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A TRACE ELEMENT STUDY OF THE CIRCLE MINING DISTRICT, ALASKA

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Fairbanks, Alaska

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UNITED STATES DEPARTMENT OF INTERIOR

Cecil D. Andrus, Secretary

BUREAU OF MINES

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A TRACE ELEMENT STUDY OF THE CIRCLE MINING DISTRICT, ALASKA

by

James C. Barker 1/

ABSTRACT

The Circle Mining District including the Birch Creek area has been known for years for its tin (cassiterite) and tungsten (wolframite and scheelite) minerals occurring in gold placer concentrates. In 1975 significant quantities of placer cassiterite and scheelite were also found by placer miners on upper Boulder Creek. Although no lode source for these placer minerals could be found, unweathered pieces of cassiterite were seen with fragments of vein quartz and schist attached.

The occurrence on Boulder Creek is located in the Birch Creek Schist near the contact of the Circle Hot Springs intrusive. Examination of the sluice box concentrates indicated 63 percent cassiterite and 0.2 percent scheelite.

Further work by the Bureau of Mines consisted of pan concentrate and limited stream sediment sampling of various creeks in the district and examination of numerous outcrops. Concentrate analyses plots were made of ten elements occurring in heavy mineral samples. As a result, a zone of tin and tungsten mineralization was defined.

INTRODUCTION

This report presents the results of a study by the Bureau of Mines of trace elements in stream valleys of the Circle Mining District in east central Alaska. This district is an old gold placer mining area known to contain tin and tungsten mineralization.

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The purpose of the investigation was to obtain a better picture of the distribution and extent of tin and tungsten mineralization.

ACKNOWLEDGMENTS

Acknowledgment is made to Mr. William Hawkins who holds claims on Boulder Creek and brought his discovery of cassiterite to the Bureau's attention and to the many other placer miners who made the sampling possible.

The particular assistance of Mr. Mitch Henning and Mr. Gil Eakins, geologists for the Alaska Division of Geological and Geophysical Surveys who assisted with field examinations and helicopter support, is also acknowledged.

LOCATION AND ACCESSIBILITY

Central, located 125 road miles northeast of Fairbanks, is the main distribution center for the district. The community has a permanent population of approximately 50 people and offers highway services, supplies, and a post office. In addition, the resort at Circle Hot Springs, nine miles to the east of Central, provides lodging and meals on a year round basis, figure 1.

The majority of the mining activity is located between 65° 20' and 65° 35' north latitude and between 144° 10' and 145° 45' west longitude about 80 miles south of the Arctic Circle, figure 2. The area is served by scheduled air service from Fairbanks and by various air taxi operators to the airstrips at Central and Circle Hot Springs. Most freight is now brought over the Steese Highway, which is an improved gravel road from Fairbanks, although historically it was landed at Circle via the Yukon river boats and then transported overland approximately 35 miles. The

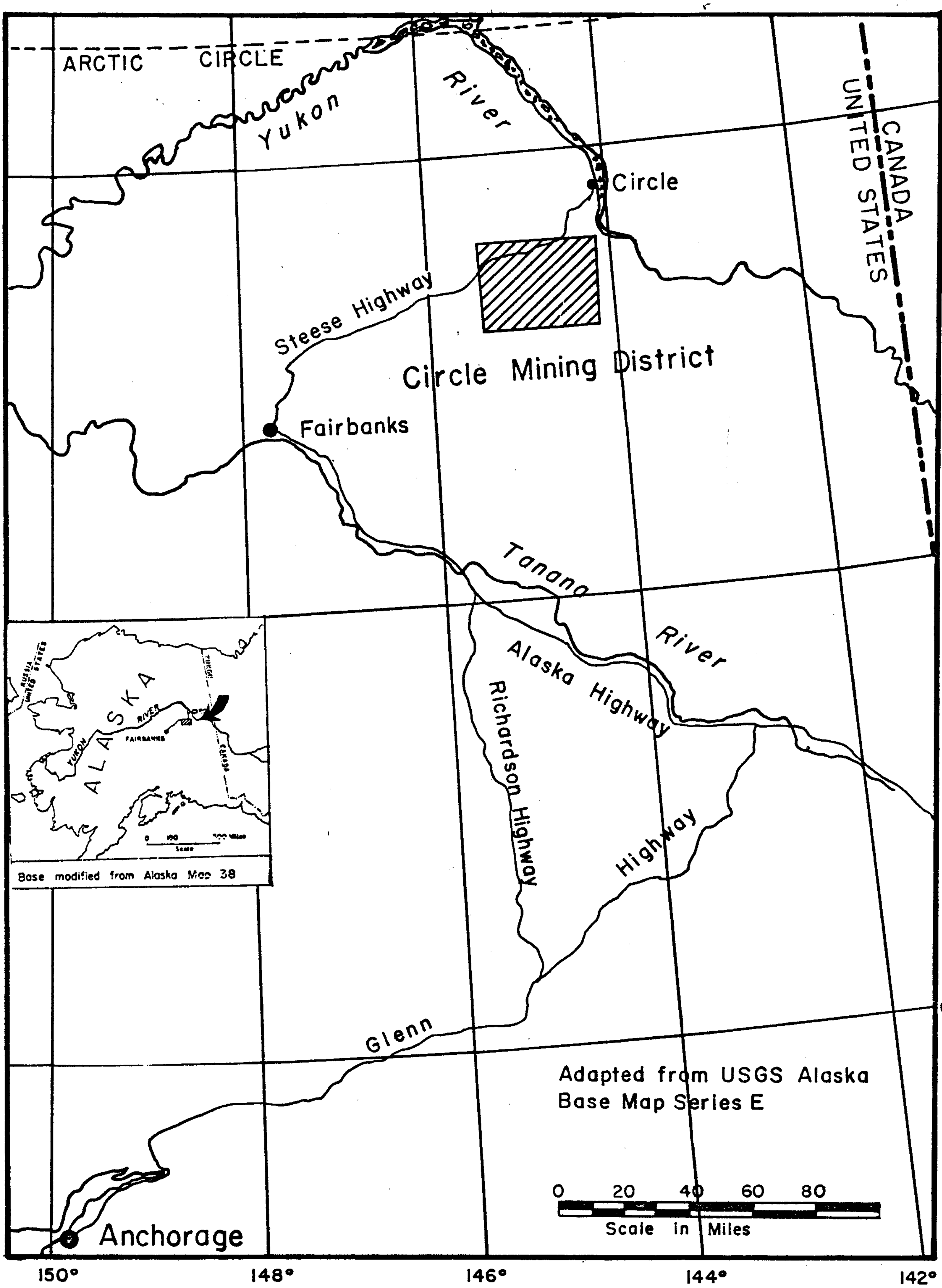

FIGURE 1.- Index map

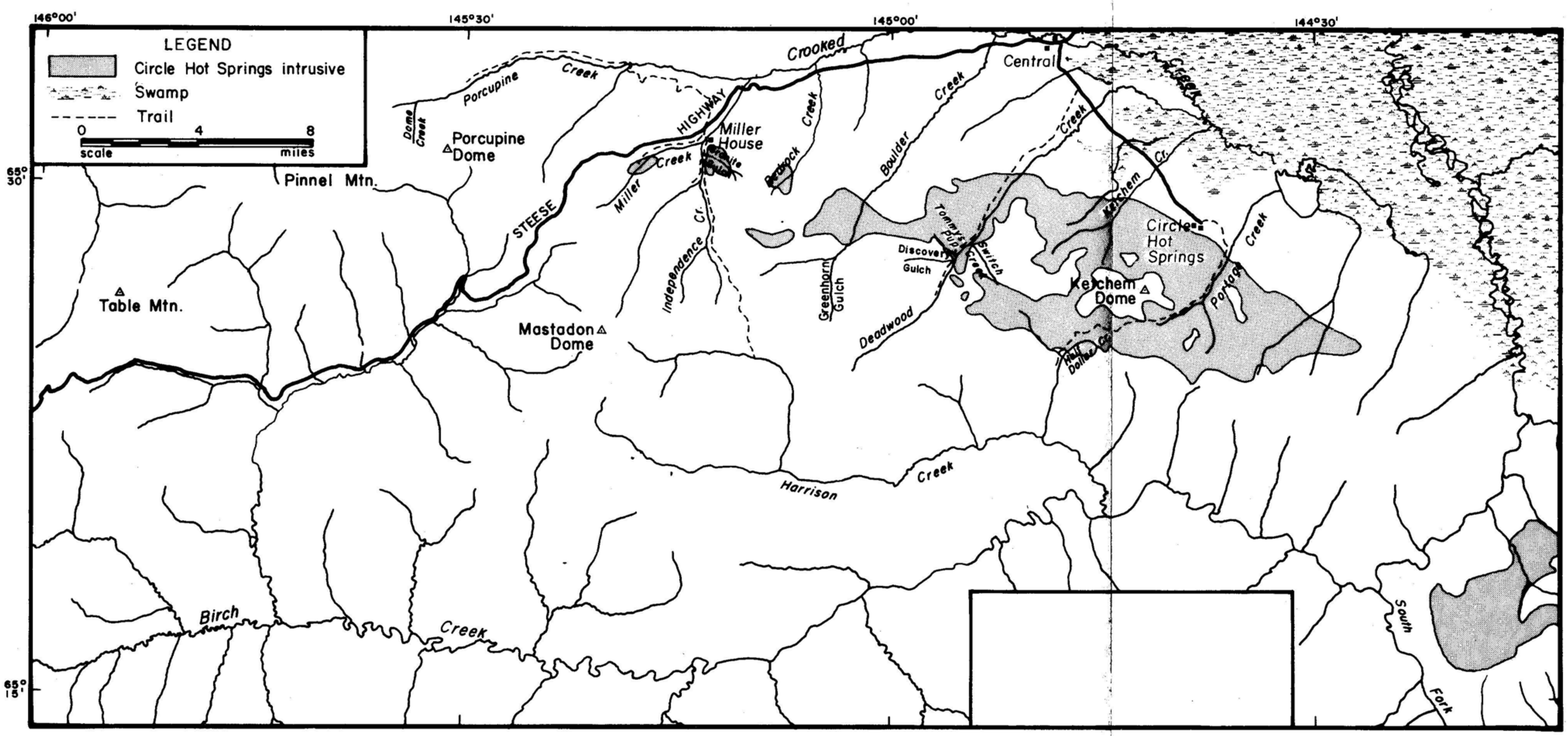

FIGURE 2.- Map of the study area

majority of the placer operations can be reached by light truck over unimproved mine roads from either Miller House or Circle Hot Springs.

HISTORY

Placer mining has been intermittent since gold was first discovered in 1893 in what was originally known as the Birch Creek District (14).2/ Since then most of the district has been reasonably prospected for shallow placer gold deposits, and most of the creeks are now under active or patented mining claims. An estimated 277,650 oz. of placer gold and 52,270 oz. of silver byproduct have been recovered from the district through 1970 (1). This past production represents about $68 million in gold and $0.38 million in silver at February 1979 prices.

PHYSIOGRAPHY

The Circle Mining District is part of the Tanana-Yukon Uplands physiographic region which is typified by hilly unglaciated terrain and moderately deep narrow valleys. Porcupine Dome at 4,915 feet is the highest elevation in the area with valley floors descending to 1,000 feet. The area is within a zone of discontinuous permafrost. Frozen colluvium and vegetation cover most slopes and valleys with only the higher more resistant ridges exposing bedrock. Excellent examples of solifluction lobes can be found on many hillsides.

Treeline reaches to about 2,500 feet elevation, above which the terrain is generally open tundra. Below the treeline, vegetation is continuous black spruce, alder, willows, and muskeg. Some southerly slopes support stands of birch, aspen, and white spruce.

The climate is typical interior continental. Mean maximum temperature

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2/ Underlined numbers refer to items in the list of references preceeding the appendixes.

in July is 74°F while the mean minimum in January is -20°F. Precipitation is approximately 10-11 inches per year including about 50 inches of snow (10). Snowfall is generally melted by late May except for the higher shaded slopes.

GENERAL GEOLOGY AND MINERALIZATION

The geology of the Circle Mining District has been described by Prindle and Mertie (14, 12). As of January 1979, a geologic map of the Circle quadrangle had not yet been prepared. Metamorphic bedrock in the area is a quartz mica schist and quartzite known as Birch Creek Schist of Precambrian age. More recently the Birch Creek Schist was thought to include younger Paleozoic units (5). The general cleavage strike of the metamorphic rocks is northwest and dipping moderately to the west. These rocks range from the lower greenschist facies to amphibolite facies in certain localities (19). Some localities of carbonaceous and calcareous members of the Birch Creek Schist are known just to the southeast of the district and are well exposed in the cliffs along Birch Creek. The schist is commonly garnetiferous.

The metamorphic rocks have been intruded by Mesozoic or Tertiary granites that consist principally of a coarse grained to porphyritic biotite granite with abundant feldspar phenocrysts. Mica in the granite near Circle Hot Springs has been dated by potassium-argon at 71 million years (Upper Cretaceous) while a similar age was obtained by whole rock dating with K-Ar and Rb-Sr (17). Greenstone dikes were observed in the vicinity of the south fork of Birch Creek.

Mineralization of the district has generally been accepted to have accompanied the intrusive activity. According to various sources within the Geological Survey, the placer gold of the Circle District has been derived from random mineralized veins cutting both the intrusive and metamorphic rocks in the Mastodon and Porcupine Dome areas. Gold fineness in the district is quite variable ranging from 702 on Half Dollar Creek to 911 on Boulder Creek with an overall average of 808 (16).

In addition to gold, minor occurrences of sulfides have been found in the placers near Miller House and Portage Creek. Early prospectors also reported a lode occurrence of gold, silver, and tin near Porcupine Dome at the head of Dome Creek. Tin in the form of cassiterite has been found in placer concentrates, particularly from Independence, Deadwood, and Portage Creeks, figure 2. Granitic contacts southeast and west of the Circle intrusive may be part of the same pluton intrusive or sequence. A large regional tin anomaly was indicated by sediment sampling about 55 miles southeast of the district. No information is available on the intervening area. West of the Circle intrusive, anomalous tin and other heavy minerals were found by the Bureau of Mines in the course of ongoing mineral studies of the Mount Prindle and Lime Peak areas.

Uraniferous fluorite and topaz were reported in the placers near Miller House, thus suggesting the possibility of late-stage mineralization of uranium from the granite (20). During the field work for this report, minor radioactive allanite(?) was found associated with a massive quartz zone in a pegmatite granite near Ketchum Creek, figure 2. An analysis of a rock chip sample (Ci-21, figure 3) of a more radioactive portion of the pegmatite showed 300 ppm uranium. Minor amounts of tourmaline were also common in most of the pan concentrate samples.

DESCRIPTION OF BOULDER CREEK

Upper boulder Creek was examined for lode sources of the placer cassiterite; however, vegetation is almost continuous throughout the valley and no in situ mineralization was found, figure 2.

The bedrock is Birch Creek Schist locally grading to a black phyllite. Float rock indicates considerable secondary quartz veining in fractures, possibly as a result of underlying granite. The intrusive near its south contact with the schist is a fine grained biotite granite. Greenhorn Gulch, as upper tributary, is the only portion of the Boulder Creek drainages that has had significant placer mining (12), figure 2.

Minor cassiterite and scheelite were found in occasional quartz and schist cobbles in the creek at and above the granite contact. A sample (Ci-14, figure 3) of fresh granite taken near the contact by the author gave the following geochemical analysis:

Gold	.20	ppm
Tin	20	ppm
Tungsten	22	ppm
Molybdenum	2	ppm

Nelson, West, and Matzko reported as much as 50% allanite in heavy mineral fractions of granite occurring along Boulder Creek (13),

The mining operation on Boulder Creek was suspended in 1975 due to the difficulty of operating a sluice box in gravels with heavy concentrations of cassiterite. This portion of the creek had not been previously mined. Based on production figures given by the placer claimant, it was tentatively estimated that the pay gravels of the creek were yielding in excess of 2 pounds of cassiterite per yard at the mine site. Since no drilling or trenching had been done, it was not possible to estimate reserves. However, any pay streak would be limited to the 200 or 300 feet of width of the alluvial gravels and to a depth of an estimated 4 to 15 feet.

