	N	N	N	N	N	N	N	N
Y....ppm...	N	N	L	N	N	L	2,000	L
Zn...ppm...	L	N	500	N	700	L	1,500	1,500
Zr...ppm...	350	500	200	N	1,000	200	500	N
Th...ppm...	NA	NA	14.0	13.8	18.0	78.8	143.8	106.3
U....ppm...	NA	NA	4.6	3.6	3.4	56.0	108.0	45.2

[1]G - greater than detection limit; L - detected; N - not detected; NA - not analyzed; i - interference.

[2]Data for samples with Be prefix from Barker and Hall (18). As, Au, Cd, Li, Nb, Pt, Sb, Sc, Se, Sr, Ta, and Te values below detection limits. Analyses by emission spectrography performed by Mineral Industry Research Laboratory (MIRL), University of Alaska, Fairbanks, AK.

Results of analyses[1] of stream sediment samples--Continued

Map no.....	Be26	Be27	Be28	Be29	Be30	Be31	Be32	Be33
Field no...	Be1113	Be1166	Be1111	Be1165	Be1164	Be1110	Be1163	Be1161
Fe...pct...	5	20	2	10	10	5	10	5
Mg...pct...	3	7	3	5	7	3	5	7
Ca...pct...	5	7	5	5	5	5	5	5
Na...pct...	G	G	G	G	G	G	G	G
K....pct...	NA	NA	NA	NA	NA	NA	NA	NA
Ti...pct...	1	G	0.7	1	1	0.7	0.1	0.1
Mn...ppm...	5,000	G	2,000	5,000	G	3,000	5,000	5,000
Ag...ppm...	2	2	2	2	2	N	2	L
B....ppm...	100	100	30	100	100	20	100	100
Ba...ppm...	N	N	5,000	N	N	N	N	N
Be...ppm...	70	10	30	15	10	15	15	7
Bi...ppm...	L	5	150	5	5	N	5	5
Co...ppm...	N	N	N	N	N	N	N	N
Cr...ppm...	200	2,000	700	1,000	1,000	300	1,000	1,000
Cu...ppm...	70	100	30	50	50	20	50	50
Ga...ppm...	2	10	1.5	2	5	L	10	5
La...ppm...	N	N	N	N	N	N	N	N
Mo...ppm...	L	N	N	N	N	N	N	N
Ni...ppm...	200	500	300	300	300	500	500	300
P....ppm...	1,000	500	500	500	1,000	N	500	500
Pb...ppm...	500	7,000	N	500	700	L	1,500	100
Pd...ppm...	N	N	N	N	N	N	N	N
V....ppm...	300	500	30	100	200	300	200	200
Sn...ppm...	N	N	N	N	N	N	N	N
W....ppm...	N	N	N	N	N	N	N	N
Y....ppm...	L	N	L	N	L	N	N	N
Zn...ppm...	500	700	N	1,000	N	N	700	N
Zr...ppm...	500	N	500	1,000	1,000	N	N	N
Th...ppm...	109.0	37.0	106.3	57.5	153.0	106.3	54.0	19.6
U....ppm...	88.0	13.2	116.0	13.3	25.5	29.6	30.8	8.6

[1]G - greater than detection limit; L - detected; N - not detected; NA - not analyzed; i - interference.

Results of analyses[1] of stream sediment samples--Continued

Map no.....	Be34	Be35	Be36	Be37	Be38	Be39	Be40	Be41
Field no...	Be1109	Be1107	Be1106	Be1159	Be1157	Be1105	Be1101	Be1155
Fe...pct...	1	0.5	5	5	5	2	5	5
Mg...pct...	2	0.1	2	5	3	0.5	2	3
Ca...pct...	2	0.1	2	3	2	1	2	2
Na...pct...	G	0.8	G	G	G	G	G	G
K....pct...	NA	NA	NA	NA	NA	NA	NA	NA
Ti...pct...	0.7	0.15	1	1	1	0.15	0.7	1
Mn...ppm...	3,000	300	2,000	2,000	2,000	700	700	2,000
Ag...ppm...	N	2	2	L	L	N	L	L
B....ppm...	70	30	200	100	50	L	70	100
Ba...ppm...	N	N	N	N	N	N	N	NA
Be...ppm...	15	20	2	5	5	3	10	10
Bi...ppm...	N	N	L	5	L	N	5	L
Co...ppm...	N	N	N	N	N	N	N	N
Cr...ppm...	300	N	1,000	1,000	500	N	300	500
Cu...ppm...	30	20	15	70	50	2	7	20
Ga...ppm...	L	N	N	1	1	1.5	1	0.5
La...ppm...	N	N	N	N	N	N	N	NA
Mo...ppm...	L	N	N	N	N	L	L	N
Ni...ppm...	200	100	300	1,000	300	70	70	200
P....ppm...	L	500	N	500	L	N	L	N
Pb...ppm...	50	L	N	50	50	N	N	N
Pd...ppm...	N	N	N	N	N	N	N	N
V....ppm...	150	50	100	150	100	70	150	100
Sn...ppm...	N	N	N	N	N	20	50	N
W....ppm...	N	N	N	N	N	N	N	N
Y....ppm...	500	N	N	N	N	N	L	N
Zn...ppm...	N	500	N	N	N	N	N	N
Zr...ppm...	N	N	N	N	N	N	200	N
Th...ppm...	52.5	83.8	8.5	16.8	34.0	107.8	52.5	33.3
U....ppm...	69.6	108.0	1.8	4.7	44.0	46.8	44.7	17.0

[1]G - greater than detection limit; L - detected; N - not detected; NA - not analyzed; i - interference.

