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GEOLOGICAL SURVEY

Geochemical Studies of the Belmont Silver District, Nye County, Nevada

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ABSTRACT

The Belmont district was an important producer of silver from 1865 to 1885. The vein-like ores are rich in base-metal sulfides and occur in Paleozoic metasedimentary rocks adjacent to a Cretaceous granite pluton. Exposures in mine workings show that many of the veins are parallel to bedding and that low angle faults control mineralization at several places in the district; the bedding plane veins may be related to the low angle or thrust faults. Richest ores were near-surface enrichments of cerargyrite (AgCl), but the primary assemblage was sulfide and sulfosalt minerals rich in Ag-Cu-Pb-As-Sb. Content of Zn and Au generally is low, and the "granitic" suite of elements B-Nb-Sn-W is absent, although there is some enrichment in Mo. The ores are post-metamorphic but probably formed during the late stages of Cretaceous plutonism, after thrust faults and bedding plane faults opened or reopened, perhaps during cooling.

INTRODUCTION

The Belmont district, located in Nye County about 80 km northeast of Tonopah, was an important producer of silver between 1865 and 1885. Records of production are incomplete and range from an estimated $3,793,000 (Kral, 1951) to $15,000,000 (Hughes, 1917). The camp has been dormant since 1885 with only a brief period of activity from 1915 to 1918. Very little work has been done on the geology of this once prosperous silver camp. There are numerous prospect pits and mine openings in the district, and although none are safe for underground study they do afford some relatively good glimpses of the rocks and structures that contain silver veins.

This study was undertaken in 1982 as part of the Conterminous United States Mineral Appraisal Program (CUSMAP) in the Tonopah 1° x 2° quadrangle to provide modern geochemical description and interpretation of this important historic district. This study was designed to provide standards for assessment of precious metal resource potential in other parts of the Tonopah quadrangle, and also for use as a guide for mineral exploration in the region. Fifty samples were submitted for chemical analysis of 34 elements, and a few samples were examined with a petrographic microscope. Similar studies are underway on about a dozen other precious metal districts in the Tonopah quadrangle.

MINING HISTORY OF BELMONT DISTRICT

The history of this important district is obscure because it is recorded in only a few old references (Hague, 1870; Hughes, 1917). Mining and geology at Belmont are reviewed by Kleinhampl and Ziony (1984). The ghost town of Belmont and its scattered mine workings as seen today do not convey a proper image of a town that once had a population of 10,000 and produced millions of dollars in silver. The ruins of the two large mills and the mostly intact courthouse, all made out of locally made brick that also was exported to other old mining camps such as Tybo, bear silent testimony to former wealth and productivity. The first claim at Belmont was located in 1864, and the district was organized as the Philadelphia mining district in 1865. Belmont became the Nye County seat in 1867. Most of the production came in the early years, and in 1885 the combination of declining silver prices and increased costs of pumping water forced closure of the mines. Many of the workings were relatively shallow, above a water table encountered at depths of about 20 to 40 m, in zones of "chloride" ores of cerargyrite (AgCl). Two main shafts, the Belmont and the Highbridge, reached depths of about 180 and 110 m, respectively. Ore mined prior to 1885 had an average value of about $80 per ton and ranged in value from about $25 to $250 per ton, or an estimated minimum silver content of about 25 oz/ton (Hughes, 1917). The mills used about 10 to 40 stamps weighing about 600 to 800 pounds each to crush ore; capacity of each stamp was one to two tons per day. The crushed ore was roasted for six to seven hours in charges of 1,000 lbs. using "salt" from Silver Peak, about 110 km to the southwest. The cost of milling was about $10 per ton of ore.

In 1915 electric power was brought in from Manhattan, 21 km to the southwest, the mines dewatered, and an effort made to reactivate the mines. Sampling of the underground workings from 1916 to 1918 (Hughes, 1917; Kral, 1951) revealed some rich sulfide zones on the 300-foot level of the Belmont mine but insufficient silver was located to support mining. Apparently no mining has been done since 1885, although some dumps have been reprocessed.