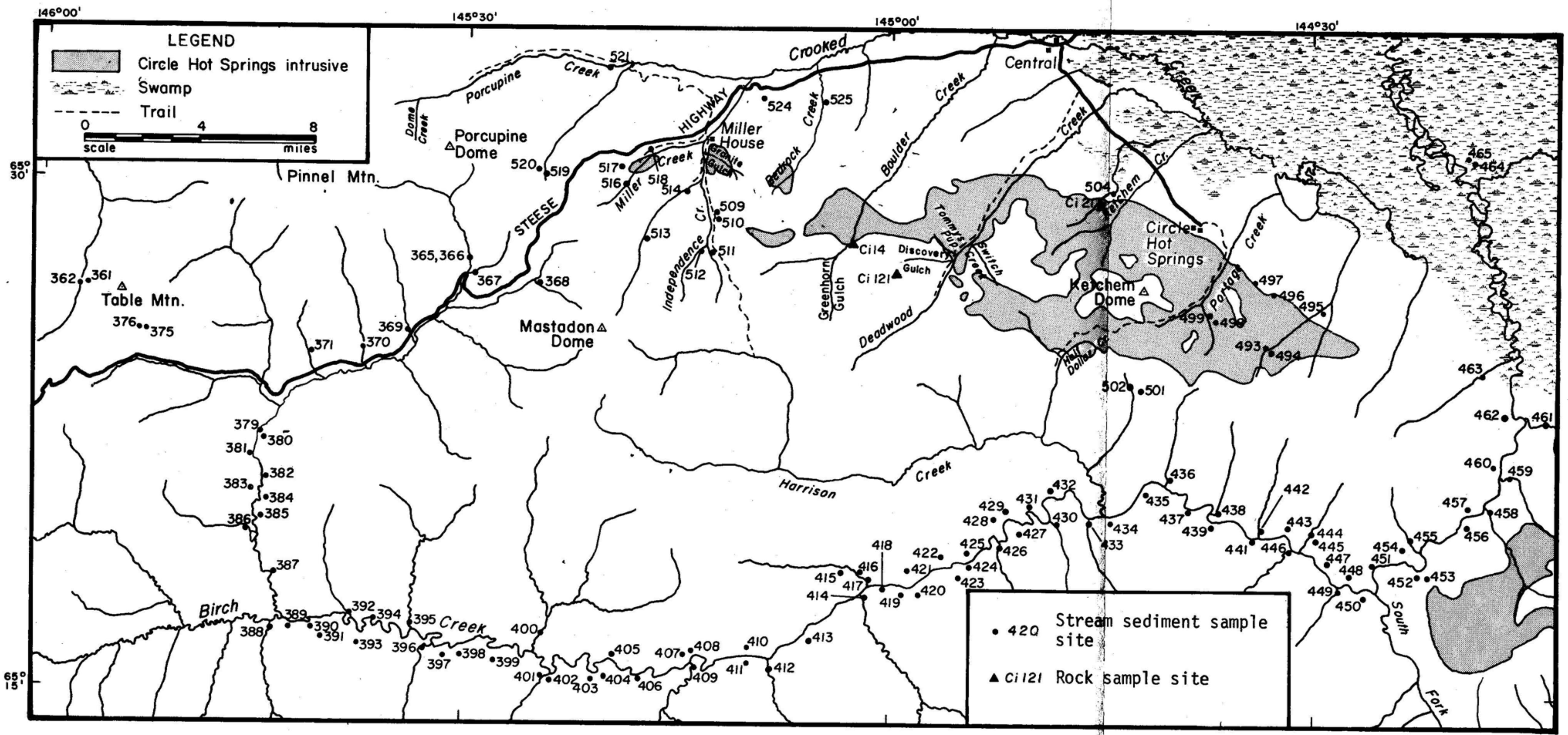

FIGURE 3.- Stream sediment and rock sample sites

Table 1 shows the results of a petrographic examination of a sluice box concentrate sample from Boulder Creek. Cassiterite occurs as fresh unweathered crystals up to 3/8 of an inch long, some of which are attached to gangue rock. Tin is particularly concentrated in the coarser size fractions. The gold is also quite fresh, occurring primarily as thin irregular flakes. The balance of the concentrate consists of rounded nuggets of hematite, magnetite, and scheelite.

DESCRIPTION OF BEDROCK CREEK

Pan samples of the gravels show a significant presence of tin and tungsten. No mining has been attempted on this portion of the creek. Nelson, West, and Matzko reported 10% monazite and 5% topaz in the heavy mineral fraction of granite bedrock (13).

DESCRIPTION OF DEADWOOD CREEK

The extension of the granitic intrusive to the east of Boulder Creek crosses the Deadwood Creek Valley, figure 2. Again, near the south contact on Tommys Pup, cassiterite was found during this study. Johnson reported a nearby locality on Discovery Gulch contained abundant wolframite and cassiterite in the gravels (9). He estimated that the combined concentrate would average 1 to 2 pounds per yard on Discovery Gulch and Deadwood Creek below their confluence point. Small shipments of tungsten concentrates were reported in 1916 when the price was higher (14). A small wolframite vein was reported by early prospectors, but this has never been verified. Two sluice box concentrate sample analyses from a mining operation near Switch Creek each showed approximately 10% tin and 2% tungsten (15). Minor cinnabar has also been reported on Deadwood Creek (7).

Most of the tin and tungsten placer minerals of Deadwood Creek

Table 1. Boulder Creek sluice box concentrate

Fraction of sample	Total	+10	10X 20	20X 35	35X 80	80X 100	100X 200	-200	*	**
Weight in grams	110.96	43.28	29.63	9.82	13.02	1.22	.94	.04	12.84	.17
percent	100.04	38.9	26.6	8.8	11.8	1.1	.9	.04	11.7	.2
Minerals:										
augite								T		
cassiterite	69.7	38.1	24.7	6.2	.7	T?	T	T?		
epidote	T						T	T		
garnet	.7		.3	.4			T	T		
goethite	1.5	.4	.8	.2	.1	T		T		
gold	T			T						
hornblende	.2			.2			T	T		
hypersthene							T			
ilmenite	.71	.4		.2		T	.1	.01		
magnetite	11.7								11.7	
muscovite+chlorite	3.9			.8	2.5	.4	.2	T		
pyrite	T				T	T				
quartz and feldspar	11.4		.8	.8	8.5	.7	.6	.03		
scheelite f	.2					T	T	T		.2
sphene	T							T		
tourmaline	T							T		
zircon f	T					T	T	T		

Remarks * hand magnetic fraction
** fluorescence scheelite coarse fragments

Legend:

P - Predominant	Over 50 percent	Numerals percent
A - Abundant	10 - 50 percent	f - Fluorescent
S - Subordinate	2 - 10 percent	R - Radioactive
M - Minor	.5 - 2 percent	C - Rock classification
F - Few	.1 - .5 percent	N - Notable amounts less than .1 percent
T - Trace	Less than .1 percent	
X - Detected		
- Sought but not detected		

appear to be derived from the tributaries of Discovery Gulch, Tommys Pup, and Switch Creek, which nearly parallel the south contact of the granite. Examination of the granite near the head of the Gulch revealed numerous fracture sets with quartz and felspar veins. A grab sample (Ci-121, figure 3) of siliceous granite in this area showed 30 ppm tin by semiquantitative emission spectrographic analysis. Burand in a geochemical survey of the area noted anomalous copper, lead, and zinc in stream sediment (2).

OTHER HEAVY MINERAL OCCURRENCES

A placer mining operation on Portage Creek, also in the vicinity of the same intrusive, contains cassiterite (15), figure 2. Nelson, West, and Matzko noted higher concentrations of uranium (40.2 ppb) in water samples from Portage Creek as well as wolframite, sphalerite, scheelite, monazite, and traces of uranothorianite (13). An occurrence of an unidentified yellow-green uranium mineral was also noted in granite bedrock.

Alluvial occurrences of tin and tungsten minerals are also known in the Miller House area. A sample of sluice box concentrate contained greater than 40% tin and .4% tungsten with minor lead and bismuth (see Sample #305B). Significant tin and tungsten values were also found in nearby Granite Gulch. Independence Creek has been reported to contain cassiterite, scheelite, and wolframite in placer concentrates (20).

Half Dollar Creek, a tributary to Harrison Creek, has been reported to contain abundant scheelite and allanite (8, 13).

The gold-tin lode prospect on Porcupine Dome is quite likely related to the same sequence of mineralization which is partly responsible for these minerals being found in the placers of Porcupine Creek (12).

SAMPLING PROGRAM

In 1976-1977, 150 pan concentrate samples were taken using one level full 14-inch pan. Sample locations are shown in figure 4. The panned material (about 40 grams) was screened at 14 mesh with the plus 14 mesh discarded and the minus 14 mesh material separated into plus and minus 2.85 specific gravity fractions in a heavy liquid medium. The minus 2.85 specific gravity portion was then split into magnetic and non-magnetic fractions with a hand magnet. The non-magnetics were weighed and analyzed by semiquantitative emission spectrographic analysis. Samples were analyzed by the Bureau of Mines Reno Metallurgical Research Laboratory and by the Mineral Industry Research Laboratory (MIRL) of the University of Alaska. These are included in appendix A. Pan and sediment samples were taken only from previously unmined gravels to avoid contamination.

Sample map numbers 305B, 292B, 297B, 337B, 359B, and 360B on figure 4 represent samples of sluice box concentrates. These were also analyzed in the manner described above.

Figure 5 shows histograms prepared from sample data of 635 pan concentrate samples. These were taken in various igneous and metamorphic rock areas of central and northeastern Alaska by the Bureau of Mines during the 1977 season and include those samples of the Circle Mining District. These compilations provide representative background and anomalous levels for this type of sampling system. All sample analyses were completed by the University of Alaska MIRL. Mineral concentrations are shown by sample locations in figures 6 through 11.

To reflect more accurately the regional pattern of tin and tungsten background levels, a "recovery factor" of each of these elements was

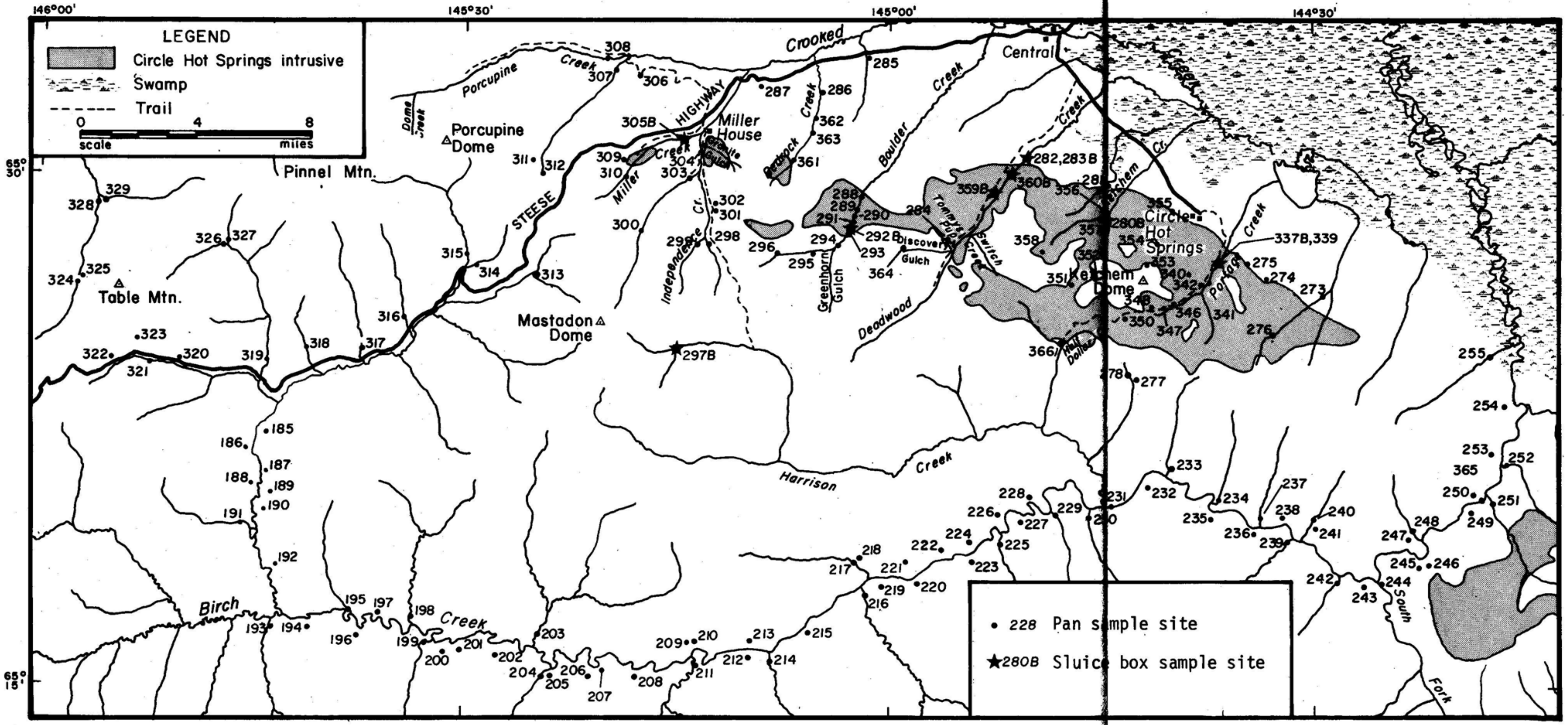

FIGURE 4.-Pan and sluice box sample sites

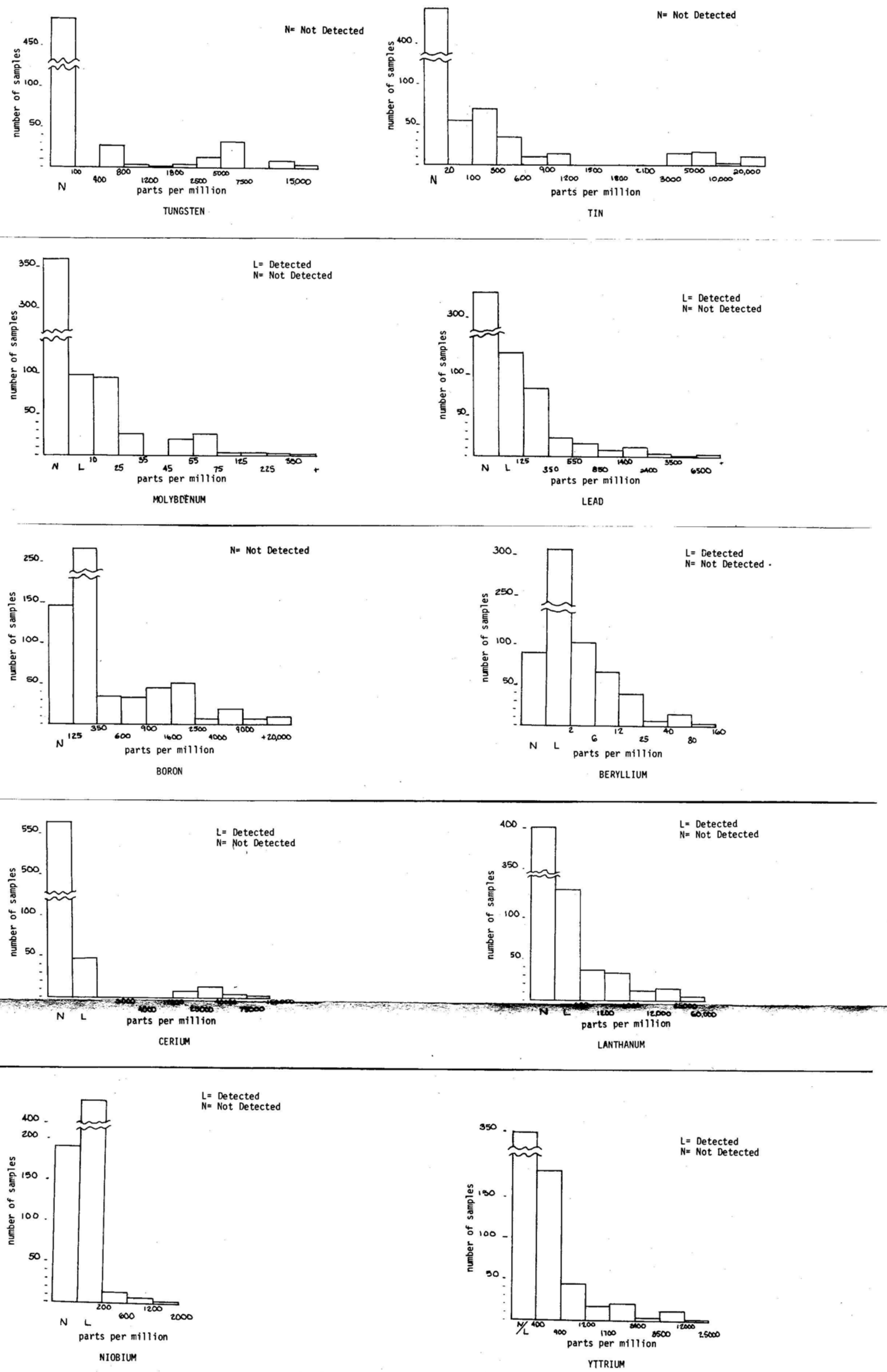

FIGURE 5.-Histogram portrayal of concentrate sample results

calculated. This is possible where a standard size gravel sample is taken and a similar procedure of separation is used. The factor is determined by dividing the parts per million analysis by 100 and then multiplying by the number of grams of non-magnetic concentrate (-2.85 sp. gr.). This procedure eliminates some error that is encountered when comparing sample analyses in ppm. Values in ppm of an element such as tin will vary proportionally to the heavy mineral concentrations of biotite, zircon, garnet, and others. Amounts of these minerals differ considerably from one site to another, particularly in metamorphic/ igneous rocks and can mask true background levels of certain trace elements. Tin and tungsten sample concentrates and recovery factors are shown in table 2 and plotted in figures 12 and 13.