Results of analyses[1] of stream sediment samples--Continued

Map no.....	Be42	Be43	Be44	Be45	Be46	CP21[3]	CP22	CP23
Field no...	Be1152	Be1009	Be1005	Be1004	Be1002	CP2987	CP2989	CP3020
Fe...pct...	1	5	5	5	5	NA	NA	NA
Mg...pct...	3	3	3	5	3	NA	NA	NA
Ca...pct...	2	2	5	5	2	NA	NA	NA
Na...pct...	G	G	G	G	G	NA	NA	NA
K....pct...	NA	i	i	i	i	NA	NA	NA
Ti...pct...	0.7	0.7	0.7	0.7	0.7	NA	NA	NA
Mn...ppm...	5,000	3,000	1,000	200	1,500	NA	NA	NA
Ag...ppm...	L	N	L	5	L	<0.5	0.5	0.8
B....ppm...	150	N	100	70	70	NA	NA	NA
Ba...ppm...	NA	70	N	N	N	NA	NA	NA
Be...ppm...	2	N	L	L	2	NA	NA	NA
Bi...ppm...	N	5	5	5	5	NA	NA	NA
Co...ppm...	N	N	N	N	N	NA	NA	NA
Cr...ppm...	300	N	500	200	700	NA	NA	NA
Cu...ppm...	30	700	20	50	30	22	19	30
Ga...ppm...	L	30	15	2	2	NA	NA	NA
La...ppm...	NA	1.5	N	N	N	NA	NA	NA
Mo...ppm...	N	N	L	L	L	N	N	N
Ni...ppm...	200	N	200	100	150	NA	NA	NA
P....ppm...	L	300	1,000	1,000	1,500	NA	NA	NA
Pb...ppm...	N	1,000	L	50	100	18	27	15
Pd...ppm...	N	L	N	N	N	NA	NA	NA
V....ppm...	100	200	200	200	200	NA	NA	NA
Sn...ppm...	N	N	N	N	N	N	N	N
W....ppm...	N	N	N	N	L	<10	N	N
Y....ppm...	N	L	N	L	L	NA	NA	NA
Zn...ppm...	N	200	200	200	200	80	140	82
Zr...ppm...	N	500	500	200	500	NA	NA	NA
Th...ppm...	14.8	33.0	15.3	20.0	19.5	NA	NA	NA
U....ppm...	3.0	NS	3.4	3.0	3.0	0.8	0.6	0.4

[1]G - greater than detection limit; L - detected; N - not detected; NA - not analyzed; NS - not sufficient sample; i - interference.

[3]Data for samples with CP prefix from Union Carbide 1974 reconnaissance. Ag, Cu, Pb, Zn, and Mo analyses by atomic absorption, W by colorimetry, and U by fluorometric techniques performed by Bondar-Clegg, Inc., Vancouver, BC, Canada.

Results of analyses[1] of stream sediment samples--Continued

Map no.....	CP24	CP25	CP26	CP27	CP28	CP29	CP30	CP31
Field no...	CP1546	CP1547	CP1777	CP1778	CP1543	CP1544	CP1766	CP1767
Fe...pct...	NA	NA	NA	NA	NA	NA	NA	NA
Mg...pct...	NA	NA	NA	NA	NA	NA	NA	NA
Ca...pct...	NA	NA	NA	NA	NA	NA	NA	NA
Na...pct...	NA	NA	NA	NA	NA	NA	NA	NA
K....pct...	NA	NA	NA	NA	NA	NA	NA	NA
Ti...pct...	NA	NA	NA	NA	NA	NA	NA	NA
Mn...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Ag...ppm...	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5
B....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Ba...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Be...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Bi...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Co...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Cr...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Cu...ppm...	65	52	60	45	31	50	33	60
Ga...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
La...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Mo...ppm...	5	2	5	1	3	5	N	5
Ni...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
P....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Pb...ppm...	35	24	25	22	14	35	24	40
Pd...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
V....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Sn...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
W....ppm...	<10	<10	14	<10	<10	15	<10	13
Y....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Zn...ppm...	135	124	110	112	72	145	129	115
Zr...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Th...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
U....ppm...	<5	NA	<5	NA	<5	<5	<5	<5

[1]G - greater than detection limit; L - detected; N - not detected; NA - not analyzed; NS - not sufficient sample; i - interference.

Results of analyses[1] of stream sediment samples--Continued

Map no.	CP32	CP33	CP34	CP35	CP36	CP37	CP38	CP39
Field no.	CP1501	CP1502	CP1536	CP4312	CP4377	CP4327	CP4328	CP5892
Fe...pct.	NA	NA	NA	NA	NA	NA	NA	NA
Mg...pct.	NA	NA	NA	NA	NA	NA	NA	NA
Ca...pct.	NA	NA	NA	NA	NA	NA	NA	NA
Na...pct.	NA	NA	NA	NA	NA	NA	NA	NA
K....pct.	NA	NA	NA	NA	NA	NA	NA	NA
Ti...pct.	NA	NA	NA	NA	NA	NA	NA	NA
Mn...ppm.	NA	NA	NA	NA	NA	NA	NA	NA
Ag...ppm.	<0.5	<0.5	<0.5	NA	<0.5	2	2	NA
B....ppm.	NA	NA	NA	NA	NA	NA	NA	NA
Ba...ppm.	NA	NA	NA	NA	NA	NA	NA	NA
Be...ppm.	NA	NA	NA	NA	NA	NA	NA	NA
Bi...ppm.	NA	NA	NA	NA	NA	NA	NA	NA
Co...ppm.	NA	NA	NA	NA	NA	NA	NA	NA
Cr...ppm.	NA	NA	NA	NA	NA	NA	NA	NA
Cu...ppm.	40	50	90	35	25	60	65	55
Ga...ppm.	NA	NA	NA	NA	NA	NA	NA	NA
La...ppm.	NA	NA	NA	NA	NA	NA	NA	NA
Mo...ppm.	10	5	5	<5	<5	25	20	<5
Ni...ppm.	NA	NA	NA	NA	NA	NA	NA	NA
P....ppm.	NA	NA	NA	NA	NA	NA	NA	NA
Pb...ppm.	20	20	40	95	45	75	75	45
Pd...ppm.	NA	NA	NA	NA	NA	NA	NA	NA
V....ppm.	NA	NA	NA	NA	NA	NA	NA	NA
Sn...ppm.	NA	NA	NA	NA	NA	NA	NA	NA
W....ppm.	11	18	13	11	24	<10	12	<10
Y....ppm.	NA	NA	NA	NA	NA	NA	NA	NA
Zn...ppm.	75	75	75	165	240	345	245	235
Zr...ppm.	NA	NA	NA	NA	NA	NA	NA	NA
Th...ppm.	NA	NA	NA	NA	NA	NA	NA	NA
U....ppm.	<5	NA	<5	<5	46	24	20	7

[1]G - greater than detection limit; L - detected; N - not detected; NA - not analyzed; NS - not sufficient sample; i - interference.