GEOLOGY

No systematic geologic study of the Belmont district has been published. Brief descriptions of some aspects of district and mine geology were given by Hague (1870) and by Hughes (1917), and Kleinhampl and Ziony (1984) compiled a useful geologic map of the district (fig. 1). Two chief units occur in the district: Paleozoic sedimentary and metasedimentary rocks, and Cretaceous granite and associated pegmatite-aplite dikes. The Paleozoic rocks consist of quartzite, phyllite, slate, and impure limestone. Based on lithologic features and presence of graptolites, Kleinhampl and Ziony suggested the sedimentary rocks are probably equivalent to the Ordovician Palmetto Formation, as in the Manhattan district (Ferguson, 1924). The sedimentary rocks are internally deformed but not appreciably folded, and are cut by north-trending low-angle faults and younger east-trending cross-faults that offset the low-angle faults. The granite, with distinctive 2-4 cm megacrysts of orthoclase, is part of a pluton that extends northwestward about 20 km to near Round Mountain. Tertiary volcanic rocks occur less than 2 km north of the area studied.

Observations made in the early operating mines by S. F. Emmons in 1868 (reported in Hague, 1870) are fairly specific and possibly the most reliable geologic information available, and thus will be summarized briefly. Two main vein systems ("ledges") were mined in the 1860's by a series of workings. The eastern vein, called the Highbridge and Transylvania ledges (fig. 1), was in slate and limestone, and generally dipped east at about 40 to 50 degrees. About 300 m to the west was a vein in quartzite called the Arizona-El Dorado. The latter vein runs along the crest of Highbridge Hill about 175 m east of the granite contact. Several inclines on the vein expose meter-thick dikes of aplite (Nash, unpub. data, 1982). Emmons observed in many places that the veins are conformable with bedding, as can be seen today in many inclines. Dip of sediments and veins generally is about 40 degrees east, but locally ranges to 60 to 90 degrees. A cross fault with displacement of about 50 m appears to offset the southern (Transylvania) end of the Highbridge vein (fig. 1), leading Emmons to suggest that the Highbridge and Transylvania veins were originally continuous. The veins mined were generally 1 to 4 m wide, but