One hundred and twenty sediment samples were taken at various sites in the district. The minus 80 mesh fraction was analyzed by semiquantitative spectrographic emission methods. Their locations are shown in figure 3 and their results are included in appendix B. Sediments were not collected in the remainder of the project since that area had been investigated by Burand in 1965 (2).

CONCLUSIONS

Minable deposits of placer tin-tungsten minerals may exist in the Circle mining District. Gold and cassiterite bearing gravels such as those occurring on upper Boulder Creek possibly could be mined using a continuous gravity separation system such as jigging.

A northwest bearing trend of tin mineralization apparently is associated with at least the southern contact of the northern limb of the Circle Hot Springs intrusive. No definable limits to this trend can be predicted without further work. An anomalous area also is found along the North Fork of Birch Creek. It appears that some amounts of radioactive and tungsten minerals also accompany this mineral trend and indications suggest that some concentrations of uranium minerals may occur in association with the granitic rocks in the district and particularly in the headwaters of Deadwood, Boulder, Portage, and Bedrock Creek near the granite-schist contacts.

Sampling indicates late intrusive minerals such as monazite, cassiterite, scheelite and tourmaline.

Granitic outcrops southeast and west of the Circle intrusive may be part of the same pluton intrusive or sequence. A large regional tin anomaly is indicated by sediment sampling about 55 miles southeast of the district but no information is available on the intervening area. West of the Circle intrusive, anomalous tin and other heavy materials were found by the Bureau of Mines in the Mount Prindle and Lime Peak areas. Tin and tungsten mineralization may be related, in varying degrees, to this northwest to west trending series of granitic intrusions.