Results of analyses[1] of stream sediment samples--Continued

Map no.....	CP40	CP41	CP42	CP43	CP44	CP45	CP46	CP47
Field no...	CP5894	CP1759	CP1760	CP2962	CP3012	CP2838	CP2841	CP1233
Fe...pct...	NA	NA	NA	NA	NA	NA	NA	NA
Mg...pct...	NA	NA	NA	NA	NA	NA	NA	NA
Ca...pct...	NA	NA	NA	NA	NA	NA	NA	NA
Na...pct...	NA	NA	NA	NA	NA	NA	NA	NA
K....pct...	NA	NA	NA	NA	NA	NA	NA	NA
Ti...pct...	NA	NA	NA	NA	NA	NA	NA	NA
Mn...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Ag...ppm...	NA	<0.5	<0.5	0.7	0.6	0.9	0.8	NA
B....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Ba...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Be...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Bi...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Co...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Cr...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Cu...ppm...	30	32	55	40	28	30	27	NA
Ga...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
La...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Mo...ppm...	<5	N	5	N	N	N	N	NA
Ni...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
P....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Pb...ppm...	75	41	50	22	39	48	57	23
Pd...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
V....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Sn...ppm...	NA	NA	NA	NA	NA	3	1	NA
W....ppm...	12	<10	16	<10	N	N	N	27
Y....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Zn...ppm...	120	110	120	153	138	120	170	78
Zr...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Th...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
U....ppm...	7	<5	<5	0.8	0.4	2	0.6	NA

[1]G - greater than detection limit; L - detected; N - not detected; NA - not analyzed; NS - not sufficient sample; i - interference.

Results of analyses[1] of stream sediment samples--Continued

Map no.....	CP48	CP49	CP50	CP51	CP52	CP53	CP54	CP55
Field no...	CP1234	CP1235	CP1249	CP1250	CP1329	CP1330	CP801	CP802
Fe...pct...	NA	NA	NA	NA	NA	NA	NA	NA
Mg...pct...	NA	NA	NA	NA	NA	NA	NA	NA
Ca...pct...	NA	NA	NA	NA	NA	NA	NA	NA
Na...pct...	NA	NA	NA	NA	NA	NA	NA	NA
K....pct...	NA	NA	NA	NA	NA	NA	NA	NA
Ti...pct...	NA	NA	NA	NA	NA	NA	NA	NA
Mn...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Ag...ppm...	<0.5	<0.5	NA	<0.5	<0.5	NA	<0.5	NA
B....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Ba...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Be...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Bi...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Co...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Cr...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Cu...ppm...	20	80	NA	95	80	NA	50	20
Ga...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
La...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Mo...ppm...	15	10	NA	10	5	NA	10	NA
Ni...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
P....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Pb...ppm...	30	30	85	95	25	28	45	46
Pd...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
V....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Sn...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
W....ppm...	20	23	33	41	16	29	14	<10
Y....ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Zn...ppm...	85	85	210	500	80	113	145	145
Zr...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
Th...ppm...	NA	NA	NA	NA	NA	NA	NA	NA
U....ppm...	<5	<5	NA	26	<0.5	<0.5	<0.5	<0.5

[1]G - greater than detection limit; L - detected; N - not detected; NA - not analyzed; NS - not sufficient sample; i - interference.

TABLE A-3. - Weight per pan volume values (mg/pan)[1] of Sn, W, and Nb in panned concentrate samples

Map no.	Field no.	Weight (g)	Sn, ppm	W, ppm	Nb, ppm	$R_{Sn(mg)}$	$R_{W(mg)}$	$R_{Nb(mg)}$
Be1....	Be1355...	1.84	700	L	200	1.29	L	0.368
Be2....	Be1354...	1.20	500	L	200	.60	L	.240
Be3....	Be1352...	.50	700	L	300	.35	L	.150
Be4....	Be2289...	1.829	N	N	L	N	N	L
Be5....	Be1099...	.870	200	L	L	.17	L	L
Be6....	Be1167...	1.56	50,000	L	200	78.0	L	.366
Be7....	Be1160...	2.17	5,000	5,000	500	10.85	10.85	1.085
Be8....	Be1158...	0.54	5,000	700	1,000	2.7	.4	2.17
Be9....	Be1151...	1.274	100	L	L	.13	L	L
Be10...	Be1063...	.205	200	N	L	.04	N	L
Be11...	Be1011...	.144	1,000	L	200	.14	L	.029
Be12...	Be1010...	.550	5,000	L	200	2.75	L	.11
Be13...	Be1008...	.494	300	L	200	.15	L	.010
Be14...	Be1007...	.67	10,000	L	200	6.7	L	.134
Be15...	Be1006...	.70	7,000	200	200	4.9	.14	.140
Be16...	Be1003...	.26	1,000	2,000	200	.26	.52	.052
Be17...	Be1088...	.74	1,000	L	200	.74	L	.148
Ci1....	Ci21286..	5.5	<100	<200	<70	<.55	<1.1	<.385
Ci2....	Ci21287..	6.8	400	<200	<70	2.72	<1.36	<.476
Ci3....	Ci21288..	6.6	<100	<200	<70	<.66	<1.32	<.462
Ci4....	Ci21289..	5.9	<100	<200	<70	<.59	<1.18	<.4713
Ci5....	Ci21284..	4.5	1,600	500	<70	7.2	2.25	<.315
Ci6....	Ci21411..	6.0	30,000	1,500	370	180.0	9.0	2.22
Ci7....	Ci21412..	6.5	6,700	1,800	150	43.55	11.7	.975
Ci8....	Ci21285..	7.0	2,100	1,600	<70	14.7	11.2	<.49
Ci9....	Ci21410..	8.6	5,200	2,100	300	44.72	18.06	2.58
Ci10...	Ci21294..	8.2	19,000	5,100	430	155.8	41.82	3.526
Ci11...	Ci21296..	7.8	72,000	13,000	710	561.8	101.4	5.538
Ci12...	Ci21291..	9.5	12,000	2,600	130	114.0	24.7	1.235
Ci13...	Ci21293..	8.2	1,100	5,100	<70	9.02	<1.64	<.574
Ci14...	Ci21292..	6.4	<100	<200	<70	<.64	2.56	<.448
Ci15...	Ci21387..	6.5	200	300	<70	1.3	2.13	<.455
Ci16...	Ci21386..	7.1	400	300	80	2.84	2.13	.568
Ci17...	Ci21385..	5.7	1,200	1,000	180	6.84	5.7	1.026
Ci18...	Ci21413..	7.0	1,200	1,000	<70	8.4	7.0	<.49
Ci19...	Ci18716..	8.5	14,000	4,000	910	119.0	34.0	7.735
Ci20...	Ci21300..	7.1	1,800	400	<70	12.78	2.84	6.497
Ci21...	Ci21299..	6.9	3,600	<200	130	24.84	1.38	.897