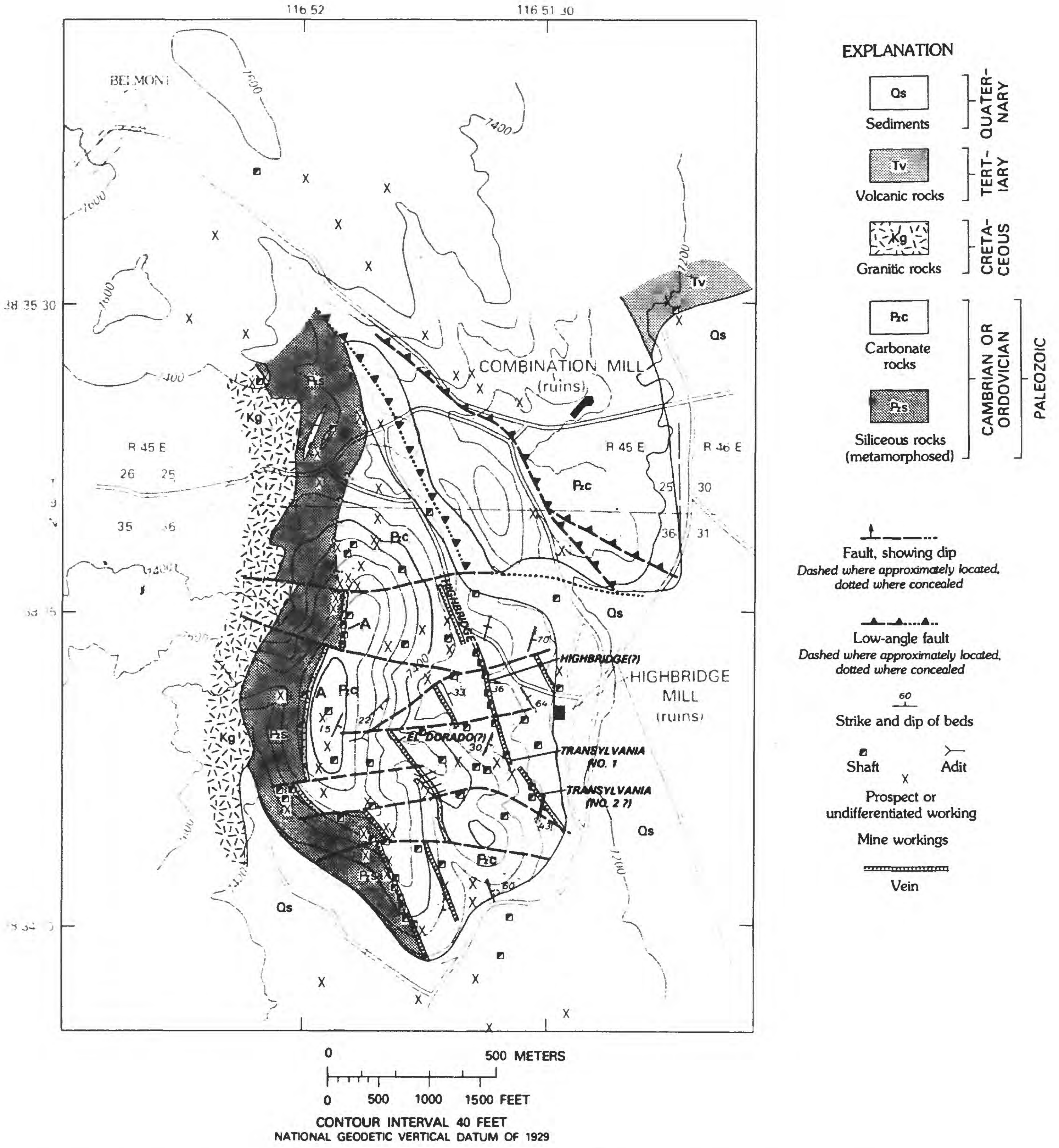

Figure 1.--Sketch map of geology in main part of Belmont district. Geology from J. F. Powers and W. L. O'Toole fitted to topography by F. J. Kleinhampl. Topographic base from U.S. Geological Survey Belmont East 7 1/2-minute quadrangle, 1971, scale 1:24,000 (Kleinhampl and Ziony, 1984, p. 61).

at one locality a vein was 10 m wide. The veins generally consisted of massive white quartz with "bunches or disseminated particles" of silver minerals. The pay zone tended to be along the hanging wall of the vein. Emmons reported that silver occurred as "chloride" ore (presumably above the watertable) and as "stetefieldtite", reported to be a silver-lead-copper-iron sulfantimonide. This mineral is not an accepted variety today, which suggests that the material reported by Emmons was a mixture of minerals such as pyrargyrite and tetrahedrite. Some rich dump samples show a gray mineral with adjacent green stains suggestive of copper; the mineral resembles tetrahedrite, but no confirming studies have been made.

The brief observations by Nash gave him the impression that the stratigraphic sequence was a conformable sequence with facies changes from a lower fine-grained sandstone (now quartzite) in the west part of Highbridge Hill to silt or mudstone (now phyllite and slate) and upper impure limestone on the eastern slope of the hill. Sheared and locally folded rocks are exposed at places such as the Highbridge trench (locality 315, fig. 2), which could reflect low angle faults or bedding-plane thrusts. Such faults are well displayed in pits and inclines at the south end of the district at sites 331-336 (fig. 2). In that area the fault and shear planes dip 15 to 45 degrees east and a gauge zone 1 to 2 m thick is developed. The granite contact is about 10-15 m below (vertically) this low angle fault or thrust. In the vicinity of locality 336 (fig. 2) quartzite is thoroughly fractured and cut by numerous small quartz veins. The dump at locality 339 contains abundant breccia of angular white limestone and quartzite fragments; the small shaft excavated at that locality reveals a fault-breccia zone about 0.5 m wide with strike N 45 W and dip 80 degrees southwest, an unusual attitude for the district. The origin of this breccia is not clear, nor is its relation to the thrust system evident. The angular texture of the breccia, mixture of lithologies that are not present in the adjacent wallrocks, and the lack of fault gouge suggest this could be a pebble dike emplaced explosively.