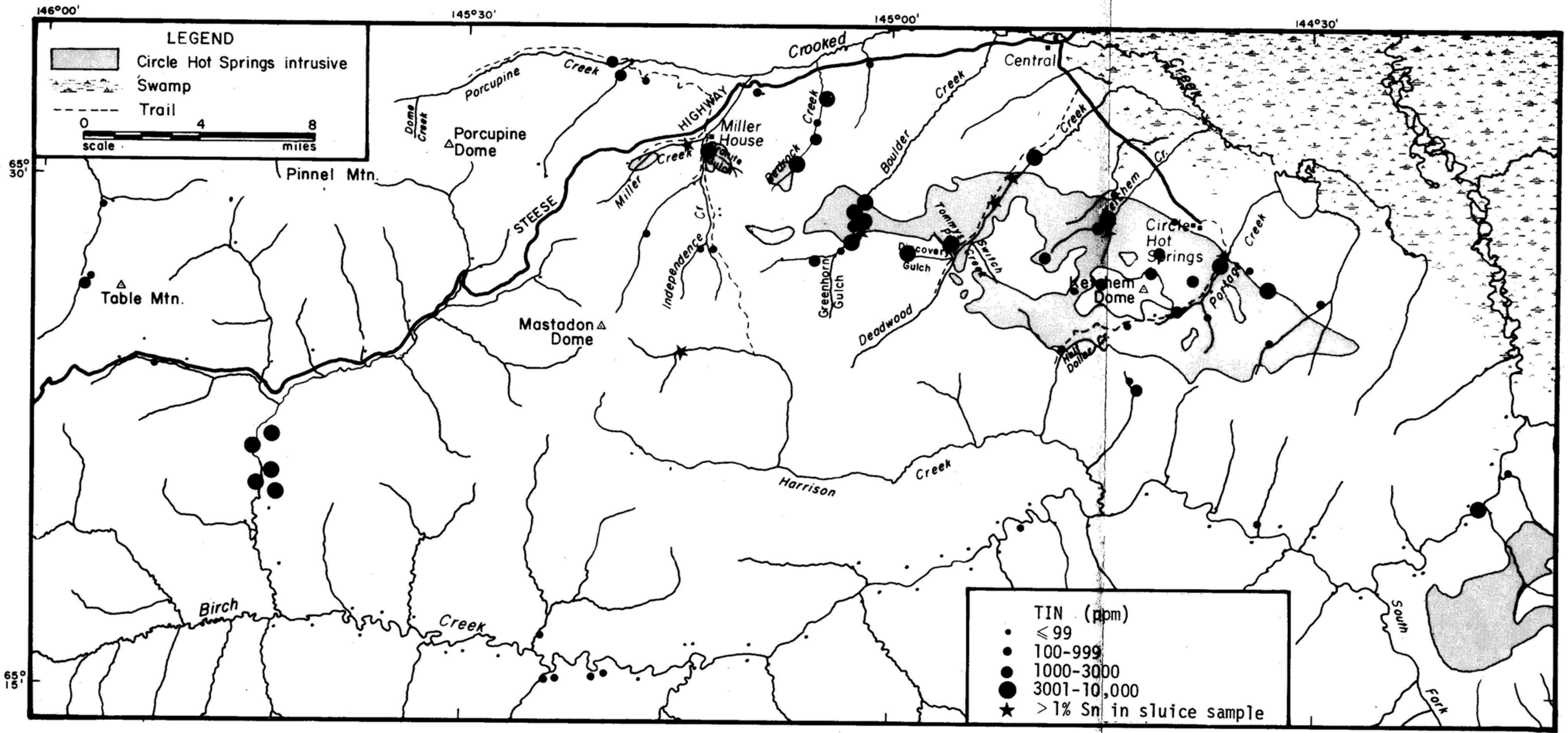

FIGURE 6.- Tin concentrations by sample site

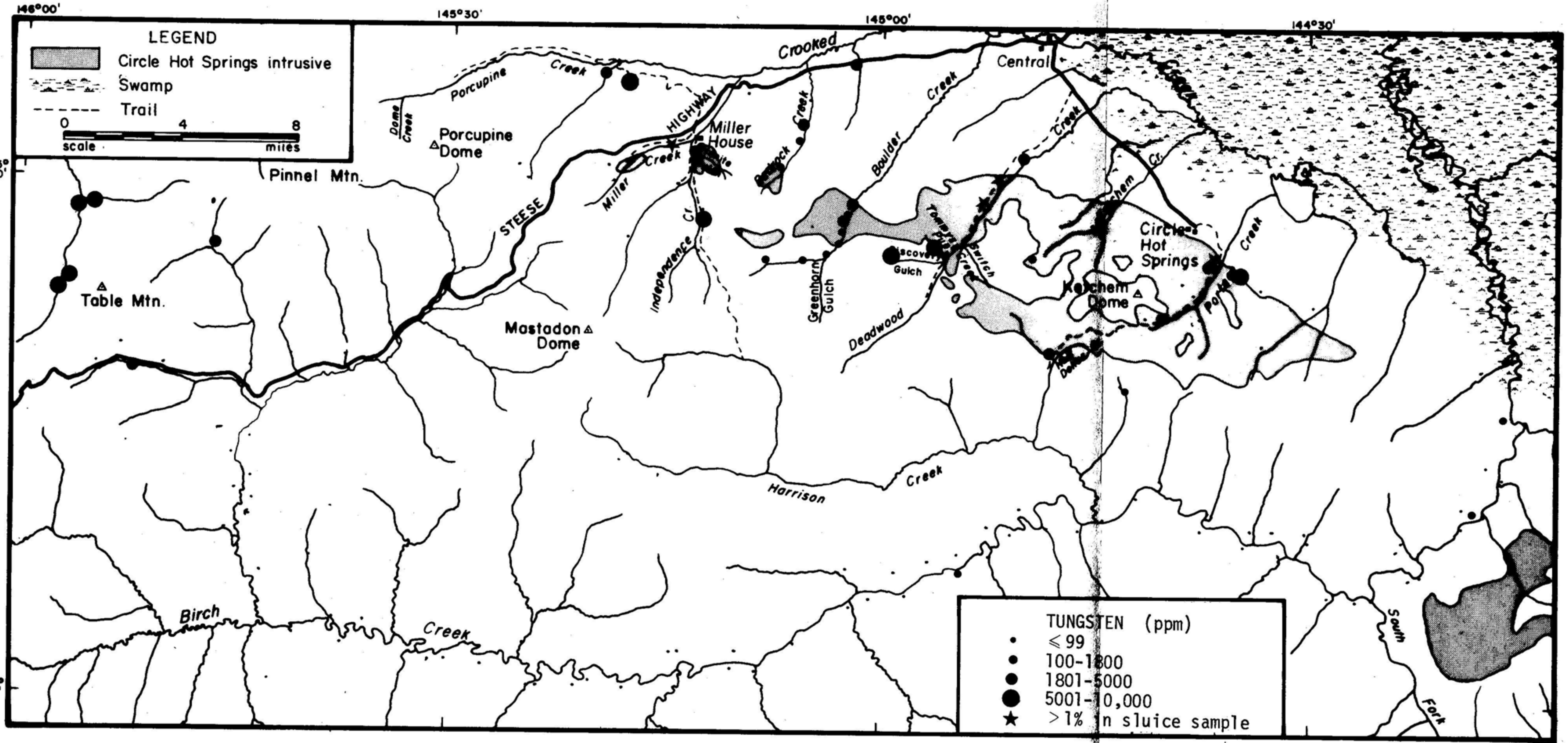

FIGURE 7.- Tungsten concentrations by sample site

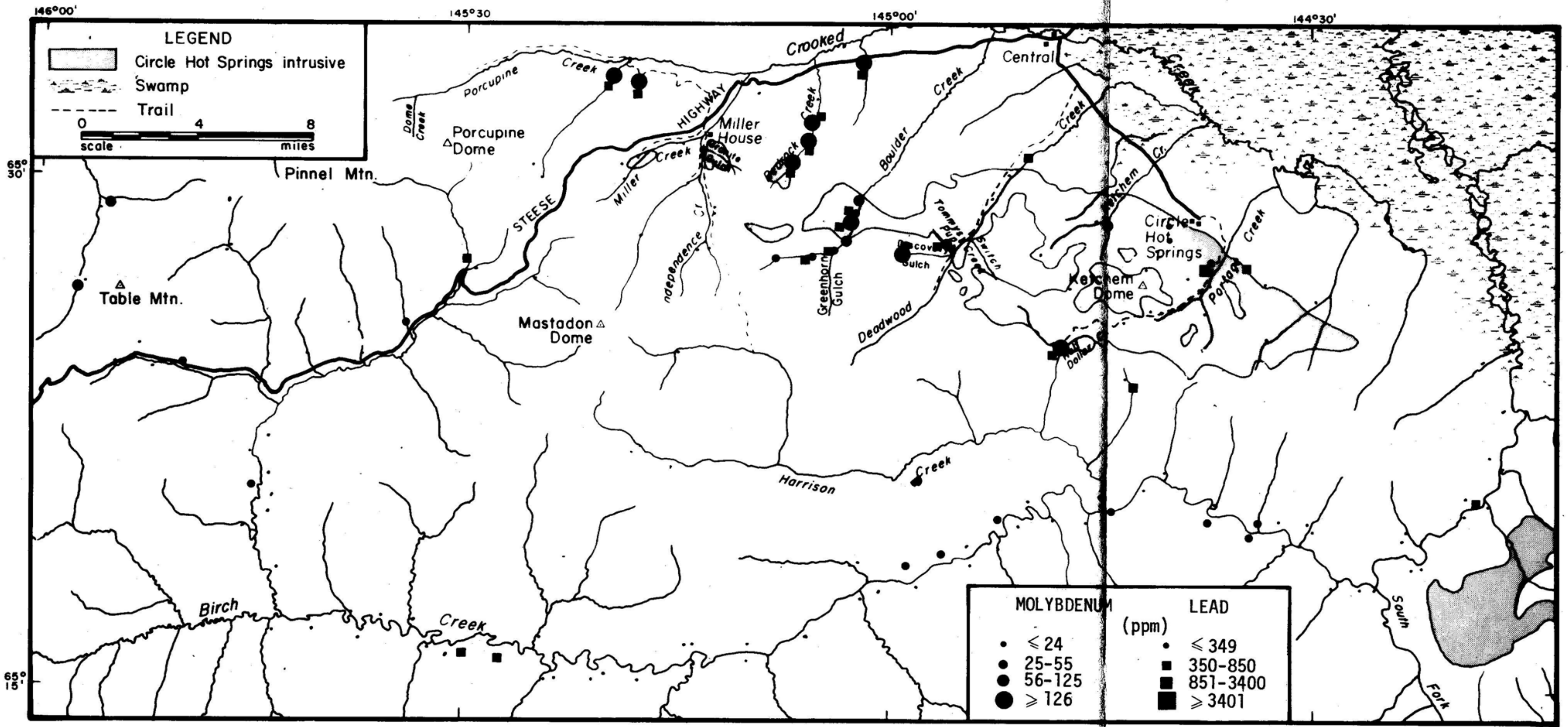

FIGURE 8.- Lead and molybdenum concentrations by sample site

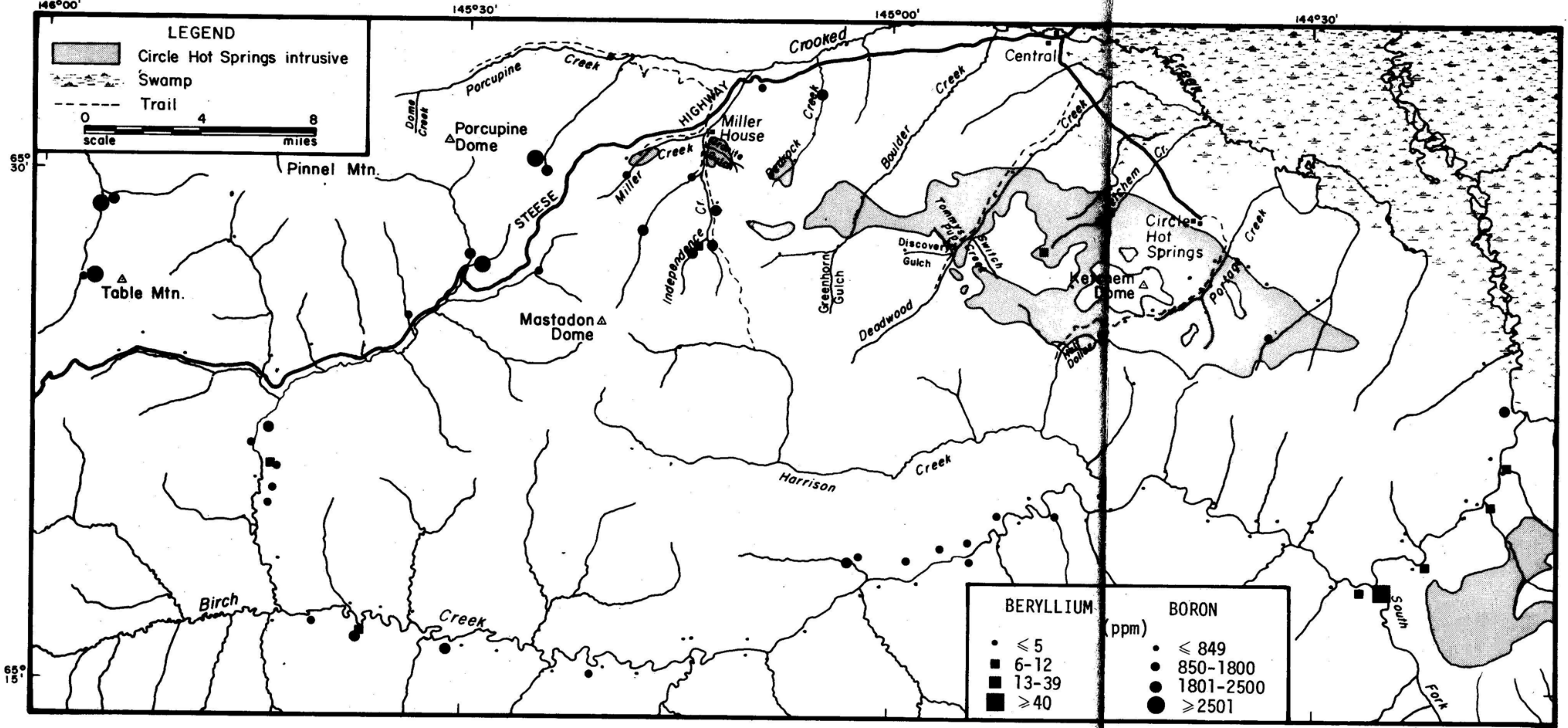

FIGURE 9.- Beryllium and boron concentrations by sample site

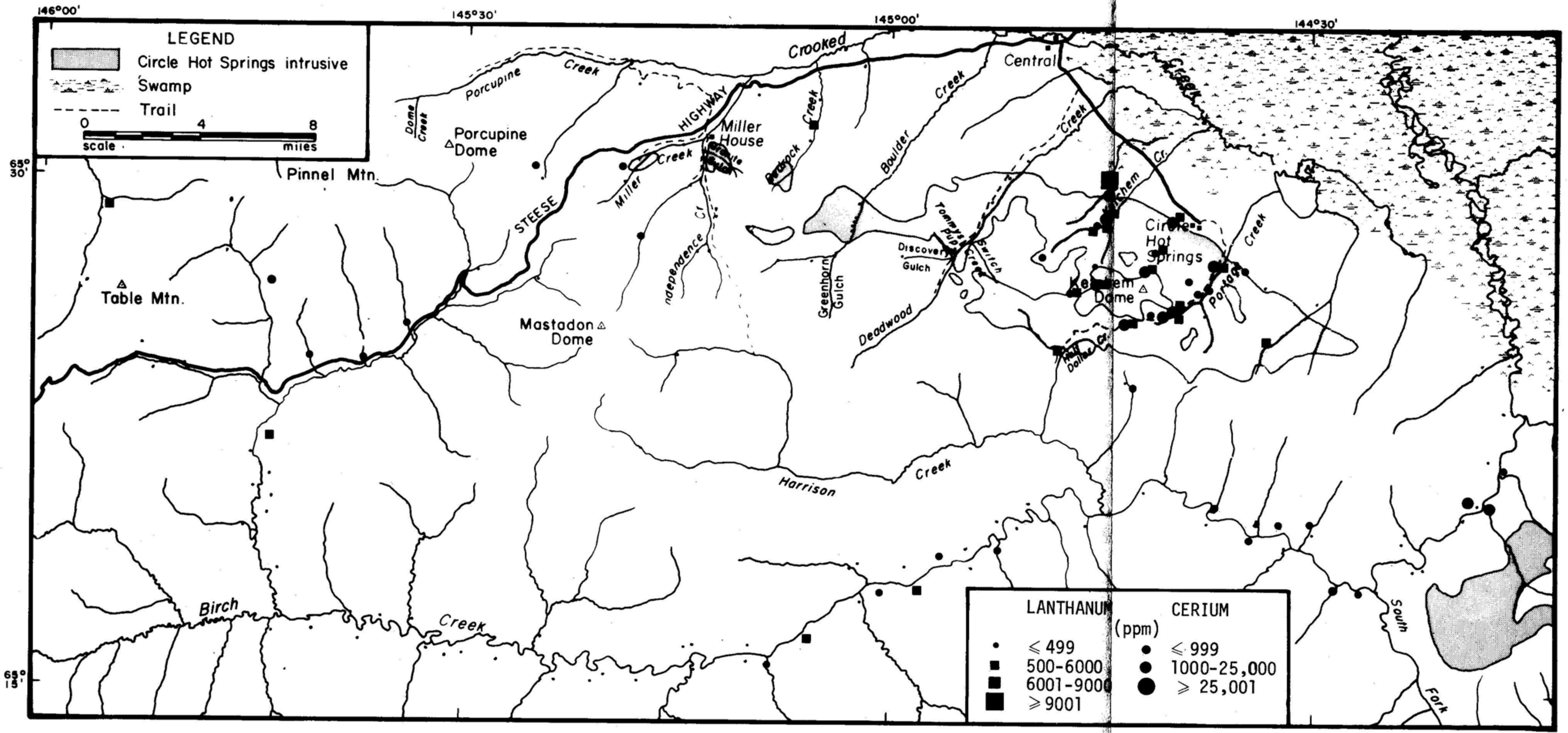

FIGURE 10.- Lanthanum and cerium concentrations by sample site

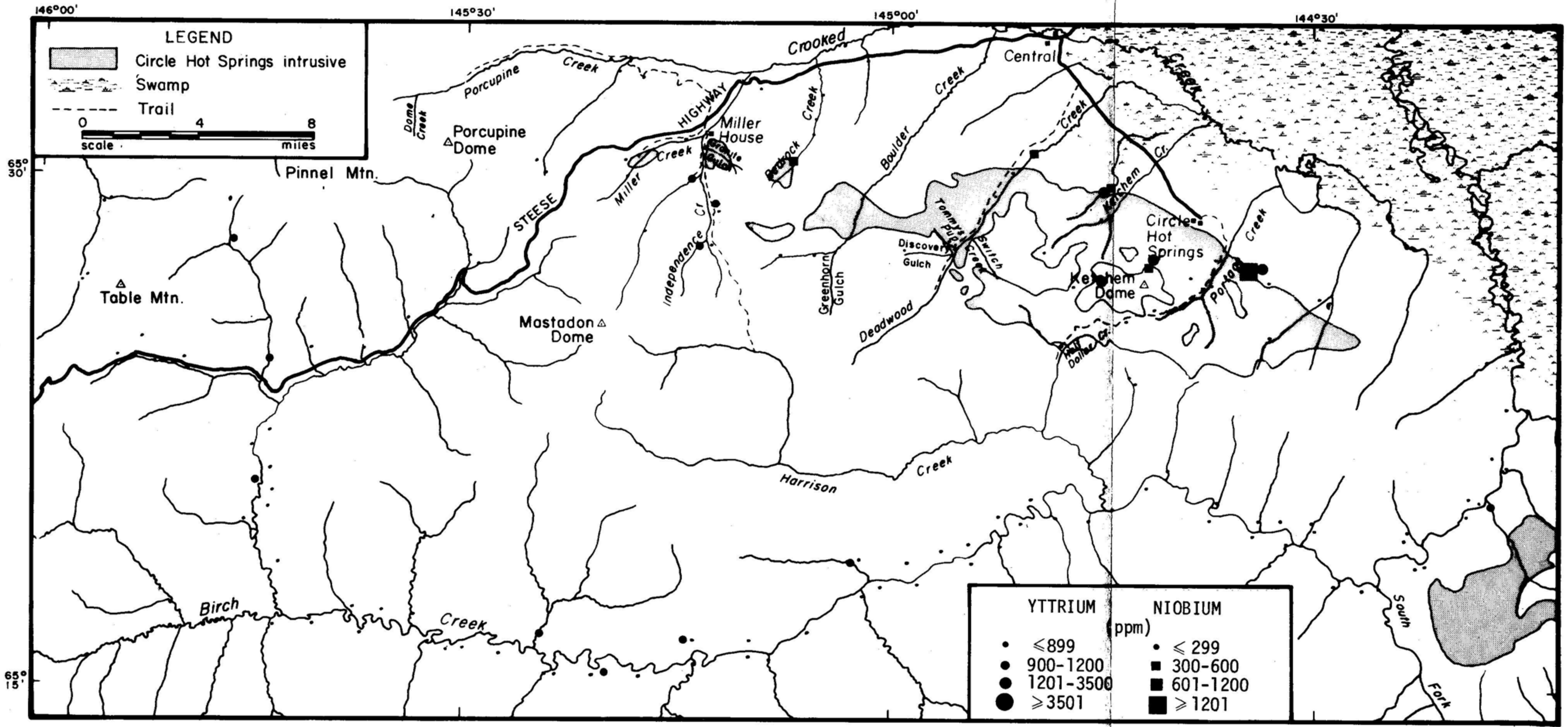

FIGURE 11.- Yttrium and niobium concentrations by sample site

TABLE 2. - Tin and tungsten sample concentrates and recovery factors

Sample map no.	Tin (ppm)	Concentrate recovered (grams)	Tin recovery factor	Tungsten (ppm)	Tungsten recovery factor
185	5,000	7.032	352	N	N
186	5,000	11.934	597	N	N
187	5,000	3,460	173	N	N
188	7,000	16.199	1,134	N	N
189	5,000	2.546	127	N	N
190	N	1.115	N	200	2
191	N	0.951	N	L	L
192	N	1.853	N	L	L
193	N	0.992	N	L	L
194	N	0.447	N	L	L
195	N	2.248	N	L	L
196	N	0.909	N	L	L
197	N	2.635	N	L	L
198	N	4.499	N	L	L
199	N	28.594	N	L	L
200	N	1.140	N	N	N
201	N	1.009	N	N	N
202	N	3.213	N	N	N
203	500	7.016	35	L	L
204	500	6.894	34	L	L
205	500	0.957	5	L	L
206	500	0.719	4	L	L
207	500	0.513	3	L	L
208	70	1.732	1	N	N

TABLE 2.- Tin and tungsten sample concentrates and recovery factors, cont.

Sample map no.	Tin (ppm)	Concentrate recovered (grams)	Tin recovery factor	Tungsten (ppm)	Tungsten recovery factor
209	N	3.567	N	N	N
210	N	1.357	N	N	N
211	N	20.951	N	N	N
212	N	8.159	N	N	N
213	N	3.248	N	N	N
214	N	28.568	N	L	L
215	N	3.356	N	N	N
216	N	28.715	N	N	N
217	N	0.901	N	N	N
218	N	0.652	N	N	N
219	N	0.488	N	N	N
220	N	2.197	N	N	N
221	N	0.449	N	N	N
222	N	1.769	N	N	N
223	N	0.951	N	1,000	10
224	N	2.316	N	N	N
225	N	9.226	N	N	N
226	N	0.953	N	N	N
227	300	1.275	4	N	N
228	N	2.216	N	N	N
229	N	1.024	N	L	L
230	N	2.386	N	L	L
231	N	1.509	N	N	N
232	N	4.394	N	N	N

TABLE 2.- Tin and tungsten sample concentrates and recovery factors, cont.

Sample map no.	Tin (ppm)	Concentrate recovery (grams)	Tin recovery factor	Tungsten (ppm)	Tungsten recovery factor
233	N	6.124	N	N	N
234	30	5.263	2	N	N
235	N	2.388	N	N	N
236	N	12.597	N	N	N
237	300	9.849	30	N	N
238	N	16.936	N	N	N
239	N	40.035	N	N	N
240	N	14.956	N	N	N
241	N	21.714	N	N	N
242	N	51.405	N	L	L
243	N	43.607	N	N	N
244	N	47.486	N	L	L
245	N	30.305	N	L	L
246	N	72.750	N	N	N
247	N	13.587	N	N	N
248	N	10.106	N	N	N
249	N	12.221	N	N	N
250	N	7.516	N	N	N
251	30	20.874	6	N	N
252	300	23.008	69	L	L
253	N	12.922	N	N	N
254	N	3.204	N	1,000	32
255	N	6.134	N	N	N

TABLE 2.- Tin and tungsten sample concentrates and recovery factors, cont.

Sample map no.	Tin (ppm)	Concentrate recovery (grams)	Tin recovery factor	Tungsten (ppm)	Tungsten recovery factor
273	200	5.8	12	N	N
274	5,000	1.8	90	N	N
275	300	4.3	13	7,000	301
276	300	1.8	5	N	N
277	1,000	3.1	31	700	22
278	150	0.8	1	L	L
279	100	0.7	1	L	L
281	500	0.5	3	N	N
283*	230,000	1.906	4,384	3,000	57
284*	G	1.149	G	5,700	65
285*	700	1.02	7	2,000	20
286	5,000	1.0	50	N	N
287	L	0.8	L	N	N
288*	7,500	1.559	117	3,300	51
289*	7,100	0.674	48	770	5
290*	4,000	0.308	12	2,000	6
291*	2,500	1.174	29	820	10
293*	4,400	0.257	11	1,000	3
294*	440	0.542	2	330	2
295*	1,400	0.181	3	600	1
296*	N	0.208	N	680	1
298	200	1.4	3	N	N
299	150	1.2	2	N	N
300	300	3.0	9	L	L

TABLE 2.- Tin and tungsten sample concentrates and recovery factors, cont.

Sample map no.	Tin (ppm)	Concentrate recovery (grams)	Tin recovery factor	Tungsten (ppm)	Tungsten recovery factor
301	50	3.5	2	7,000	245
302	50	15.0	8	N	N
303	20	8.1	2	L	L
304*	G	0.237	G	3,100	7
306*	700	1.178	8	G	G
307*	2,000	1.006	20	2,000	20
308	1,000	3.1	31	N	N
309	50	5.3	3	N	N
310	N	3.5	N	N	N
311	50	3.2	2	N	N
312	N	3.1	N	N	N
313	N	1.0	N	N	N
314	N	0.8	N	N	N
315	N	1.9	N	N	N
316	N	1.6	N	N	N
317	50	13.6	7	N	N
318	N	12.5	N	N	N
319	N	10.9	N	N	N
320	N	74.7	N	N	N
321	100	4.37	4	3,000	131
322	N	27.9	N	N	N
323	N	30.7	N	N	N
324	1,000	3.986	40	7,000	279
325	150	6.257	9	10,000	626

TABLE 2.- Tin and tungsten sample concentrates and recovery factors, cont.

Sample map no.	Tin (ppm)	Concentrate recovery (grams)	Tin recovery factor	Tungsten (ppm)	Tungsten recovery factor
326	N	28.41	N	N	N
327	50	15.76	8	3,000	473
328	150	5.385	8	7,000	377
329	50	2.655	1	20,000	531
339	20,000	Sample by others No conc. wt.	-	N	-
340	2,000	"	-	N	-
341	20	"	-	N	-
342	70	"	-	N	-
346	2,000	"	-	N	-
347	70	"	-	N	-
348	N	"	-	N	-
350	500	"	-	N	-
351	150	"	-	N	-
352	1,500	"	-	N	-
353	1,500	"	-	N	-
354	2,000	"	-	N	-
355	300	"	-	N	-
356	15,000	"	-	500	-
357	2,000	"	-	N	-
358	3,000	"	-	700	-
361*	4,000	1.174	47	600	7
362*	900	0.262	2	2,000	5
363*	3,000	0.340	10	1,000	3
364	30,000	0.145	44	G	G

TABLE 2.- Tin and tungsten sample concentrates and recovery factors, cont.

Sample map no.	Tin (ppm)	Concentrate recovery (grams)	Tin recovery factor	Tungsten (ppm)	Tungsten recovery factor
365*	5,000	2.603	130	1,000	26
366*	900	1.471	13	3,000	44

L - Detected

N - Not detected

i - Interference

G - Greater than detection limits

All analyses by semi-quantitative emission spectographic method by the University of Alaska except:

1) Sample map numbers with an asterisk (*) were analyzed by the Bureau of Mines Reno Metallurgical Lab.

2) Sample map numbers 337 to 360 were analyzed by the U. S. Geological Survey.