[1]Values calculated by method described in Bureau of Mines OFR 59-83 using the following formula:

$$\text{mg/pan} = \frac{\text{(ppm value)}}{1 \times 10^6} [1{,}000 \text{ (weight in grams)}]$$

APPENDIX B.--ROCK SAMPLE ANALYTICAL RESULTS

TABLE B-1. - Results of trace element analyses and field descriptions of rock samples

Map no.	Field no.	Au, ppm	Ag, ppm	Cu, ppm	Pb, ppm	Zn, ppm	Mo, ppm	Sn, ppm	W, ppm	U, ppm	Li, ppm	Rb, ppm	Ba, ppm	Nb, ppm	F; ppm	Th, ppm
Be47[1]..	Be1112...	NA	14.0	18	470	950	7	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be48...	Be1108...	NA	7.7	4,900	290	160	3	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be49...	Be1102...	NA	2.8	10	100	190	4	NA	NA	NA	NA	NA	NA	NA	NA	NA
Be50...	Be1104...	NA	9.6	97	370	1,000	82	NA	NA	NA	NA	NA	NA	NA	NA	NA
CP56[2]..	CP6407...	NA	NA	800	275	530	<5	NA	NA	6	NA	NA	NA	NA	NA	NA
CP57...	CP6408...	NA	NA	1,160	170	2,600	100	NA	NA	<5	NA	NA	NA	NA	NA	NA
CP58...	CP4160...	9.6	6.8	460	1,050	18,750	<5	NA	133	NA	NA	NA	NA	NA	NA	NA
CP59...	CP5739...	NA	NA	200	1,700	1,450	<5	NA	13	NA	NA	NA	NA	NA	NA	NA
Ci22[3]..	Ci17996..	<.007	<.3	NA	NA	NA	NA	15	<5	0.8	NA	NA	NA	<50	120	<30
Ci23...	Ci17999..	<.007	1.543	NA	NA	NA	NA	130	10	.88	NA	NA	NA	80	34,000	<30
Ci24...	Ci17997..	<.007	<.3	NA	NA	NA	NA	66	40	<.5	NA	NA	NA	<50	6,000	<30
Ci25...	Ci17994..	<.007	<.3	NA	NA	NA	NA	9	<5	1.6	NA	NA	NA	<50	270	35
Ci26...	Ci17995..	<.007	<.3	NA	NA	NA	NA	15	<5	15	NA	NA	NA	<50	660	65
Ci27...	Ci17993..	<.007	.770	NA	NA	NA	NA	34	<5	6.2	NA	NA	NA	<50	930	35
Ci28...	Ci17992..	<.007	<.3	NA	NA	NA	NA	220	6	3.4	NA	NA	NA	<50	130	<30
Ci29...	Ci17998..	<.007	<.3	NA	NA	NA	NA	15	12	1.1	NA	NA	NA	<50	33,000	<30

Map no.	Field description
Be47...	Granite containing minor fluorite, limonite, goethite, and hematite.
Be48...	One- to two-foot-wide vein.
Be49...	Silicic, fine-grained igneous rock with K-spar, quartz, biotite phenocrysts and rusty veinlets and blebs throughout.
Be50...	Altered granite with abundant limonite and manganese staining.
CP56...	No description; approximately located within Sec. 3, T 9 N, R 5 E.
CP57...	Do.
CP58...	Assay shows 0.28 oz/ton Au, 0.2 oz/ton Ag, approximately located within Sec. 9, T 9 N, R 5 E.
CP59...	No description; approximately located within Sec. 20, T 9 N, R 5 E.
Ci22...	Grit with chlorite (or tourmaline?).
Ci23...	Tourmalinized granite, biotite and feldspars replaced, heavily Mn stained.
Ci24...	Skarn.
Ci25...	Skarn, underlying marble 1,500 ft from contact.
Ci26...	Fine-grained granite float near contact.
Ci27...	Hornfels with disseminated sulfides (pyrrhotite?).
Ci28...	Limestone and calc silicates (?).
Ci29...	Hornfels with quartz veins, fluorite, and tourmaline.

See explanatory notes at end of table.

Results of trace element analyses and field descriptions of rock samples--Continued