The geometric relation of ore to granite is uncertain to us, although early workers seemed to imply that ore, like metamorphism, was related to the granite underlying the west side of the district. A few prospects occur in granite, and some fairly large workings (localities 692, 698, 699, fig. 2) are in and along aplite dikes. Geochemistry of the granite-associated deposits will be discussed in the next section. Low-angle or thrust faults with abundant shear, and the open breccia at site 339, are clearly younger than contact metamorphism. These structures may have formed by readjustments following emplacement of the pluton.

GEOCHEMICAL STUDIES

Sampling

All samples for this study are rock samples collected from natural exposures, from mine exposures such as trenches or portals, or from mine dumps. All samples are composites of many small chips or chunks and have a total weight of about 1 kg. Many samples were selected for a particular aspect, such as sulfide mineral or iron oxide content, and were known to be anomalous in metal content. This sampling technique was designed to emphasize ore-associated elements. No effort was made to collect unaltered or unmineralized samples for use in determining background. The intent in

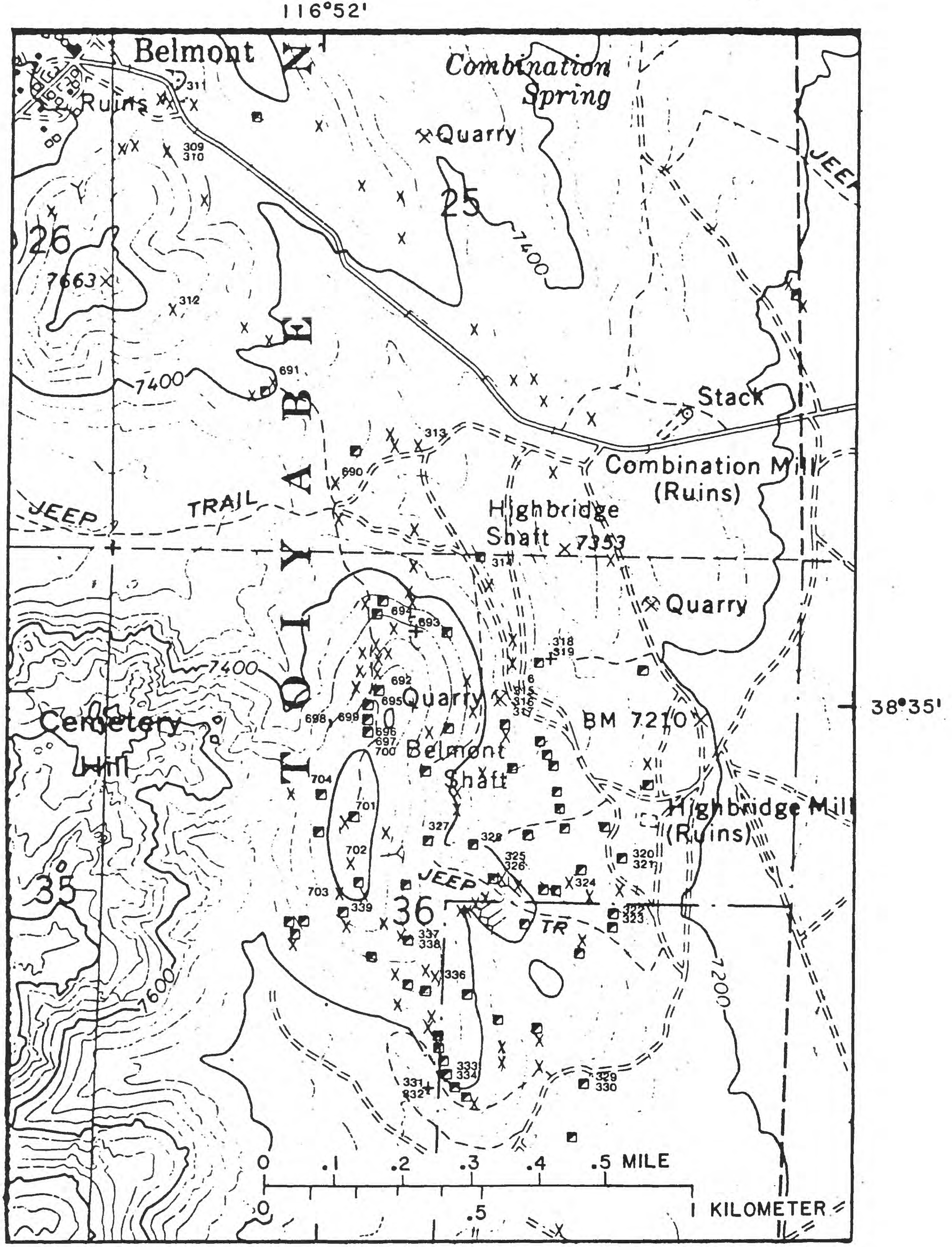

Figure 2.--Localities of rock samples from Belmont district.

sampling, and in the chemistry laboratory, was to utilize rapid, cost-effective methods that could be used in Government resource assessment programs or in industry exploration. Sampling was done on two visits in May and September 1982. Geologic notes were taken at all sites and a rough geologic sketch made as sampling progressed. In our opinion, key geologic features can be observed most rapidly and clearly by focusing on exposures in old prospect pits and mine openings. These rapid studies are not as thorough as systematic mapping studies, but can yield essential information, if little time is available.

Sample preparation and chemical analysis