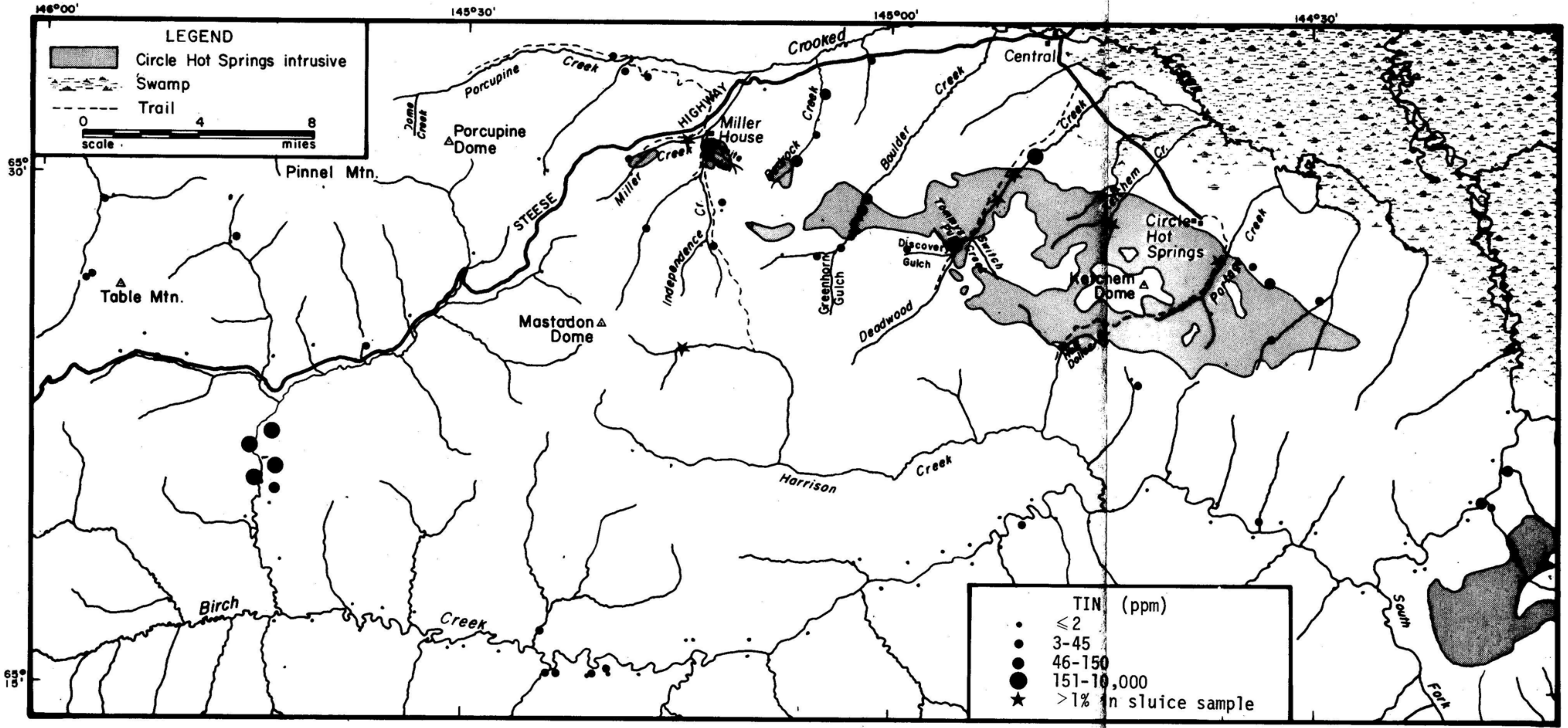

FIGURE 12.- Tin concentrations by the "recovery factor method"

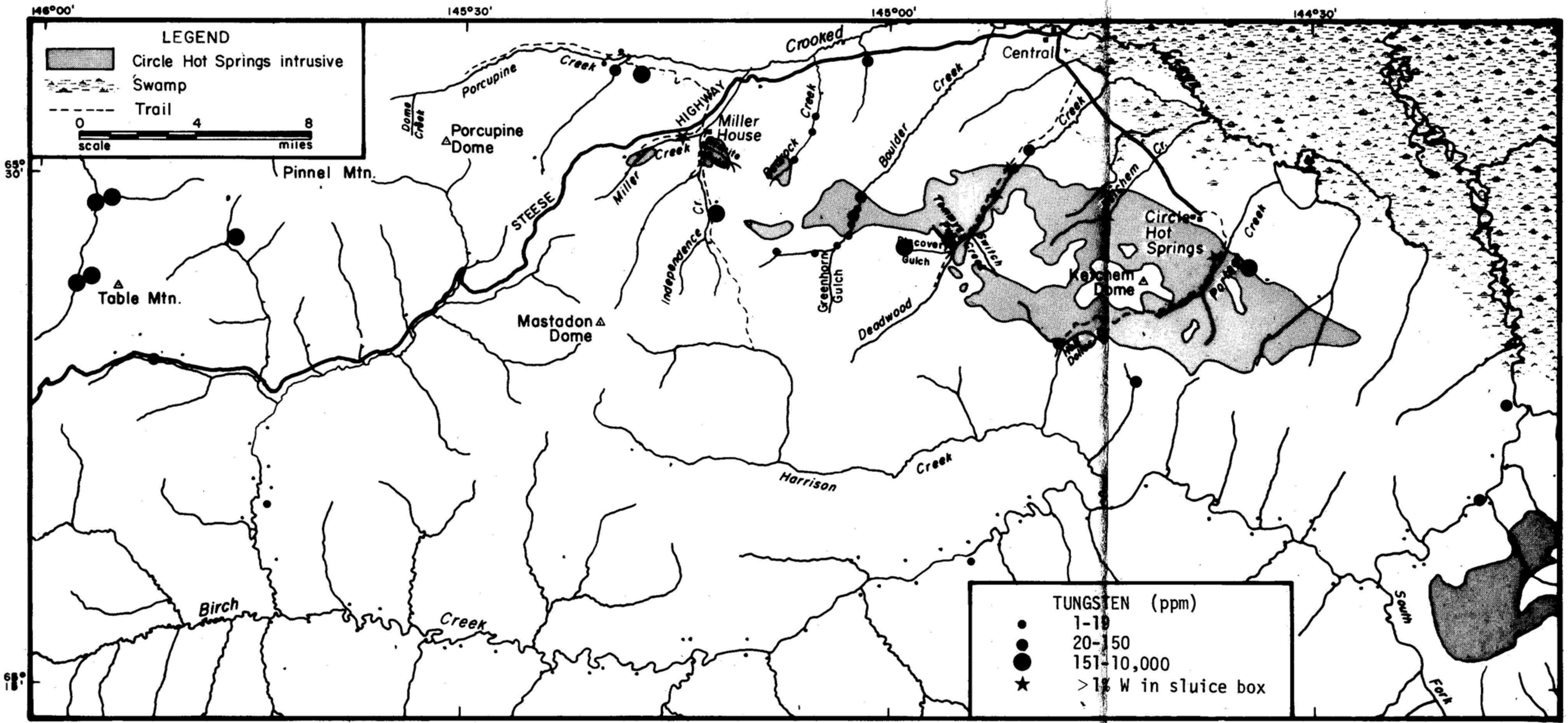

FIGURE 13.- Tungsten concentrations by the "recovery factor method"

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APPENDIX - A

Pan and sluice concentrate analyses (in ppm)

L - Detected

N - Not detected

i - Interference

G - Greater than detection limits

All analyses by semi-quantitative emmission spectrographic method by the University of Alaska except:

1) Sample map numbers with an asterisk (*) were analyzed by the Bureau of Mines Reno Metallurgical Lab.

2) Sample Map number 337 to 360 were analyzed by the U.S. Geological Survey.

Map No.	185	186	187	188	189	190	191	192
Sample No.	BC1241P	BC1243P	BC1245P	BC1247P	BC1249P	BC1300P	BC1331P	BC1333P
Ag	10	2	5	10	10	2	5	L
As	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N
B	2000	1000	1000	200	1000	1500	300	300
Ba	N	N	N	N	N	N	N	N
Be	5	2	10	2	5	N	N	N
Bi	L	L	L	L	L	N	N	N
Ce	N	N	N	N	N	N	N	N
Co	50	N	50	50	50	50	N	N
Cr	200	20	20	200	100	500	50	L
Cu	200	100	200	500	500	300	15	20
La	5000	N	N	N	N	N	N	N
Mo	N	N	N	50	N	N	N	N
Nb	L	L	L	L	200	N	N	N
Ni	1000	100	200	500	200	300	15	15
Pb	N	N	N	N	N	N	N	N
Pt	N	N	N	N	N	N	N	N
Sb	500	N	N	L	L	N	N	N
Sn	5000	5000	5000	7000	5000	N	N	N
Th								
U								
V	200	100	100	100	100	70	70	70
W	N	N	N	N	N	200	L	L
Y	700	500	500	1000	500	500	N	L
Zn	N	N	N	N	N	N	N	N
Zr	G	1000	500	500	G	G	G	1000

Map No.	201	202	203	204	205	206	207	208
Sample No.	BC1358P	BC1360P	BC1502P	BC1506P	BC1504P	BC1510P	BC1508P	BC1513P
Ag	3	3	5	2	1	2	2	3
As	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N
B	700	700	200	300	500	1000	700	700
Ba	2000	2000	N	N	N	1000	1000	1500
Be	L	L	1	2	5	5	1	N
Bi	L	L	L	L	L	L	L	L
Ce	N	N	N	N	N	N	N	N
Co	100	100	50	50	150	100	100	30
Cr	1000	1000	1000	1000	1000	1000	1000	700
Cu	1000	500	200	500	500	500	5000	15
La	N	N	N	N	N	N	N	L
Mo	20	20	20	20	20	20	20	15
Nb	N	N	200	L	200	200	L	N
Ni	300	500	500	500	500	200	2000	150
Pb	500	700	L	20	L	L	L	N
Pt	N	N	N	N	N	N	N	N
Sb	N	N	N	N	N	N	100	N
Sn	N	N	500	500	500	500	500	70
Th								
U								
V	300	300	50	100	50	300	200	300
W	N	N	L	L	L	L	L	N
	N	700	1000	700	500	700	1000	500
Zn	700	700	500	500	1000	1000	1000	700
Zr	G	G	1000	G	G	G	G	G

Map No.	193	194	195	196	197	198	199	200
Sample No.	BC1335P	BC1338P	BC1341P	BC1343P	BC1345P	BC1347P	BC1349P	BC1356P
Ag	2	5	2	10	L	2	2	3
As	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N
B	300	1000	300	2000	300	300	70	2000
Ba	N	N	N	N	N	N	N	L
Be	N	N	N	10	N	N	N	L
Bi	N	N	N	N	N	N	N	L
Ce	N	N	N	N	N	N	N	N
Co	20	50	50	20	N	N	N	70
Cr	20	1000	50	1000	50	500	1000	1500
Cu	150	150	150	15	30	20	20	200
La	N	N	N	N	N	N	N	N
Mo	N	N	N	N	N	N	N	20
Nb	N	N	N	L	N	N	N	N
Ni	150	150	150	1500	150	200	300	300
Pb	N	N	L	N	N	N	N	L
Pt	N	N	N	N	N	N	N	N
Sb	N	N	N	N	N	N	N	N
Sn	N	N	N	N	N	N	N	N
Th								
U								
V	70	100	70	500	500	70	500	300
W	L	L	L	L	L	L	L	N
Y	N	N	L	500	L	500	500	50
Zn	N	N	N	N	N	N	N	700
Zr	G	G	G	G	G	1000	200	G

Map No.	209	210	211	212	213	214	215	216
Sample No.	BC1517P	BC1519P	BC1514P	BC1527P	BC1529P	BC1531P	BC1533P	BC1535P
Ag	5	5	5	5	3	5	3	5
As	L	N	N	N	N	N	N	3000
Au	N	N	N	N	N	N	N	N
B	700	500	150	200	500	70	700	70
Ba	1500	1500	N	1500	2000	N	3000	N
Be	N	N	L	L	L	L	L	1.5
Bi	N	L	L	L	L	L	L	L
Ce	N	N	N	N	N	L	N	L
Co	50	50	L	L	70	L	70	L
Cr	700	150	500	1500	1500	700	500	500
Cu	150	100	20	100	300	5	150	100
La	N	N	N	N	N	N	500	N
Mo	20	15	N	N	15	N	N	N
Nb	N	N	N	N	N	N	N	N
Ni	300	70	70	150	150	70	150	2
Pb	70	50	N	N	N	N	50	L
Pt	N	N	N	N	N	N	N	N
Sb	L	L	N	N	N	L	L	N
Sn	N	N	N	N	N	N	N	N
Th								
U								
V	700	700	L	500	500	300	300	L
W	N	N	N	N	N	L	N	N
	1000	500	500	500	700	700	500	500
Zn	1000	700	700	N	700	N	700	1500
Zr	G	G	G	1000	G	700	G	L

Map No.	217	218	219	220	221	222	223	224
Sample No.	BC1540P	BC1538P	BC1543P	BC1546P	BC1549P	BC1551P	BC1553P	BC1556P
Ag	5	5	7	3	3	3	3	5
As	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N
B	2000	1500	70	700	1500	1000	1500	1500
Ba	1500	L	N	L	N	N	N	N
Be	N	L	1	L	1	N	L	N
Bi	L	L	L	N	N	N	N	N
Ce	L	N	N	N	N	L	N	N
Co	100	100	L	L	50	70	70	50
Cr	1000	1500	1500	150	1500	1000	700	1000
Cu	200	300	150	150	150	200	200	150
La	N	N	N	1000	N	L	N	N
Mo	N	15	15	N	30	50	10	15
Nb	N	N	N	N	N	N	N	N
Ni	300	300	300	15	700	300	300	200
Pb	70	70	N	50	150	150	300	N
Pt	N	N	N	N	N	N	N	N
Sb	L	N	N	N	L	N	N	L
Sn	N	N	N	N	N	N	N	N
Th								
U								
V	700	300	300	500	300	300	300	500
W	N	N	N	N	N	N	1000	N
Y	1000	500	700	500	N	700	N	N
Zn	1500	500	700	700	1500	1500	1500	1500
Zr	G	G	700	G	G	G	G	G

Map No.	225	226	227	228	229	230	231	232
Sample No.	BC1558P	BC1560P	BC1563P	BC1520P	BC1522P	BC1525P	BC1566P	BC1568P
Ag	5	3	5	3	3	5	7	5
As	N	N	N	N	1000	N	N	N
Au	N	N	N	N	N	N	N	N
B	150	1000	700	300	1500	300	200	150
Ba	1500	N	N	2000	1500	L	N	N
Be	1	1	N	L	1.5	1	1	1
Bi	N	N	L	L	L	N	N	N
Ce	L	N	N	N	N	N	N	N
Co	L	70	70	50	50	50	L	N
Cr	1500	1000	1500	700	700	1000	1000	700
Cu	70	300	100	300	150	150	70	10
[illegible]a	10	N	N	N	N	N	L	L
Mo	N	50	10	N	N	15	30	10
Nb	200	N	N	N	N	N	N	N
Ni	N	300	300	300	150	150	100	70
Pb	N	70	300	100	300	L	N	N
Pt	N	N	N	N	N	N	N	N
Sb	N	N	L	N	L	N	N	N
Sn	N	300	N	N	N	N	N	N
Th								
U								
V	300	200	300	500	500	700	300	L
W	N	N	N	N	L	L	N	N
[illegible]	700	N	N	N	N	N	N	N
Zn	1500	1500	1500	1000	700	N	150	1500
Zr	G	G	G	G	G	G	1000	300

Map No.	233	234	235	236	237	238	239	240
Sample No.	BC1570P	BC1573P	BC1575P	BC1579P	BC1581P	BC1583P	BC1585P	BC1590P
Ag	5	5	7	5	7	7	3	5
As	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N
B	200	300	300	100	150	100	70	150
Ba	1500	1500	N	N	1500	N	1500	1500
Be	1	1	1	1	1	1	L	1.5
Bi	N	N	N	N	N	N	N	N
Ce	N	L	N	L	L	L	N	L
Co	30	70	N	30	50	30	N	N
Cr	1000	1500	1000	3000	1500	1000	1500	1500
Cu	150	150	20	10	150	70	15	100
La	N	L	N	N	N	N	L	N
Mo	15	10	30	30	30	10	N	L
Nb	N	N	N	N	N	N	L	L
Ni	100	200	50	300	200	200	150	100
Pb	N	20	N	N	20	N	N	N
Pt	N	N	N	N	N	N	N	N
Sb	N	N	L	L	N	N	N	N
Sn	N	30	N	N	300	N	N	N
Th								
U								
V	500	300	200	200	200	200	200	700
W	N	N	N	N	N	N	N	N
Y	N	N	N	700	N	N	N	N
Zn	1500	1500	1500	1500	1500	1500	N	N
Zr	300	G	G	L	L	L	300	L

Map No.	241	242	243	244	245	246	247	248
Sample No.	BC1588P	BC1593P	BC1597P	BC1598P	BC1602P	BC1604P	BC1606P	BC1608P
Ag	5	7	7	10	15	15	15	10
As	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N
B	150	200	200	200	150	100	150	150
Ba	N	N	N	N	N	N	N	N
Be	1	L	7	70	N	10	3	L
Bi	N	N	N	N	N	N	N	N
Ce	N	L	L	N	N	N	N	N
Co	N	30	50	30	30	N	N	N
Cr	1500	2000	2000	2000	2000	1500	1500	1500
Cu	15	70	70	15	20	15	70	15
[illegible]a	L	N	N	150	N	N	L	N
Mo	N	N	L	L	L	N	N	L
Nb	L	L	L	L	L	L	L	L
Ni	100	150	150	150	150	150	150	100
Pb	N	N	N	N	N	N	N	N
Pt	N	N	N	N	N	N	N	N
Sb	N	L	L	N	N	L	N	L
Sn	N	N	N	N	N	N	N	N
Th								
U								
V	500	200	700	700	1000	300	200	700
W	N	L	N	L	L	N	N	N
[illegible]	N	N	N	N	500	500	N	150
Zn	N	L	N	N	L	L	N	N
Zr	L	500	N	L	N	L	N	L

Map No.	249	250	251	252	253	254	255	273
Sample No.	BC1610P	BC1612P	BC1614P	BC1617P	BC1619P	BC1622P	BC1624P	Ci 211P
Ag	10	15	20	10	10	3	5	15
As	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N
B	300	300	200	200	300	2000	300	500
Ba	N	N	1500	N	N	L	L	N
Be	1.5	N	7	10	3	L	N	L
Bi	N	N	N	N	N	L	150	L
Ce	N	5000	5000	L	N	N	N	N
Co	L	70	L	L	N	N	N	10
Cr	2000	2000	2000	1500	1500	1000	1500	200
Cu	15	150	50	50	70	200	150	100
La	N	N	N	N	N	N	N	L
Mo	15	L	L	L	L	20	15	N
Nb	L	L	L	L	N	N	N	L
Ni	100	300	150	150	150	50	150	100
Pb	N	N	N	N	N	N	N	L
Pt	N	N	N	N	N	N	N	N
Sb	L	N	L	L	L	N	L	N
Sn	N	N	30	300	N	N	N	200
Th								
U								
V	700	300	200	700	200	L	300	300
W	N	N	N	N	N	1000	N	N
Y	500	500	1000	L	L	N	N	N
Zn	1500	L	1500	2000	L	300	300	1500
Zr	G	G	G	L	L	1000	200	L