Map no.	Field no.	Au, ppm	Ag, ppm	Cu, ppm	Pb, ppm	Zn, ppm	Mo, ppm	Sn, ppm	W, ppm	U, ppm	Li, ppm	Rb, ppm	Ba ppm	Nb, ppm	F, ppm	Th, ppm
Ci30...	Ci21268..	<0.007	<0.3	NA	NA	NA	NA	60	<5	3.6	NA	NA	NA	<50	46	45
Ci31...	Ci21290..	<.007	<.3	98	NA	NA	NA	9	<5	1.6	NA	NA	NA	<50	340	40
Ci32...	Ci21269..	<.007	4.873	NA	NA	NA	NA	1,560	12	10	NA	NA	NA	<50	1,100	70
Ci33...	Ci21270..	<.007	4.743	NA	NA	NA	NA	220	6	52	NA	NA	NA	<50	950	35
Ci34...	Ci21271..	<.007	.370	NA	NA	NA	NA	690	20	8.6	NA	NA	NA	<50	5,100	90
Ci35...	Ci21272..	<.007	2.223	NA	NA	NA	NA	880	10	22	NA	NA	NA	<50	2,000	55
Ci36...	Ci21273..	<.007	2.854	1,400	NA	NA	NA	1,000	16	12	NA	NA	NA	<50	1,000	60
Ci37...	Ci21274..	<.007	3.923	NA	NA	NA	NA	910	10	15	NA	NA	NA	<50	2,100	<30
Ci38...	Ci21275..	NA	NA	NA	NA	NA	NA	7	<5	5.3	50	210	200	<50	980	70
Ci39...	Ci21276..	<.007	1.490	NA	NA	NA	NA	270	8	13	NA	NA	NA	<50	2,500	125
Ci40...	Ci21277..	<.007	.942	NA	NA	NA	NA	320	8	13	NA	NA	NA	<50	2,200	45
Ci41...	Ci21278..	NA	NA	NA	NA	NA	NA	7	<5	3.8	44	270	<200	<50	1,500	45
Ci42...	Ci21279..	NA	NA	NA	NA	NA	NA	48	<5	12.0	25	330	<200	80	1,700	35
Ci43...	Ci21295..	<.007	4.520	NA	NA	NA	NA	530	6	30	NA	NA	NA	<50	3,800	45
Ci44...	Ci18000..	<.007	3.007	NA	NA	NA	NA	570	140	19	NA	NA	<200	<50	260	<30

Map no.	Field description
Ci30...	Typical chlorite ± tourmaline, sericite and quartz greisen in biotite granite.
Ci31...	Limestone with disseminated pyrite and chalcopyrite.
Ci32...	Random chips of chlorite-sericite greisen veins in granite. Veins at least 15 cm wide and at least some random orientation. Creek float.
Ci33...	Sericite-chlorite-quartz-tourmaline(?)-fluorite greisen rubble similar to sample Ci32. Greisen scattered in float for few hundred meters.
Ci34...	Same as sample Ci33, but with more fluorite.
Ci35...	Mn-stained, quartz-sericite-tourmaline(?) greisen. Extensive altered shear(?) zone that aligns with break in slope.
Ci36...	Chlorite-quartz-sericite greisen veins (?) with minor to accessory chalcopyrite in medium-grained biotite granite. Few pieces in float.
Ci37...	Same as Ci36 but more abundant in float.
Ci38...	Random unweathered chips from relatively fresh, frost-fractured boulders of medium-grained to porphyritic biotite granite.
Ci39...	Greisen with a few specks fluorite. Fairly common in float and aligns with break in slope at 3,850 ft elevation.
Ci40...	Abundant greisen and fine-grained, black (tourmaline?) groundmass material. Possible sedimentary roof rock.
Ci41...	Random chip from internal areas of boulders of frost-fractured coarse-grained, equigranular, biotite quartz monzonite. Possible saussuritization of feldspars.
Ci42...	N 50° W-striking, unaltered aplinitic to finely crystalline aplite dike, approximately 5 m thick. Minor Mn stain on fractures.
Ci43...	Composite chip of greisen vein material.
Ci44...	Moderately to intensely greisenized granite.

See explanatory notes at end of table.

Results of trace element analyses and field descriptions of rock samples--Continued

Map no.	Field no.	Au, ppm	Ag, ppm	Cu, ppm	Pb, ppm	Zn, ppm	Mo, ppm	Sn, ppm	W, ppm	U, ppm	Li, ppm	Rb, ppm	Ba, ppm	Nb, ppm	F, ppm	Th, ppm
Ci45...	Ci17669..	<0.007	<0.3	NA	NA	NA	NA	11	<5	0.55	NA	NA	NA	<50	420	<30
Ci46...	Ci18718..	.033	.780	NA	NA	NA	NA	220	100	.69	NA	NA	NA	<50	1,000	<30
Ci47...	Ci18938..	<.007	2.348	NA	NA	NA	NA	78	14	93	NA	NA	NA	<50	150	35
Ci48...	Ci18937..	<.007	<.3	NA	NA	NA	NA	<5	<5	.53	NA	NA	NA	<50	280	<30
Ci49...	Ci18936..	<.007	<.3	NA	NA	NA	NA	21	8	15	NA	NA	NA	<50	410	70
Ci50...	Ci18939..	<.007	<.3	NA	NA	NA	NA	300	<5	13	NA	NA	NA	<50	540	85
Ci51...	Ci18940..	<.007	<.3	NA	NA	NA	NA	46	<5	19	NA	NA	NA	<50	250	45
Ci52...	Ci20121..	<.007	1.964	NA	NA	NA	NA	76	12	35	NA	NA	NA	<50	410	<30
Ci53...	Ci21218..	NA	NA	NA	NA	NA	NA	<5	<5	7.8	100	240	<200	<50	570	60
Ci54...	Ci21217..	<.007	2.596	NA	NA	NA	NA	540	6	100	NA	NA	NA	<50	320	<30
Ci55...	Ci20216..	<.007	.890	NA	NA	NA	NA	99	8	28	NA	NA	NA	<50	140	<30
Ci56...	Ci20732..	<.007	.580	NA	NA	NA	NA	60	6	53	NA	NA	NA	<50	270	45
Ci57...	Ci20731..	<.007	2.048	NA	NA	NA	NA	490	6	67	NA	NA	NA	<50	6,000	<30
Ci58...	Ci18717..	<.007	<.3	NA	NA	NA	NA	84	<5	.88	NA	NA	NA	<50	900	40
Ci59...	Ci20730..	NA	NA	NA	NA	NA	NA	NA	NA	4.8	NA	NA	NA	<50	930	40

Field descriptions

Map no.	Field description
Ci45...	Diabase dike.
Ci46...	Fe-stained, magnetite-pyrrhotite-pyroxene skarn. Possible scheelite?
Ci47...	Mn-stained intensely greisenized granite.
Ci48...	Green-black altered diabase. Trends approximately N 30° W.
Ci49...	Quartz latite(?) porphyry, green matrix, smoky quartz phenocrysts.
Ci50...	Intensely greisenized granite.
Ci51...	K-spar-quartz porphyry with aplinitic groundmass. Only rock type not greisenized in area, later intrusion?
Ci52...	Greisenized granite.
Ci53...	Non-porphyritic coarse-grained granite with both plagioclase and orthoclase. Quartz is slightly smokey.
Ci54...	Sericite-quartz veins with goethite and limonite in coarse-grained granite along side of tor.
Ci55...	Greisen rubble in talus. Clots of tourmaline sen innearby fine-grained biotite granite.
Ci56...	Greisen vein in biotite quartz monzonite. Pieces to 2 by 5 cm. Minor boxwork.
Ci57...	Do.
Ci58...	Tactite float in creek. Few specks pyrrhotite and scheelite(?).
Ci59...	Muscovite granite.