All samples were crushed and then pulverized between ceramic plates to attain a grain size smaller than 100 mesh (0.15 mm). All samples were analyzed for 31 elements using a semiquantitative, direct-current arc emission spectrographic method (Grimes and Marranzino, 1968). Limits of determination are summarized in Table 1. Spectrographic results are obtained by visual comparison of spectra derived from the sample against spectra obtained from standards made of pure oxides and carbonates. Standard concentrations are geometrically spaced over any given order of magnitude of concentrations as follows: 100, 50, 20, 10, and so forth. Samples whose concentrations are estimated to fall between those values are assigned values of 70, 30, 15, and so forth. The precision of the method is approximately plus or minus one reporting interval at the 83 percent confidence level and plus or minus two reporting intervals at the 96 percent confidence level (Motooka and Grimes, 1976). Values determined for the major elements (iron, magnesium, calcium, and titanium) are reported in weight percent of the element; all other elements are reported in parts per million (micrograms per gram) (Table 1).

All samples were analyzed by wet chemical procedures for determination of elements of special interest or which have high limits of determination by emission spectrography (such as As, Sb, Zn, and Hg). The wet chemical methods are summarized in Table 2.

Upon completion of the analytical work, results were entered into a computer-based system called RASS (Rock Analysis Storage System) that contains both the analytical data and descriptive geologic and geographic information for each sample. Parts of the RASS data were retrieved under a slightly different format and manipulated using routines of the STATPAC system (VanTrump and Miesch, 1976).

Results

Chemical data for 30 elements in 50 rock samples collected for this study are in Table 3. A summary of basic statistics is in Table 4. Some elements such as Au, Sn, Th, and W were looked for in the emission spectrographic analyses but not detected in any samples. Data for Bi, Nb, and W are presented in the explanation for Table 3. Sample localities are shown on figure 2.