Map No.	274	275	276	277	278	279	280*B	281
Sample No.	Ci 221P	Ci 229P	Ci 255P	Ci 240P	Ci 243P	Ci 251P	Ci 023PB	Ci 258P
Ag	3	5	5	15	3	3	i	5
As	L	L	N	1000	N	N	N	N
Au	N	N	N	N	N	N	N	N
B	700	700	1000	500	300	500	N	100
Ba	N	L	N	N	L	L	N	N
Be	L	N	L	N	N	L	N	5
Bi	L	N	N	L	N	L	N	N
Ce	N	L	N	L	N	N	–	7000
Co	20	50	10	50	10	10	50	10
Cr	1000	1000	500	1500	500	500	550	300
Cu	300	200	200	300	70	150	N	150
a	N	N	1000	N	L	L	490	50000
Mo	L	20	10	20	N	N	90	10
Nb	L	1500	L	L	L	200	N	500
Ni	150	150	150	300	100	150	130	150
Pb	300	700	100	500	100	50	250	200
Pt	N	N	N	N	N	N	i	N
Sb	N	N	N	N	N	N	710	N
Sn	5000	300	300	1000	150	100	G	500
Th								
U								
V	500	700	500	1500	700	500	90	500
W	N	7000	N	700	L	L	G	N
	L	1500	700	L	700	500	630	2000
Zn	N	N	1500	N	500	N	1300	700
Zr	G	G	G	L	G	G	4000	G

Map No.	282*B	283*	284*	285*	286	287	288*	289*
Sample No.	Ci133p(76)B	Ci131P	Ci025P	Ci127P	Ci261P	Ci263P	Ci013P	Ci011P
Ag	i	i	70	i	3	3	i	120
As	L	200	N	1000	N	N	N	N
Au	N	L	N	N	N	N	N	N
B	N	N	140	600	2000	1000	270	230
Ba	N	N	N	200	N	L	N	N
Be	N	N	N	N	5	5	N	N
Bi	N	800	N	5000	N	L	N	N
Ce	–	–	–	–	N	N	–	–
Co	N	N	60	200	30	30	60	50
Cr	N	N	100	60	500	300	250	160
Cu	–	2000	50	2000	150	150	70	90
La	N	L	N	300	L	L	N	N
Mo	N	N	70	500	10	10	70	50
Nb	–	600	N	200	200	200	N	N
Ni	N	200	160	100	300	150	360	340
Pb	N	400	650	800	200	100	320	480
Pt	N	N	i	i	N	N	i	i
Sb	–	8000	680	8000	N	N	1600	1700
Sn	100,000	230,000	G	700	5000	L	7500	7100
Th								
U								
V	N	N	90	1000	500	500	110	70
W	2000	3000	5700	2000	N	N	3300	770
Y	100	300	190	700	700	N	300	230
Zn	30	50	420	400	N	L	740	480
Zr	N	100	3000	6000	L	1000	6800	4100

Map No.	290*	291*	292*B	293*	294*	295*	296*	297*B
Sample No.	Ci135P(76)	Ci010P	Ci09B	Ci08P	Ci07P	Ci06P	Ci05P	Ci132B
Ag	i	50	N	60	50	70	N	i
As	600	N	N	N	N	N	N	100
Au	L	N	N	N	N	N	N	L
B	500	280	N	220	400	200	600	100
Ba	40	N	N	N	N	N	N	100
Be	N	N	N	N	N	N	N	N
Bi	2000	N	N	N	N	450	N	900
Ce	—	—	—	—	—	—	—	—
Co	300	N	N	90	N	L	N	N
Cr	300	110	110	140	140	410	210	N
Cu	2000	50	N	100	50	70	N	2000
[illegible]a	N	N	N	250	N	N	N	N
Mo	200	40	20	60	30	40	40	N
Nb	200	N	N	N	N	N	N	200
Ni	90	210	60	250	290	270	190	100
Pb	400	250	90	250	520	460	220	400
Pt	i	i	N	i	i	i	i	N
Sb	8000	1200	N	940	1600	1100	1000	8000
Sn	4000	2500	G	4400	440	1400	N	10,000
Th								
U								
V	40	50	90	150	90	N	60	N
W	2000	820	210	1000	330	600	680	600
[illegible]	N	230	100	250	260	120	250	N
Zn	200	520	50	280	290	790	230	L
Zr	10,000	6800	390	2800	6800	1800	6900	100

Map No.	298	299	300	301	302	303	304*	305* B
Sample No.	Ci268P	Ci267P	Ci272P	Ci247P	Ci248P	Ci273P	Ci03P	Ci04 B
Ag	10	50	1000	3	15	10	90	N
As	N	L	3000	N	N	L	2300	9000
Au	L	50	G	N	N	N	N	L
B	2000	2000	2000	2000	150	1000	390	N
Ba	N	L	N	N	2000	N	N	N
Be	L	10	L	L	L	N	N	N
Bi	N	L	N	L	N	L	N	1000
Ce	N	N	L	N	N	N	—	—
Co	70	50	100	70	50	10	N	N
Cr	300	1500	700	700	700	300	N	N
Cu	200	300	1500	200	300	1000	60	N
La	N	N	L	N	N	N	N	N
Mo	N	N	10	20	10	N	50	200
Nb	N	N	N	L	L	N	N	100
Ni	200	300	300	200	100	150	150	N
Pb	100	100	150	50	L	50	180	3000
Pt	N	N	N	N	N	N	N	N
Sb	N	L	N	N	N	N	690	2000
Sn	200	150	300	50	50	20	G	G
Th								
U								
V	700	2000	700	500	500	500	N	N
W	N	N	L	7000	N	L	3100	G
Y	N	1000	700	L	1000	1000	610	N
Zn	L	L	L	1500	L	N	710	N
Zr	G	G	G	L	L	G	760	L

Map No.	306*	307*	308	309	310	311	312	313
Sample No.	Ci123P	Ci125P	Ci244P	Ci215P	Ci217p	Ci235p	Ci231p	Ci220p
Ag	i	i	3	10	3	15	3	2
As	900	700	N	N	L	3000	N	N
Au	N	N	N	N	N	N	N	N
B	300	400	1500	700	1000	10,000	2000	1500
Ba	100	L	N	L	L	3000	L	L
Be	N	N	N	L	L	N	L	L
Bi	5000	3000	N	L	L	N	L	L
Ce	—	—	N	L	N	L	N	N
Co	200	N	30	20	20	100	50	50
Cr	L	N	300	1500	300	1500	1000	500
Cu	2000	2000	300	500	150	700	500	300
[illegible]a	200	200	N	N	L	N	N	L
Mo	400	300	N	10	L	20	20	L
Nb	200	200	200	L	L	L	L	L
Ni	90	100	150	300	100	300	300	200
Pb	700	500	100	150	70	300	70	200
Pt	i	i	N	N	N	N	N	N
Sb	8000	8000	N	N	N	1000	N	N
Sn	700	2000	1000	50	N	50	N	N
Th								
U								
V	60	N	700	500	200	1500	500	300
W	G	2000	N	N	N	N	N	N
[illegible]	100	80	N	500	500	700	L	L
Zn	100	100	L	N	1000	N	N	1000
Zr	10,000	5000	G	G	G	G	G	1000

Map No.	314	315	316	317	318	319	320	321
Sample No.	Ci 227P	Ci 225P	Ci 208P	Ci 207P	Ci 205P	Ci 446P	Ci 444P	Ci 442P
Ag	2	5	20	15	10	10	7	2
As	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N
B	5000	2000	1500	300	300	150	150	50
Ba	L	L	3000	L	L	N	N	1000
Be	L	N	N	L	L	N	L	1
Bi	L	L	N	L	L	N	N	50
Ce	N	N	L	L	L	N	N	N
Co	20	50	50	50	20	30	N	N
Cr	500	700	5000	3000	2000	1500	2000	200
Cu	150	500	500	300	50	200	300	15
La	N	N	N	N	N	N	N	L
Mo	10	L	30	20	10	20	50	N
Nb	L	L	L	L	L	N	N	L
Ni	300	200	1000	500	L	200	500	L
Pb	N	500	N	N	N	N	N	N
Pt	N	N	N	N	N	N	N	N
Sb	N	500	1000	N	N	N	N	N
Sn	N	N	N	50	N	N	N	100
Th								
U								
V	500	500	500	300	300	500	150	200
W	N	N	N	N	N	N	N	3000
Y	L	500	700	700	700	1000	L	L
Zn	N	N	N	N	N	500	1000	N
Zr	G	G	G	L	L	G	L	G

Map No.	322	323	324	325	326	327	328	329
Sample No.	Ci440p	Ci203p	Ci133p	Ci135p	Ci144p	Ci142p	Ci140p	Ci138p
Ag	7	10	3	10	3	3	10	10
As	N	N	N	N	N	N	N	3000
Au	N	N	N	N	N	N	N	N
B	70	150	1500	3000	150	100	3000	2000
Ba	N	L	N	1000	N	N	1000	1000
Be	N	L	N	2	2	L	N	N
Bi	L	L	N	N	L	L	N	N
Ce	N	N	N	N	N	N	N	N
Co	N	20	30	70	N	N	70	50
Cr	200	3000	2000	700	1000	500	1000	500
Cu	150	150	200	1000	100	100	300	150
[illegible]a	N	N	L	N	N	N	N	5000
Mo	N	10	70	L	L	L	L	70
Nb	L	L	L	L	N	N	L	L
Ni	150	300	300	L	150	200	150	50
Pb	N	N	N	150	N	N	70	150
Pt	N	N	N	N	N	N	N	50
Sb	N	N	N	N	N	N	N	N
Sn	N	N	1000	150	N	50	150	50
Th								
U								
V	300	300	1000	500	200	300	500	500
W	N	N	7000	10,000	N	3000	7000	20,000
[illegible]	N	700	700	300	L	1000	500	700
Zn	L	N	L	700	500	500	700	N
Zr	200	G	G	G	L	G	G	G

Map No.	337B	339	340	341	342	346	347	348
Sample No.	3646B	3648p	3649p	3650p	3651p	3654p	3652p	3656p
Ag	20	3	N	N	N	N	N	N
As	3000	5000	N	N	N	N	N	N
Au	100	N	N	N	N	N	N	N
B	N	N	70	200	N	50	100	50
Ba	200	150	300	200	300	500	300	700
Be	5	3	N	N	N	3	3	2
Bi	500	N	N	N	N	N	N	N
Ce	700	3000	500	300	500	3000	1500	300
Co	N	30	15	30	20	20	30	30
Cr	70	100	100	150	150	150	150	150
Cu	15	20	30	15	15	15	20	50
La	700	2000	300	100	300	2000	1000	150
Mo	300	30	N	N	N	N	N	N
Nb	300	150	50	20	30	150	50	20
Ni	10	50	30	50	20	20	50	50
Pb	3000	1500	30	30	30	70	70	70
Pt	N	N	N	N	N	N	N	N
Sb	N	N	N	N	N	N	N	N
Sn	G	20,000	2000	20	70	2000	70	N
Th	N	N	N	N	N	L	N	N
U	N	N	N	N	N	N	N	N
V	100	150	150	200	200	200	300	200
W	10,000	3000	N	N	N	N	300	N
Y	300	500	70	150	70	500	200	70
Zn	N	N	N	N	N	N	N	N
Zr	150	200	150	200	100	300	300	150

Map No.	350	351	352	353	354	355	356	357
Sample No.	3653p	3668p	3667p	3662p	3661p	3660p	3663p	3664p
Ag	N	N	N	N	N	N	7	N
As	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N
B	50	50	N	N	N	300	N	200
Ba	300	500	100	100	200	50	150	300
Be	3	3	5	3	3	5	7	7
Bi	N	N	N	N	N	N	N	N
Ce	2000	700	5000	7000	300	3000	7000	700
Co	15	30	N	N	N	N	N	15
Cr	100	150	50	20	50	150	70	100
Cu	7	15	15	20	15	15	15	30
[illegible]a	1500	500	3000	5000	1500	2000	5000	500
Mo	N	N	N	N	N	N	N	N
Nb	70	30	300	500	300	300	300	150
Ni	15	50	15	10	15	20	30	30
Pb	100	100	70	100	70	70	150	30
Pt	N	N	N	N	N	N	N	N
Sb	N	N	N	N	N	N	N	N
Sn	100	150	1500	1500	2000	300	15,000	2000
Th	500	N	700	700	N	N	N	N
U	N	—	—	—	—	—	—	—
V	150	200	200	100	100	200	100	150
W	N	N	N	N	N	N	500	N
	200	70	1500	1500	700	500	700	200
Zn	N	N	N	N	N	N	N	N
Zr	500	200	3000	700	1500	300	300	300

Map No.	358	359B	360B	361*	362*	363*	364*	365*
Sample No.	3665p	3672B	3673B	Ci-MH-110.2p	Ci-MH-112.1p	Ci-MH-113.1p	Ci 117p	Ci 114p
Ag	N	50	700	i	i	i	i	i
As	N	N	N	300	600	1000	700	1000
Au	N	300	3000	N	N	N	N	i
B	200	N	N	200	200	800	300	200
Ba	500	30	20	100	60	100	60	60
Be	7	100	5	N	N	N	N	N
Bi	N	20	30	2000	3000	2000	3000	800
Ce	500	300	N	—	—	—	—	—
Co	30	15	15	N	N	N	200	N
Cr	100	20	30	N	1000	N	90	N
Cu	70	50	20	2000	2000	1000	2000	8000
La	300	70	70	200	600	N	300	200
Mo	N	N	N	200	300	200	300	L
Nb	100	70	150	400	N	200	N	L
Ni	70	15	20	80	N	N	100	300
Pb	70	300	50	400	500	400	500	700
Pt	N	N	N	i	i	i	i	i
Sb	N	N	N	8000	8000	5000	8000	20,000
Sn	3000	100,000	100,000	4000	900	3000	30,000	5000
Th	N	N	N					
U	—	—	—					
V	150	70	70	N	70	N	200	200
W	700	20,000	20,000	600	2000	1000	G	1000
Y	200	30	20	N	200	800	100	N
Zn	N	N	N	400	700	500	500	200
Zr	300	70	30	300	5000	900	2000	1000

Map No.		366*	55*						
Sample No.		Ci129p	BE2266						
Ag		i	5						
As		500	N						
Au		N	N						
B		100	150						
Ba		N	2000						
Be		N	N						
Bi		3000	N						
Ce		–	N						
Co		300	30						
Cr		200	5000						
Cu		2000	100						
[illegible]a		600	1000						
Mo		300	N						
Nb		200	L						
Ni		80	70						
Pb		400	70						
Pt		i	N						
Sb		8000	500						
Sn		900	N						
Th									
U									
V		70	300						
W		3000	N						
[illegible]		200	N						
Zn		500	700						
Zr		7000	N						

APPENDIX - B

Stream sediment analyses (in ppm)

L - Detected

N - Not detected

i - Interference

G - Greater than detection limits

All analyses by semi-quantitative emission spectrographic method by the University of Alaska except:

1) Sample map numbers with an asterisk (*) were analyzed by the Bureau of Mines Reno Metallurgical Lab.

2) Sample Map number 337 to 360 were analyzed by the U. S. Geological Survey.