NA Not analyzed.

[1]Data for samples with Be prefix from Barker and Hall (18). Analyses by atomic absorption by the Bureau's Reno (NV) Research Center.

[2]Data for samples with CP prefix from Union Carbide 1974 reconnaissance. Analyses of Au and Ag by fire assay; Cu, Pb, Zn, and Mo by atomic absorption; W by colorimetry; and U by fluorometry performed by Bondar-Clegg, Vancouver, BC, Canada.

[3]Data for samples with Ci prefix from Bureau (1983) work. Analyses of Au and Ag by fire assay; Sn, Li, Rb, and Ba by atomic absorption; W by colorimetry; and W by fluorometry performed by the Bureau's Reno (NV) Research Center.

TABLE B-2. - Results of semi-quantitative emission spectrographic analyses[1] of 1983 (Ci) Lime Peak rock samples

Map no.....	Ci22	Ci23	Ci24	Ci25	Ci26	Ci27	Ci28	Ci29
Field no...	Ci17996	Ci17999	Ci17997	Ci17994	Ci17995	Ci17993	Ci17992	Ci17998
	Concentration, percent							
Ag.........	<0.0007	<0.006	<0.001	<0.0005	<0.0005	<0.0008	<0.003	<0.0008
Al.........	>3	>4	>4	>3	>4	>4	>4	>3
As.........	<0.01	<0.009	<0.009	<0.009	<0.02	<0.009	<0.009	<0.01
Au.........	<0.002	<0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
B..........	0.01	<0.004	0.01	0.01	0.02	0.02	0.02	0.01
Ba.........	0.008	0.006	0.01	1	0.03	0.3	0.008	0.02
Be.........	<0.0003	0.001	0.0006	<0.0003	0.001	0.0003	0.0005	0.002
Bi.........	<0.01	<0.3	<0.05	<0.01	<0.02	<0.02	<0.02	<0.01
Ca.........	<0.05	3	6	3	0.1	1	>10	5
Cd.........	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	<0.0005	<0.0005
Co.........	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cr.........	0.01	0.001	0.001	0.003	0.009	0.002	0.006	0.009
Cu.........	<0.0006	0.001	<0.0006	0.0008	<0.0006	0.0007	<0.0006	<0.0006
Fe.........	3	9	4	3	2	3	7	5
Ga.........	<0.0002	0.002	<0.0004	<0.0002	<0.0003	<0.0002	<0.0008	<0.0002
K..........	<0.9	<0.7	2	5	>10	10	<0.6	<1
La.........	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Li.........	<0.002	>0.09	>0.04	<0.003	0.02	>0.05	<0.002	0.01
Mg.........	0.2	0.8	2	1	0.3	1	0.8	0.6
Mn.........	0.1	>6	>2	>2	0.06	0.2	>5	0.4
Mo.........	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Na.........	<0.3	3	4	<0.3	4	<0.7	<0.3	<0.3
Nb.........	<0.007	<0.03	<0.02	<0.01	<0.02	<0.02	<0.03	<0.007
Ni.........	0.001	<0.0002	0.004	0.001	0.001	0.002	<0.003	0.002
P..........	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
Pb.........	<0.005	0.1	<0.002	<0.003	<0.006	0.2	<0.004	<0.003
Pd.........	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pt.........	<0.0006	<0.0007	<0.0006	<0.0006	<0.0006	<0.0006	<0.0009	<0.0006
Sb.........	<0.06	<0.1	<0.06	<0.06	<0.06	<0.06	<0.07	<0.06
Sc.........	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Si.........	>10	>10	>10	>10	>10	>10	>10	>10
Sn.........	<0.004	<0.03	<0.008	<0.007	<0.003	<0.005	<0.03	<0.01
Sr.........	<0.0001	0.001	0.04	0.03	0.002	0.002	0.0006	0.0005
Ta.........	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Te.........	<0.04	<0.04	<0.04	<0.07	<0.04	<0.04	<0.04	<0.04
Ti.........	0.8	<0.04	0.1	0.2	<0.03	0.2	0.3	0.2
V..........	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
Y..........	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009
Zn.........	0.02	0.2	0.04	0.09	0.05	0.2	0.03	0.04
Zr.........	0.01	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003

[1]Analyses by Bureau of Mines Reno (NV) Research Center.

Results of semi-quantitative emission spectrographic analyses of 1983 (Ci) Lime Peak rock samples--Continued