Discussion

The suite of elements Ag, As, Cu, Mo, Pb, and Sb is enriched in the Belmont ores and mineralized rocks. Some metallic "ore" elements are present in notably low concentrations: Au, Co, Cr, Ni, and Zn. Tungsten, Sn, and Bi were below detection levels in all samples, but are present in amounts over 100 ppm in similar dump and prospect samples collected at many sites elsewhere in the Tonopah Quadrangle. The "gangue" elements Mn, B, Ba, and Sr are enriched to moderate levels at Belmont, but are not considered to be diagnostic as they are in some other districts in the Tonopah quadrangle.

Silver is associated with several base-metals in the Belmont samples. Positive correlation coefficients for Ag include: Sb, 0.85; Cu, 0.83; Pb, 0.83; Zn, 0.66; Cd, 0.48; Mo, 0.45; As, 0.27; Sr, 0.17; and Te, 0.12. Silver is not associated with Au or Tl (r=-0.05 and -0.30, respectively). Some of the correlations are not as strong as the high coefficients would suggest, however. Scatterplots of Ag with the other metals confirm the low correlation of Ag with Au, As, and Te, and show that for Ag:Cu and Ag:Sb a few samples rich in Cu or Sb dominate the statistics.

The elements Ag-Cu-Pb-Sb probably occur together in a complex mineral such as a sulfosalt, or in a consistently recurring combination of minerals. The anion is presumably Sb, which correlates highly with Ag-Cu-Pb, or possibly S (not determined). Some of the erratic multi-element behavior may be caused by oxidation, near-surface leaching, or formation of secondary phases such as cerargyrite (AgCl).

The following brief comments are offered on some elements of interest.

Tin--Not detected at a level of 10 ppm in any samples, a bit surprising considering the presence of the granite pluton, and also the high Sn values in some other silver camps such as Tybo and Morey (Nash, unpub. data, 1984). Elsewhere in the southern Toquima Range granitic rocks only rarely contain more than 10 ppm Sn (D. R. Shawe, written commun., 1985), thus Belmont fits the regional pattern.

Tungsten--Only one sample (TND330) contained detectable W at the 50 ppm level; sample 330 consists of random dump rocks and the reasons for the 50 ppm W in that sample are not evident. We had suspected that more samples would be enriched in W because the granite pluton generated huebnerite veins near Round Mountain and some small quartz-huebnerite veins are known in granite south of Belmont (Kleinhampl and Ziony, 1984).

Bismuth--Only four samples contained detectable Bi at the 2 ppm level. The four samples that contain 2 to 44 ppm contain 30 to 500 ppm Ag, which is not exceptional in this dataset, and in all samples Ag is far more abundant than Bi, thus an Ag-Bi mineral such as matildite ($AgBiS2$) cannot explain much of the silver residence. Compared with other districts in the region, the Belmont samples contain somewhat more Bi than most precious metal deposits, but less than base-metal skarn deposits.

Arsenic and antimony--Antimony correlates highly with Ag, but is generally less abundant than Ag, notably in Ag-rich samples, and therefore cannot explain all of the mineral residence of Ag. Arsenic is more abundant than Sb in all but a few samples but the As/Sb ratio approaches 1 in the central part of the district in the vicinity of sites 316-320-325. This zone of increased Sb, relative to As, is also one of greater carbonate content in host rocks. Arsenic has a low association with Ag, even though it is more abundant than Sb in the district overall. The apparent zonation of Sb, or decrease of As/Sb to near 1, seems to correlate with the spatial distribution of highest Ag values in the Belmont district, but more data are needed to properly establish the validity of this relationship.

Vanadium--Many samples contain more than 500 ppm V, some of which are rich in micas, but many V-rich samples are predominantly vein quartz. In one R-mode factor analysis the variance of V was split equally between the factor carrying rock forming elements, such as Ti, and the factor carrying ore elements such as Ag, Cu, and Mo. This relationship is not expected and may indicate that V is partly mobile and enriched in some mineralized sulfidic rocks.