Map No.								363	364
Sample No.								Ci 141	Ci 143
Fe %								3	2
Mg %								3	3
Ca %								5	5
Na %								G	G
K %								-	-
Ti %								1	.5
Mn								1500	500
Ag								2	2
As								N	N
Au								N	N
B								50	50
Ba								1000	L
Be								1	L
Bi								20	L
Cd								N	N
Co								50	30
Cr								300	300
Cu								50	30
Ga								1	1
La								N	N
Li								N	N
Mo								N	N
Nb								L	L
Ni								50	150
P								1500	1500
Pb								N	N
Pd								N	N
Pt								N	N
Sb								N	N
Sc								N	N
Se								-	-
Sn								N	N
Sr								N	N
Ta								N	N
Te								N	N
V								100	100
W								N	N
Y								N	N
Zn								N	N
Zr								200	200
Th									
U									

Map No.	365	366	367	368	369	370	371	375	376
Sample No.	Ci 223	Ci 224	Ci 226	Ci 219	Ci 209	Ci 206	Ci 204	Ci 201	Ci 202
Fe %	5	7	5	10	5	2	5	10	5
Mg %	2	3	3	3	5	5	7	7	5
Ca %	2	2	2	3	1	2	2	7	3
Na %	G	G	G	G	G	G	G	G	G
K %	—	—	—	—	—	—	—	—	—
Ti %	1	1	1	1	.7	.7	.7	G	1
Mn	2000	2000	2000	5000	5000	5000	5000	5000	5000
Ag	L	L	L	2	L	N	L	L	L
As	N	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N	N
B	100	200	200	200	100	100	150	100	150
Ba	N	N	N	N	N	N	N	N	N
Be	L	L	L	2	2	2	N	N	N
Bi	L	L	L	L	L	N	L	L	L
Cd	N	N	N	N	N	L	N	N	N
Co	N	N	N	N	L	N	L	L	N
Cr	1000	1000	1000	2000	1500	1500	500	2000	2000
Cu	30	50	50	50	70	30	150	1000	50
Ga	.5	.5	1	1	5	5	1	2	1
La	N	N	N	N	N	N	N	N	N
Li	N	N	N	N	N	N	N	N	N
Mo	N	N	N	N	N	N	N	N	N
Nb	N	N	N	N	N	N	N	N	N
Ni	300	300	300	500	1000	300	300	500	700
P	L	L	L	L	500	2000	1000	500	500
Pb	N	N	N	N	N	N	N	N	N
Pd	N	N	N	N	N	N	N	N	N
Pt	N	N	N	N	N	N	N	N	N
Sb	N	N	N	N	N	N	N	N	N
Sc	N	N	N	N	N	N	N	N	N
Se	—	—	—	—	—	—	—	—	—
Sn	N	N	N	N	N	N	N	N	N
Sr	N	N	N	N	N	N	N	N	N
Ta	N	N	N	N	N	N	N	N	N
Te	N	N	N	N	N	N	N	N	N
V	200	500	500	500	150	150	500	500	150
W	N	N	N	N	L	N	L	L	N
Y	N	N	N	N	N	N	N	N	N
Zn	N	N	N	N	N	N	N	N	N
Zr	N	N	N	N	L	L	N	L	L
Th									
U									

Map No.	379	380	381	382	383	384	385	386	387
Sample No.	BC1096	BC1106	BC1242	BC1244	BC1246	BC1248	BC1250	BC1330	BC1332
Fe %	10	5	2	5	5	2	5	2	5
Mg %	3	2	2	3	3	3	3	3	5
Ca %	7	2	3	3	5	2	3	3	7
Na %	G	G	G	G	G	G	G	G	G
K %	—	—	—	—	—	—	—	—	—
Ti %	1	1	.7	.7	G	1	1	1	G
Mn	5000	2000	3000	3000	3000	3000	3000	3000	G
Ag	5	2	2	2	2	2	2	2	2
As	N	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N	N
B	70	200	100	200	70	200	200	50	200
Ba	N	N	N	N	N	N	L	L	N
Be	L	2	2	2	2	L	2	L	2
Bi	L	L	L	L	L	L	L	L	L
Cd	N	N	N	N	N	N	N	N	N
Co	N	N	N	L	L	N	N	N	N
Cr	1000	1000	500	1000	1000	500	2000	1000	2000
Cu	70	15	5	10	30	20	30	10	70
Ga	2	L	L	2	1	L	1	1	5
La	N	N	N	N	N	N	N	N	N
Li	N	N	N	N	N	N	N	N	N
Mo	N	N	N	N	N	N	N	N	N
Nb	N	N	N	N	N	N	N	N	N
Ni	300	300	300	500	300	100	200	500	300
P	L	L	L	L	L	3000	500	1000	L
Pb	N	N	N	N	N	L	L	L	L
Pd	N	N	N	N	N	N	N	N	N
Pt	N	N	N	N	N	N	N	N	N
Sb	N	N	N	N	N	N	N	N	N
Sc	N	N	N	N	N	N	N	N	N
Se	—	—	—	—	—	—	—	—	—
Sn	N	N	N	N	N	N	N	N	N
Sr	N	N	N	N	N	N	N	N	N
Ta	N	N	N	N	N	N	N	N	N
Te	N	N	N	N	N	N	N	N	N
V	200	100	150	200	200	100	200	100	500
W	N	N	N	N	N	N	N	N	N
Y	N	N	N	N	L	N	N	N	N
Zn	N	N	N	N	N	L	L	L	L
Zr	L	N	N	N	L	L	1000	N	L
Th									
U									

Map No.	388	389	390	391	392	393	394	395	396
Sample No.	BC1334	BC1336	BC1337	BC1339	BC1340	BC1342	BC1344	BC1346	BC1348
Fe %	5	10	2	1.5	5	1.5	20	5	5
Mg %	3	3	3	3	2	3	5	3	3
Ca %	3	7	5	5	1	1	5	1	5
Na %	G	G	G	G	G	G	G	G	G
K %	—	—	—	—	—	—	—	—	—
Ti %	1	G	1	1	.7	.7	G	1	1
Mn	3000	3000	2000	2000	3000	2000	5000	3000	3000
Ag	2	2	L	L	L	L	5	2	2
As	N	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N	N
B	200	100	200	100	200	100	200	100	100
Ba	L	N	L	L	L	N	L	L	L
Be	2	L	L	L	L	L	2	2	2
Bi	L	L	L	L	L	L	L	L	L
Cd	N	N	N	N	N	N	N	N	N
Co	N	N	N	N	N	N	30	N	N
Cr	2000	2000	2000	2000	2000	2000	2000	1000	2000
Cu	50	50	50	100	50	7	50	10	50
Ga	5	2	2	1	L	.5	7	L	1
La	N	N	N	N	N	N	N	N	N
Li	N	N	N	N	N	N	N	N	N
Mo	N	N	N	N	N	N	N	N	N
Nb	N	N	N	N	N	N	N	N	N
Ni	200	500	500	500	700	300	500	100	300
P	500	500	500	500	500	L	500	500	500
Pb	L	L	L	L	L	L	L	L	L
Pd	N	N	N	N	N	N	N	N	N
Pt	N	N	N	N	N	N	N	N	N
Sb	N	N	N	N	N	N	N	N	N
Sc	N	N	N	N	N	N	N	N	N
Se	—	—	—	—	—	—	—	—	—
Sn	N	N	N	N	N	N	N	N	N
Sr	N	N	N	N	N	N	N	N	N
Ta	N	N	N	N	N	N	N	N	N
Te	N	N	N	N	N	N	N	N	N
V	150	500	500	150	100	100	200	100	150
W	N	L	L	N	N	N	N	L	L
Y	N	N	N	N	N	N	N	N	N
Zn	L	L	L	L	L	L	L	L	L
Zr	L	N	L	L	L	L	L	N	1000
Th									
U									

Map No.	397	398	399	400	401	402	403	404	405
Sample No.	BC1350	BC1357	BC1359	BC1501	BC1505	BC1503	BC1509	BC1507	BC1511
Fe %	5	2	5	5	5	5	2	5	5
Mg %	3	3	3	3	3	3	3	3	3
Ca %	5	2	3	2	5	7	5	5	7
Na %	G	G	G	G	G	G	G	G	G
K %	—	—	—	—	—	—	—	—	—
Ti %	1	1	.5	.3	.5	G	G	.5	G
Mn	3000	2000	2000	2000	500	2000	2000	1000	2000
Ag	2	L	L	L	L	L	L	L	L
As	N	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N	N
B	100	150	150	100	100	100	100	100	150
Ba	L	N	N	N	N	N	N	N	N
Be	2	L	L	L	L	L	L	L	L
Bi	L	L	L	L	L	L	L	L	L
Cd	N	N	N	N	N	N	N	N	N
Co	N	N	N	N	L	L	L	L	L
Cr	2000	1000	1000	1000	1000	1500	1000	1000	1500
Cu	50	50	20	20	10	50	20	20	50
Ga	1	1	1	.5	.5	1.5	1	1.5	1.5
La	N	N	N	N	N	N	N	N	N
Li	N	N	N	N	N	N	N	N	N
Mo	N	N	N	N	N	L	N	N	L
Nb	N	N	N	N	N	N	N	N	N
Ni	300	300	300	200	200	1500	500	500	1000
P	500	500	N	L	L	L	L	L	L
Pb	L	L	N	N	N	N	N	N	N
Pd	N	N	N	N	N	N	N	N	N
Pt	N	N	N	N	N	N	N	N	N
Sb	N	N	N	N	N	N	N	N	N
Sc	N	N	N	N	N	N	N	N	N
Se	—	—	—	—	—	—	—	—	—
Sn	N	N	N	N	N	N	N	N	N
Sr	N	N	N	N	N	N	N	N	N
Ta	N	N	N	N	N	N	N	N	N
Te	N	N	N	N	N	N	N	N	N
V	200	150	200	50	100	200	200	150	100
W	L	L	N	N	N	L	L	L	L
Y	N	N	N	N	N	N	N	N	N
Zn	L	L	N	N	N	N	N	N	N
Zr	L	L	N	L	5000	L	L	L	L
Th									
U									

Map No.	406	407	408	409	410	411	412	413	414
Sample No.	BC1512	BC1516	BC1518	BC1515	BC1528	BC1526	BC1530	BC1532	BC1534
Fe %	1.5	2	5	5	1.5	1.5	1.5	1.5	2
Mg %	1	3	3	2	3	3	2	2	3
Ca %	2	2	5	2	5	5	2	3	2
Na %	G	G	G	G	G	G	G	G	G
K %	—	—	—	—	—	—	—	—	—
Ti %	.15	.5	G	.2	1	.5	.5	G	1
Mn	200	1000	1000	1000	1000	500	1000	1000	1000
Ag	L	L	L	L	L	L	L	L	L
As	N	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N	N
B	100	150	100	200	200	100	100	100	150
Ba	N	N	N	N	N	N	N	N	N
Be	L	L	L	L	2	L	2	2	2
Bi	L	L	L	L	L	L	L	L	L
Cd	N	N	N	N	N	N	N	N	N
Co	N	L	L	L	N	L	N	N	L
Cr	300	1000	1000	1000	1000	1000	500	500	500
Cu	1	5	20	2	15	L	10	10	15
Ga	L	1	1	.5	3	1	L	.5	1
La	L	N	N	N	N	N	N	N	N
Li	N	N	N	N	N	N	N	N	N
Mo	L	N	N	N	N	N	N	N	N
Nb	N	N	N	N	N	N	N	N	N
Ni	300	500	300	300	500	700	200	200	200
P	N	L	L	L	L	L	L	L	L
Pb	N	N	L	N	N	L	N	N	N
Pd	N	N	N	N	N	N	N	N	N
Pt	N	N	N	N	N	N	N	N	N
Sb	N	N	N	N	N	N	N	N	N
Sc	N	N	N	N	N	N	N	N	N
Se	—	—	—	—	—	—	—	—	—
Sn	N	N	N	N	N	N	N	N	N
Sr	N	N	N	N	N	N	N	N	N
Ta	N	N	N	N	N	N	N	N	N
Te	N	N	N	N	N	N	N	N	N
V	L	100	200	100	100	200	50	100	100
W	N	L	L	L	L	L	N	L	L
Y	N	N	N	N	L	N	L	L	L
Zn	N	N	N	N	N	N	N	N	N
Zr	L	L	L	L	500	5000	200	500	500
Th									
U									

Map No.	415	416	417	418	419	420	421	422	423
Sample No.	BC 1539	BC 1537	BC 1541	BC 1542	BC 1544	BC 1545	BC 1548	BC 1550	BC 1554
Fe %	5	5	5	2	2	2	2	2	5
Mg %	3	3	3	3	3	3	3	3	3
Ca %	3	3	3	3	3	3	3	3	3
Na %	G	G	G	G	G	G	G	G	G
K %	—	—	—	—	—	—	—	—	—
Ti %	G	G	G	.5	1	1	G	1	1
Mn	1000	1500	1000	5000	500	500	1000	1000	2000
Ag	2	2	2	2	L	2	2	2	2
As	N	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N	N
B	150	150	150	150	100	150	150	150	150
Ba	N	N	N	N	N	N	N	N	N
Be	1	5	2	2	2	2	2	2	2
Bi	L	L	L	L	L	L	L	L	L
Cd	N	N	N	N	N	N	N	N	N
Co	L	L	L	70	N	N	L	L	L
Cr	500	500	1000	1000	500	500	500	500	500
Cu	10	15	15	15	1.5	1.5	5	15	15
Ga	1	.5	1	1	.5	1	1	1.5	1
La	N	N	N	N	N	N	N	N	N
Li	N	N	N	N	N	N	N	N	N
Mo	N	N	N	N	N	N	N	N	N
Nb	N	N	N	N	N	N	N	N	N
Ni	150	200	200	500	150	150	500	200	500
P	L	L	L	L	L	L	L	L	L
Pb	L	L	L	N	N	N	N	L	L
Pd	N	N	N	N	N	N	N	N	N
Pt	N	N	N	N	N	N	N	N	N
Sb	N	N	N	N	N	N	N	N	N
Sc	N	N	N	N	N	N	N	N	N
Se	—	—	—	—	—	—	—	—	—
Sn	N	N	N	N	N	N	N	N	N
Sr	N	N	N	N	N	N	N	N	N
Ta	N	N	N	N	N	N	N	N	N
Te	N	N	N	N	N	N	N	N	N
V	100	100	100	100	100	100	100	200	100
W	L	L	L	L	N	L	L	L	L
Y	L	L	L	L	L	L	L	L	L
Zn	N	N	N	N	N	N	N	N	N
Zr	1000	500	200	1000	200	200	200	200	L
Th									
U									

Map No.	424	425	426	427	428	429	430	431	432
Sample No.	BC1552	BC1555	BC1557	BC1562	BC1559	BC1561	BC1521	BC1564	BC1523
Fe %	3	2	2	10	5	2	3	10	7
Mg %	3	2	3	3	3	3	3	3	3
Ca %	3	3	2	7	3	5	3	3	3
Na %	G	G	G	G	G	G	G	G	G
K %	—	—	—	—	—	—	—	—	—
Ti %	1	1	1	G	1	.5	1	1	G
Mn	1000	500	500	500	1000	2000	1000	500	500
Ag	2	2	L	L	L	L	L	L	L
As	N	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N	N
B	150	150	100	100	150	150	150	150	150
Ba	N	N	N	N	N	N	N	N	N
Be	2	2	L	2	2	2	L	2	L
Bi	L	L	L	L	L	L	L	L	L
Cd	N	N	N	N	N	N	N	N	N
Co	L	L	N	L	N	N	L	L	L
Cr	1000	500	500	1500	1000	500	1500	1000	1000
Cu	15	15	2	5	10	5	20	10	50
Ga	1.5	.5	1	2	1.5	1.5	1.5	1.5	1
La	N	N	N	N	N	N	N	N	N
Li	N	N	N	N	N	N	N	N	N
Mo	N	N	N	L	N	N	L	L	N
Nb	N	N	N	N	N	N	N	N	N
Ni	1000	200	150	500	150	150	500	500	700
P	L	L	L	L	L	L	L	L	N
Pb	L	L	N	N	L	N	L	N	L
Pd	N	N	N	N	N	N	N	N	N
Pt	N	N	N	N	N	N	N	N	N
Sb	N	N	N	N	N	N	N	N	N
Sc	N	N	N	N	N	N	N	N	N
Se	—	—	—	—	—	—	—	—	—
Sn	N	N	N	N	N	N	N	N	N
Sr	N	N	N	N	N	N	N	N	N
Ta	N	N	N	N	N	N	N	N	N
Te	N	N	N	N	N	N	N	N	N
V	150	30	150	300	100	100	200	200	200
W	L	L	N	N	N	N	L	N	L
Y	L	L	N	N	N	N	N	N	N
Zn	N	N	N	N	N	N	N	N	N
Zr	500	200	N	L	N	L	N	N	L
Th									
U									