Map no.....	Ci30	Ci31	Ci32	Ci33	Ci34	Ci35	Ci36	Ci37
Field no...	Ci21268	Ci21290	Ci21269	Ci21270	Ci21271	Ci21272	Ci21273	Ci21274
	Concentration, percent							
Ag.........	<0.001	<0.0005	<0.002	<0.004	<0.002	<0.008	<0.003	<0.003
Al.........	>3	>3	>4	>4	>4	>4	>4	>3
As.........	<0.009	<0.009	<0.01	<0.009	<0.009	<0.06	<0.01	<0.05
Au.........	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
B..........	0.009	0.02	0.01	0.009	0.01	<0.006	0.04	<0.008
Ba.........	0.09	0.06	0.007	0.005	0.03	0.005	0.01	0.005
Be.........	0.001	0.0008	0.002	0.001	0.01	0.001	0.002	0.001
Bi.........	<0.03	<0.02	<0.04	<0.02	<0.04	<0.03	<0.02	<0.04
Ca.........	<0.05	1	<0.07	<0.1	7	<0.06	<0.05	<0.2
Cd.........	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Co.........	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cr.........	0.003	<0.0007	0.002	0.003	<0.0003	0.001	0.006	<0.0009
Cu.........	<0.0006	0.004	<0.0006	0.007	<0.0006	<0.0006	0.1	0.08
Fe.........	3	5	8	7	8	10	6	9
Ga.........	<0.0007	<0.0002	<0.001	<0.0005	0.002	<0.001	<0.0004	<0.0005
K..........	10	4	5	4	4	<1	7	<1
La.........	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Li.........	0.02	0.01	>0.1	>0.04	>0.2	>0.06	>0.09	>0.03
Mg.........	0.1	1	0.2	0.04	0.3	0.1	0.1	0.05
Mn.........	0.5	0.3	>3	>5	>2	>5	0.5	>3
Mo.........	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Na.........	2	<0.3	<0.3	<0.3	3	<0.3	<0.3	<0.3
Nb.........	<0.007	<0.02	<0.02	<0.009	<0.02	<0.02	<0.01	<0.008
Ni.........	0.0008	0.001	<0.0002	<0.002	<0.0003	<0.004	<0.0008	<0.003
P..........	<0.7	<0.7	<0.9	<0.7	<0.7	<0.7	<0.7	<0.7
Pb.........	<0.002	<0.004	0.02	0.1	0.009	0.03	0.02	0.03
Pd.........	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pt.........	<0.0006	<0.0006	0.0007	<0.0006	<0.0006	<0.0008	<0.0006	<0.0007
Sb.........	<0.06	<0.06	<0.1	<0.1	<0.09	<0.1	<0.08	<0.01
Sc.........	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Si.........	>10	>10	>10	>10	>10	>10	>10	>10
Sn.........	<0.006	<0.004	<0.2	<0.03	<0.09	<0.2	<0.1	<0.1
Sr.........	0.0003	0.0004	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001
Ta.........	<0.02	<0.02	<0.03	<0.02	<0.02	<0.03	<0.02	<0.02
Te.........	<0.04	<0.04	<0.04	<0.04	<0.04	<0.05	<0.04	<0.04
Ti.........	<0.03	0.2	<0.04	<0.03	0.09	<0.05	<0.05	<0.03
V..........	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Y..........	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009
Zn.........	0.2	0.01	0.09	0.09	0.07	0.1	0.08	0.09
Zr.........	0.003	<0.003	0.005	<0.003	<0.003	0.006	<0.003	0.01

Results of semi-quantitative emission spectrographic analyses of 1983 (Ci) Lime Peak rock samples--Continued

Map no.....	Ci38	Ci39	Ci40	Ci41	Ci42	Ci43	Ci44	Ci45
Field no...	Ci21275	Ci21276	Ci21277	Ci21278	Ci21279	Ci21295	Ci18000	Ci17669
				Concentration, percent				
Ag.........	<0.0005	<0.002	<0.009	<0.001	<0.0005	<0.006	<0.002	<0.002
Al.........	>4	>4	>4	>4	>4	>4	>4	>5
As.........	<0.01	<0.01	<0.06	<0.01	<0.01	<0.05	<0.009	<0.009
Au.........	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
B..........	0.01	0.02	0.04	0.01	0.01	0.03	0.009	0.01
Ba.........	0.04	0.01	0.02	0.02	<0.002	0.01	0.002	0.02
Be.........	0.001	0.002	0.006	0.0007	0.0004	0.002	0.0005	0.0006
Bi.........	<0.02	<0.05	<0.04	<0.03	<.02	<0.03	<0.03	<0.02
Ca.........	0.5	<0.2	<0.07	0.4	0.2	<0.1	0.5	10
Cd.........	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Co.........	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005
Cr.........	0.006	0.001	<0.0008	0.005	0.003	0.002	0.003	0.03
Cu.........	<0.0006	<0.0006	0.001	<0.0006	<0.0006	0.002	0.0008	<0.0006
Fe.........	2	9	9	2	0.9	8	6	6
Ga.........	<0.0002	<0.002	0.002	<0.0003	<0.0008	<0.0007	<0.001	<0.0008
K..........	>10	6	7	>10	9	7	3	<0.6
La.........	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Li.........	0.02	<0.2	>0.1	0.02	<0.005	>0.1	>0.1	0.01
Mg.........	0.1	0.2	0.2	0.1	0.001	0.1	0.03	2
Mn.........	0.09	>3	>6	0.09	0.4	>5	>2	>2
Mo.........	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Na.........	3	<0.3	<0.3	4	6	<0.3	<0.3	2
Nb.........	<0.02	<0.03	<0.03	<0.01	<0.02	<0.01	<0.01	<0.06
Ni.........	0.0009	<0.0002	<0.004	0.0009	<0.0007	<0.003	<0.0007	<0.001
P..........	<0.7	<0.9	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
Pb.........	<0.002	0.02	0.06	<0.003	<0.007	0.05	0.01	0.01
Pd.........	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pt.........	<0.0006	<0.001	<0.001	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Sb.........	<0.06	<0.1	<0.1	<0.06	<0.06	<0.1	<0.06	<0.07
Sc.........	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Si.........	>10	>10	>10	>10	>10	>10	>10	>10
Sn.........	<0.003	<0.04	<0.04	<0.003	<0.004	<0.04	<0.05	<0.02
Sr.........	0.0003	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	0.01
Ta.........	<0.02	<0.05	<0.03	<0.02	<0.02	<0.02	<0.02	<0.02
Te.........	<0.04	<0.04	<0.04	<0.04	<0.05	<0.04	<0.04	<0.04
Ti.........	<0.05	<0.06	<0.06	<0.04	<0.03	<0.03	<0.03	0.6
V..........	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.03
Y..........	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009
Zn.........	0.003	0.1	0.2	0.006	0.02	0.1	0.04	0.008
Zr.........	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003

Results of semi-quantitative emission spectrographic analyses of 1983 (Ci) Lime Peak rock samples--Continued