Map No.	433	434	435	436	437	438	439	441	442
Sample No.	BC1524	BC1565	BC1567	BC1569	BC1571	BC1572	BC1574	BC1578	BC1580
Fe %	5	10	10	5	2	2	5	2	2
Mg %	3	3	3	3	3	3	3	3	2
Ca %	3	3	3	3	3	3	3	5	2
Na %	G	G	G	G	G	G	G	G	G
K %	—	—	—	—	—	—	—	—	—
Ti %	.5	1	.5	.2	1	.5	G	1	.2
Mn	1000	500	500	500	500	500	500	500	1000
Ag	L	L	L	L	L	L	L	L	L
As	N	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N	N
B	70	70	100	150	150	150	150	150	150
Ba	N	N	N	N	N	N	N	N	N
Be	L	2	L	2	L	2	2	2	2
Bi	L	L	L	L	L	L	L	L	L
Cd	N	N	N	N	N	N	N	N	N
Co	L	L	L	N	N	L	L	L	L
Cr	1000	1000	1500	200	1000	1000	1500	1000	150
Cu	10	5	2	10	2	10	10	5	5
Ga	1.5	1.5	1.5	L	1.5	1.5	1.5	1.5	L
La	N	N	N	N	N	N	N	N	N
Li	N	N	N	N	N	N	N	N	N
Mo	N	L	L	N	L	N	50	L	L
Nb	N	N	N	N	N	N	N	N	N
Ni	300	300	300	70	150	150	200	150	70
P	L	L	L	L	L	L	L	L	L
Pb	L	N	L	N	N	N	L	N	N
Pd	N	N	N	N	N	N	N	N	N
Pt	N	N	N	N	N	N	N	N	N
Sb	N	N	N	N	N	N	L	N	N
Sc	N	N	N	N	N	N	N	N	N
Se	—	—	—	—	—	—	—	—	—
Sn	N	N	N	N	N	N	N	N	N
Sr	N	N	N	N	N	N	N	N	N
Ta	N	N	N	N	N	N	N	N	N
Te	N	N	N	N	N	N	N	N	N
V	200	200	200	50	100	200	200	100	L
W	L	N	N	N	N	N	N	N	N
Y	N	N	N	N	N	N	N	N	N
Zn	N	N	N	N	N	N	N	N	N
Zr	L	L	500	N	N	N	L	L	N
Th									
U									

Map No.	443	444	445	446	447	448	449	450	451
Sample No.	BC1582	BC1589	BC1587	BC1584	BC1591	BC1595	BC1592	BC1596	BC1600
Fe %	5	10	5	2	5	10	5	5	1
Mg %	3	3	3	3	3	3	3	3	3
Ca %	7	5	5	5	3	10	15	15	2
Na %	G	G	G	G	G	G	G	G	G
K %	—	—	—	—	—	—	—	—	—
Ti %	.5	G	G	1	1	G	G	G	G
Mn	1000	1000	2000	500	1000	1500	1500	2000	1000
Ag	L	L	1	L	1	1	1	1	L
As	N	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N	N
B	150	150	150	150	150	150	150	150	150
Ba	N	N	N	N	N	N	L	L	N
Be	2	2	2	2	3	2	2	3	2
Bi	L	L	L	L	L	L	L	L	L
Cd	N	N	N	N	N	N	N	N	N
Co	L	L	N	L	20	50	50	20	50
Cr	500	500	1000	1000	1000	1500	1000	500	1000
Cu	5	10	5	5	20	15	10	15	20
Ga	1.5	2	1.5	1	2	2	3	3	2
La	N	N	N	N	N	N	N	N	N
Li	N	N	N	N	N	N	N	N	N
Mo	L	N	N	L	L	N	N	N	N
Nb	N	N	N	N	N	N	N	N	N
Ni	100	300	150	150	1000	1000	150	200	300
P	L	L	L	L	L	L	L	L	L
Pb	N	N	N	N	N	N	N	N	N
Pd	N	N	N	N	N	N	N	N	N
Pt	N	N	N	N	N	N	N	N	N
Sb	N	N	N	N	N	N	N	N	N
Sc	N	N	N	N	N	N	N	N	N
Se	—	—	—	—	—	—	—	—	—
Sn	N	N	N	N	N	N	N	N	N
Sr	N	N	N	N	N	N	N	N	N
Ta	N	N	N	N	N	N	N	N	N
Te	N	N	N	N	N	N	N	N	N
V	100	200	100	100	200	200	500	300	200
W	N	L	N	N	L	L	L	L	L
Y	N	N	N	N	N	N	L	L	L
Zn	N	N	N	N	N	L	L	N	N
Zr	L	L	L	L	L	200	500	L	L
Th									
U									

Map No.	452	453	454	455	456	457	458	459
Sample No.	BC1601	BC1603	BC1605	BC1607	BC1609	BC1611	BC1613	BC1616
Fe %	2	1	5	10	5	5	5	1
Mg %	3	3	3	3	3	3	3	3
Ca %	7	5	7	5	7	7	7	5
Na %	G	G	G	G	G	G	G	G
K %	-	-	-	-	-	-	-	-
Ti %	G	.5	G	G	1	G	G	1
Mn	1000	1500	2000	1500	1500	1000	2000	1000
Ag	L	L	L	1	1	1	1	L
As	N	N	N	N	N	N	N	N
Au	N	N	N	N	N	N	N	N
B	70	70	150	70	150	150	150	150
Ba	N	N	N	N	L	L	L	N
Be	2	3	3	2	2	2	3	2
Bi	L	L	L	L	L	L	L	L
Cd	N	N	N	N	N	N	N	N
Co	L	L	L	20	20	L	L	L
Cr	700	700	1000	500	500	7000	1000	500
Cu	5	10	15	20	15	15	10	10
Ga	2	1.5	2	2	2	2	2	1
La	N	N	N	N	N	N	N	N
Li	N	N	N	N	N	N	N	N
Mo	50	N	N	N	N	N	L	N
Nb	N	N	N	N	N	N	N	N
Ni	200	300	500	150	300	300	500	100
P	L	L	L	L	L	L	L	L
Pb	N	N	N	N	N	N	N	N
Pd	N	N	N	N	N	N	N	N
Pt	N	N	N	N	N	N	N	N
Sb	N	N	N	N	N	N	N	N
Sc	N	N	N	N	N	N	N	N
Se	-	-	-	-	-	-	-	-
Sn	N	N	N	N	N	N	N	N
Sr	N	N	N	N	N	N	N	N
Ta	N	N	N	N	N	N	N	N
Te	N	N	N	N	N	N	N	N
V	300	200	200	150	200	200	300	100
W	L	L	L	L	L	L	L	L
Y	L	L	L	L	L	L	L	L
Zn	N	N	L	N	N	N	N	N
Zr	200	500	500	1000	L	200	200	L
Th								
U								

Map No.	460	461	462	463	464	465	466	467
Sample No.	BC1618	BC1620	BC1621	BC1623	BC1625	BC1626	UP34	UP35
Fe%	10	7.5	10	3.5	3.5	5		
Mg%	3	3.5	1	1	1	1		
Ca%	3	7.5	3.5	3.5	3.5	5		
Na%	G	G	G	G	1.6	G		
K%	—	—	—	—	—	—		
Ti%	0.7	G	1.0	G	0.5	0.5		
Mn	1000	1000	1500	1000	1000	1000		
Ag	3	2	2	1	2	2		
As	N	N	N	N	N	N		
Au	N	N	N	N	N	N		
B	500	200	500	100	50	100		
Ba	L	L	L	N	N	N		
Be	2	L	5	1.5	L	L		
Bi	N	50	20	20	20	20		
Cd	N	N	N	N	N	N		
Co	N	N	N	N	N	N		
Cr	500	1000	1000	1000	1000	500		
Cu	200	2	5	1	1	5		
Ga	2	1.5	2	1	L	0.5		
La	N	N	N	N	N	N		
Li	N	N	N	N	N	N		
Mo	N	N	N	N	N	N		
Nb	N	N	N	N	N	N		
Ni	500	100	200	350	500	200		
P	L	L	L	L	L	L		
Pb	200	L	L	50	50	L		
Pd	N	N	N	N	N	N		
Pt	N	N	N	N	N	N		
Sb	N	N	N	N	N	N		
Sc	N	N	N	N	N	N		
Se	—	—	—	—	—	—		
Sn	N	N	N	N	N	N		
Sr	N	N	N	N	N	N		
Ta	N	N	N	N	N	N		
Te	N	N	N	N	N	N		
V	150	200	500	200	100	200		
W	L	L	N	N	L	N		
Y	N	N	N	N	N	N		
Zn	N	L	L	L	N	N		
Zr	N	G	1000	1000	1000	500		
Th								
U								

Map No.	463	487	488	489	490	491	492	493
Sample No.	UP33	UP8	UP11	UP10	UP305	UP307	UP309	C: 253
Fe%								5
Mg%								3
Ca%								7
Na%								G
K%								-
Ti%								G
Mn								3000
Ag								L
As								N
Au								N
B								100
Ba								N
Be								3
Bi								N
Cd								N
Co								N
Cr								150
Cu								5
Ga								1
La								N
Li								N
Mo								N
Nb								N
Ni								70
P								N
Pb								N
Pd								N
Pt								N
Sb								N
Sc								N
Se								—
Sn								N
Sr								N
Ta								N
Te								N
V								200
W								N
Y								N
Zn								N
Zr								N
Th								
U								

Map No.	494	495	496	497	498	499	500	501
Sample No.	C:254	C:210	C:222	C:230	C:252	C:250	C:130	C:241
Fe%	5	5	7	5	5	7		5
Mg%	3	5	5	3	5	5		3
Ca%	5	10	5	5	5	7		5
Na%	G	G	G	G	G	G		G
K%	—	—	—	—	—	—		—
Ti%	0.7	G	G	1	1	G		G
Mn	5000	5000	5000	2000	3000	5000		5000
Ag	L	2	L	L	L	2		L
As	N	N	N	N	N	N		N
Au	N	N	N	N	N	N		N
B	100	100	150	100	70	150		70
Ba	N	N	N	N	N	N		N
Be	2	2	L	L	L	5		L
Bi	N	L	L	L	N	N		L
Cd	N	N	N	N	N	N		N
Co	N	N	N	N	N	N		N
Cr	300	2000	2000	2000	200	2000		2000
Cu	30	30	100	50	100	50		100
Ga	2	5	2	0.5	1	5		1
La	N	N	N	N	N	N		N
Li	N	N	N	N	N	N		N
Mo	N	N	N	N	N	N		N
Nb	N	N	N	N	N	N		N
Ni	300	300	500	500	300	300		300
P	N	L	L	L	N	L		L
Pb	N	N	N	N	N	100		N
Pd	N	N	N	N	N	N		N
Pt	N	N	N	N	N	N		N
Sb	N	N	N	N	N	N		N
Sc	N	N	N	N	N	N		N
Se	—	—	—	—	—	—		—
Sn	N	N	N	N	N	N		70
Sr	N	N	N	N	N	N		N
Ta	N	N	N	N	N	N		N
Te	N	N	N	N	N	N		N
V	200	200	500	500	200	700		500
W	N	L	N	N	N	N		N
Y	N	N	N	N	N	N		N
Zn	N	N	N	N	N	700		N
Zr	N	L	N	L	N	N		N
Th								
U								

Map No.	502	503	504	505	506	507	508	509
Sample No.	C-242	VOID	C-257	C-026	C-117	C-012	C-015	C-249
Fe%	5		10					7
Mg%	5		3					3
Ca%	10		7					5
Na%	G		G					G
K%	—		—					—
Ti%	G		1					G
Mn	3000		G					3000
Ag	L		2					2
As	N		N					N
Au	N		N					N
B	50		20					70
Ba	L		N					N
Be	5		10					L
Bi	L		N					L
Cd	N		N					N
Co	N		N					N
Cr	2000		500					2000
Cu	30		50					150
Ga	5		5					2
La	N		N					N
Li	N		N					N
Mo	N		N					N
Nb	N		N					N
Ni	300		300					300
P	L		1500					L
Pb	N		N					N
Pd	N		N					N
Pt	N		N					N
Sb	N		N					N
Sc	N		N					N
Se	—		—					—
Sn	N		N					N
Sr	N		N					N
Ta	N		N					N
Te	N		N					N
V	700		150					700
W	N		N					N
Y	N		N					N
Zn	N		N					N
Zr	L		L					N
Th								
U								

Map No.	510	511	512	513	514	515	516	517
Sample No.	C:246	C:269	C:266	C:270	C:271	C:02	C:216	C:214
Fe%	7	10	10	10	10		10	10
Mg%	3	3	5	3	3		3	7
Ca%	5	5	2	2	7		2	5
Na%	G	G	G	G	G		G	G
K%	—	—	—	—	—		—	—
Ti%	1	1	G	1	1		0.7	G
Mn	3000	3000	3000	3000	3000		5000	5000
Ag	L	2	2	2	2		L	2
As	N	N	N	N	N		N	N
Au	N	N	N	N	N		N	N
B	70	100	200	100	100		200	300
Ba	N	N	N	N	N		N	N
Be	L	2	L	L	L		L	L
Bi	L	L	L	L	L		L	L
Cd	N	N	N	N	N		N	N
Co	N	L	L	L	L		L	L
Cr	2000	2000	1500	1000	2000		2000	2000
Cu	100	70	50	100	100		70	100
Ga	1.5	1	2	2	2		1	5
La	N	N	N	N	N		N	N
Li	N	N	N	N	N		N	N
Mo	N	N	N	N	N		N	N
Nb	N	N	N	N	N		N	N
Ni	500	300	1000	500	700		500	500
P	L	L	1500	L	N		500	1000
Pb	N	N	N	N	N		N	N
Pd	N	N	N	N	N		N	N
Pt	N	N	N	N	N		N	N
Sb	N	N	N	N	N		N	N
Sc	N	N	N	N	N		N	N
Se	—	—	—	—	—		—	—
Sn	N	N	N	N	N		N	N
Sr	N	N	N	N	N		N	N
Ta	N	N	N	N	N		N	N
Te	N	N	N	N	N		N	N
V	500	500	200	200	500		150	700
W	N	N	N	N	N		L	L
Y	N	N	N	N	N		N	L
Zn	N	N	N	N	N		N	N
Zr	L	L	L	N	N		L	L
Th								
U								

Map No.	518	519	520	521	522	523	524	525
Sample No.	C. 218	Ci 232	Ci 236	C. 245	C. 124	Ci 122	Ci 262	Ci 260
Fe%	2	10	2	5			5	5
Mg%	3	5	3	3			3	3
Ca%	2	5	3	1			1.5	1
Na%	G	G	G	G			G	G
K%	—	—	—	—			—	—
Ti%	1	G	1	1			1	0.1
Mn	2000	3000	2000	2000			3000	2000
Ag	L	2	L	L			2	L
As	N	N	N	N			N	N
Au	N	N	N	N			N	N
B	100	200	200	200			100	200
Ba	N	N	N	N			N	N
Be	L	2	L	L			L	2
Bi	L	L	L	L			L	L
Cd	N	N	N	N			N	N
Co	N	N	N	N			N	N
Cr	500	2000	1000	2000			1000	1000
Cu	50	150	70	50			50	50
Ga	5	5	2	0.5			L	0.5
La	N	N	N	N			N	N
Li	N	N	N	N			N	N
Mo	N	N	N	N			N	N
Nb	N	N	N	N			N	N
Ni	100	500	300	500			300	500
P	L	L	L	L			N	N
Pb	N	L	L	L			N	N
Pd	N	N	N	N			N	N
Pt	N	N	N	N			N	N
Sb	N	N	N	N			N	N
Sc	N	N	N	N			N	N
Se	—	—	—	—			—	—
Sn	N	N	N	N			N	N
Sr	N	N	N	N			N	N
Ta	N	N	N	N			N	N
Te	N	N	N	N			N	N
V	500	700	200	150			150	100
W	N	N	N	N			N	N
Y	N	N	N	N			N	N
Zn	N	N	N	N			N	N
Zr	N	L	N	L			L	L
Th								
U								

Map No.	526	527	528	529	530	531		
Sample No.	C.126	KD1636	KD1635	KD1632	KD1629	KD1627		
Fe%		2	10	0.5	2	1		
Mg%		5	1	2	1	3.5		
Ca%		10	3.5	5	3.5	7.5		
Na%		G	1.6	1.6	1.6	G		
K%		—	—	—	—	—		
Ti%		G	0.05	0.1	0.1	1.0		
Mn		1500	200	500	500	3500		
Ag		2	L	2	1	1.5		
As		N	N	N	N	N		
Au		N	N	N	N	N		
B		150	35	150	75	100		
Ba		N	N	N	N	N		
Be		2	1	2	1	1		
Bi		L	N	N	N	L		
Cd		N	N	N	N	N		
Co		L	N	N	N	50		
Cr		500	20	50	20	1000		
Cu		150	15	50	20	100		
Ga		1.5	L	L	L	1.5		
La		N	N	N	N	N		
Li		N	N	N	N	N		
Mo		N	N	N	N	N		
Nb		N	N	N	N	N		
Ni		200	10	50	50	150		
P		1000	1000	1000	1000	1000		
Pb		N	N	N	N	N		
Pd		N	N	N	N	N		
Pt		N	N	N	N	N		
Sb		N	N	N	N	N		
Sc		N	N	N	N	N		
Se		—	—	—	—	—		
Sn		N	N	N	N	N		
Sr		N	N	N	N	N		
Ta		N	N	N	N	N		
Te		N	N	N	N	N		
V		350	35	35	L	200		
W		N	N	N	N	L		
Y		N	N	N	N	N		
Zn		N	N	N	N	N		
Zr		500	L	N	N	500		
Th								
U								