Map no.....	Ci46	Ci47	Ci48	Ci49	Ci50	Ci51	Ci52	Ci53
Field no...	Ci18718	Ci18938	Ci18937	Ci18936	Ci18939	Ci18940	Ci20121	Ci21218
	Concentration, percent							
Ag.........	<0.002	<0.01	<0.002	<0.0005	<0.0008	<0.0005	<0.003	<0.0005
Al.........	1	>4	>4	>4	>3	>4	>4	>4
As.........	<0.05	<0.07	<0.01	<0.02	<0.01	<0.02	<0.009	<0.01
Au.........	<0.002	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
B..........	<0.006	<0.003	<0.008	0.01	0.01	0.01	<0.009	0.02
Ba.........	0.01	0.04	0.04	0.04	0.002	0.03	0.02	0.007
Be.........	0.005	0.002	0.001	0.002	0.0009	0.001	0.002	0.003
Bi.........	<0.02	<0.03	<0.03	<0.03	<0.01	<0.02	<0.03	<0.02
Ca.........	0.2	<0.05	8	<0.05	<0.05	<0.05	<0.2	0.4
Cd.........	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Co.........	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cr.........	0.001	<0.0003	0.004	0.005	0.005	0.003	<0.0003	0.007
Cu.........	0.03	<0.0006	<0.0006	<0.0006	0.01	<0.0006	<0.0006	<0.0006
Fe.........	9	10	6	3	6	2	10	2
Ga.........	<0.0007	<0.002	<0.0002	<0.0006	<0.0006	<0.0002	<0.001	<0.0004
K..........	<0.8	10	<0.7	>10	<2	>10	<2	>10
La.........	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Li.........	0.005	>0.1	0.03	>0.05	>0.04	0.009	>0.08	>0.1
Mg.........	0.4	0.07	1	0.8	0.02	0.05	0.04	0.06
Mn.........	0.4	>8	>3	0.2	0.6	0.2	>3	0.09
Mo.........	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Na.........	<.3	<0.3	2	3	<0.3	2	<0.3	6
Nb.........	<0.007	<0.02	<0.04	<0.02	<0.02	<0.02	<0.03	<0.02
Ni.........	<0.001	<0.006	<0.0008	0.001	<0.0005	<0.0007	<0.0006	0.0009
P..........	<0.7	<0.9	<1	<0.7	<0.7	<0.7	<1	<0.7
Pb.........	<0.002	0.06	<0.006	<0.004	<0.003	<0.004	0.02	<0.004
Pd.........	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pt.........	<0.0006	<0.0009	<0.001	<0.0006	<0.0006	<0.0006	<0.001	<0.0006
Sb.........	<0.1	<0.2	<0.1	<0.06	<0.06	<0.06	<0.3	<0.06
Sc.........	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Si.........	>10	>10	>10	>10	>10	>10	>10	>10
Sn.........	<0.04	<0.04	<0.008	<0.007	<0.02	<0.003	<0.04	<0.003
Sr.........	<0.0001	0.002	0.03	0.0009	<0.0001	<0.0001	<0.0001	<0.0001
Ta.........	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.1	<0.02
Te.........	<0.04	<0.07	<0.04	<0.04	<0.04	<0.04	<0.04	<0.05
Ti.........	<0.05	<0.04	0.5	0.1	<0.03	<0.03	<0.03	<0.03
V..........	<0.005	<0.005	<0.007	<0.005	<0.005	<0.005	<0.005	<0.005
Y..........	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009
Zn.........	0.01	0.2	0.04	0.006	0.07	0.01	0.2	0.004
Zr.........	0.003	<0.003	<0.003	<0.003	0.005	<0.003	0.005	<0.003

Results of semi-quantitative emission spectrographic analyses of 1983 (Ci) Lime Peak rock samples--Continued

Map no.....	Ci54	Ci55	Ci56	Ci57	Ci58	Ci59
Field no...	Ci21217	Ci20216	Ci20732	Ci20731	Ci18717	Ci20730
	Concentration, percent					
Ag.........	<0.004	<0.005	<0.0005	<0.002	<0.002	<0.002
Al.........	>3	>4	>3	>3	>4	>4
As.........	<0.009	<0.04	<0.009	<0.03	<0.02	<0.01
Au.........	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
B..........	<0.007	<0.003	0.01	<0.003	0.02	0.02
Ba.........	0.007	0.02	0.04	0.01	0.01	<0.002
Be.........	0.009	0.002	0.005	0.002	0.0007	0.002
Bi.........	<0.02	<0.02	<0.02	<0.01	<0.03	<0.03
Ca.........	<0.09	<0.05	<0.05	<0.1	6	0.1
Cd.........	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Co.........	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001
Cr.........	<0.0004	<0.0006	0.003	<0.0003	<0.0003	0.004
Cu.........	0.006	<0.0006	<0.0006	<0.0006	0.0006	<0.0006
Fe.........	10	7	6	9	7	1
Ga.........	0.002	<0.0008	<0.0009	<0.0002	<0.0006	<0.001
K..........	<0.6	4	6	4	<1	10
La.........	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Li.........	>0.08	>0.1	>0.05	>0.06	0.009	>0.5
Mg.........	0.03	0.04	0.1	0.1	1	0.0003
Mn.........	>2	>6	>3	>6	0.9	0.2
Mo.........	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Na.........	<0.4	<0.4	<0.3	<0.3	4	6
Nb.........	<0.03	<0.02	<0.02	<0.01	<0.05	<0.02
Ni.........	<0.0007	<0.003	<0.0002	<0.003	0.002	0.001
P..........	<1	<0.7	<0.8	<1	<1	<0.7
Pb.........	0.02	0.03	<0.005	<0.004	<0.003	<0.003
Pd.........	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pt.........	<0.0008	<0.0006	<0.0006	<0.0006	<0.001	<0.0006
Sb.........	<0.2	<0.1	<0.1	<0.2	<0.1	<0.06
Sc.........	<0.0005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Si.........	>10	>10	>10	>10	>10	>10
Sn.........	<0.1	<0.01	<0.02	<.03	<0.02	<0.003
Sr.........	0.0001	0.0002	0.002	0.0002	0.05	<0.0001
Ta.........	<0.02	<0.02	<0.02	<0.07	<0.02	<0.02
Te.........	<0.04	<0.04	<0.04	<0.04	<0.05	<0.05
Ti.........	<0.03	<0.03	<0.03	<0.03	1	<0.03
V..........	<0.01	<0.005	<0.005	<0.005	0.01	<0.005
Y..........	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009
Zn.........	0.1	0.2	0.04	0.1	0.04	0.002
Zr.........	0.01	0.004	<0.003	<0.003	<0.003	<0.003