Tellurium--Content of Te is erratic, weakly correlated with Ag in the total dataset, and ranges to as much as 100 ppm in a sample of vein quartz with notable iron oxide content (3 percent Fe). A subset of 17 samples from the Highbridge vein produced an Ag-Te correlation of 0.87, suggesting in some environments Te is strongly associated with Ag. Another observation is that the samples with more than 10 ppm Te all have notable iron oxide content. These relations suggest that Te is enriched in samples that had high content of primary sulfide minerals, which is a logical primary residence for Te, and subsequently retained in iron oxides. Thus Te may be a better guide to primary sulfides than to Ag.

Thallium--Thallium displays no simple pattern or relation to Ag. Most of the high values are in granitic rocks or phyllites, suggesting that Tl is associated with potassic rocks, consistent with the common observation of Tl substituting for K in crystal lattices. Such residence of Tl in rock-forming minerals is not like the anomalous Tl in epithermal ores as at Carlin where Tl occurs as epigenetic minerals.

Metal associations in the granite and thrust environments--The geology of the district, previously outlined, indicates that the granite intrusion and the low angle thrust (or thrusts) may have played a role in the genesis of the silver ores. As a simple test of these possibilities, subsets of samples thought to best describe the "granite environment" (six samples) or the "thrust fault environment" (14 samples) were defined for comparison with the most typical environment described by 17 samples from the Highbridge vein. The "granite" suite is samples from prospects within the granite or near aplite dikes. The "thrust" suite is samples from the zone described earlier from site 331 to site 701. For these subsets we examined statistics for means, standard deviations, and correlation coefficients. As a generalization, these simple tests suggest that the samples from the thrust and from the granite environments contain lower concentrations of the ore suite (Ag, Cu, Mo,Pb, As, Sb) but the abundances overlap those of the Highbridge set and have similar metal ratios and correlations. This simple test with a small number of samples suggests that the three environments are more similar than dissimilar and do not provide chemical evidence for distinct mineralizing processes in time or space. Notably absent in the granite subset are any unusual values of B, Mo, Sn, or W, compared with other sample types.

CONCLUSIONS

The limited geochemical and geologic data available do not clearly define a genetic model for the Belmont district but are most consistent with ore formation in the late stages of the Cretaceous plutonism, following contact metamorphism by the adjacent granite body. Thrust faults and bedding plane faults seem to have opened or reopened after intrusion, possibly during cooling, and the ore fluids favored those structures for vein formation. The metallic elements were deposited after the massive quartz veins, suggesting they may have been derived from a hydrothermal system circulating around the cooling pluton or perhaps a late-stage pluton that is not exposed. Detailed studies elsewhere in the southern Toquima Range by Shawe (1985) document complex reactivation of structures, multiple periods of plutonism, and probable remobilization of metals in multiple stages of mineralization.

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Table 1.--Limits of determination for the spectrographic analysis of rocks

Elements	Lower determination limit	Upper determination limit
	Percent	
Iron (Fe)	0.05	20
Magnesium (Mg)	.02	10
Calcium (Ca)	.05	20
Titanium (Ti)	.002	1
	Parts per million	
Manganese (Mn)	10	5,000
Silver (Ag)	0.5	5,000
Arsenic (As)	200	10,000
Gold (Au)	10	500
Boron (B)	10	2,000
Barium (Ba)	20	5,000
Beryllium (Be)	1	1,000
Bismuth (Bi)	10	1,000
Cadmium (Cd)	20	500
Cobalt (Co)	5	2,000
Chromium (Cr)	10	5,000
Copper (Cu)	5	20,000
Lanthanum (La)	20	1,000
Molybdenum (Mo)	5	2,000
Niobium (Nb)	20	2,000
Nickel (Ni)	5	5,000
Lead (Pb)	10	20,000
Antimony (Sb)	100	10,000
Scandium (Sc)	5	100
Tin (Sn)	10	1,000
Strontium (Sr)	100	5,000
Vanadium (V)	10	10,000
Tungsten (W)	50	10,000
Yttrium (Y)	10	2,000
Zinc (Zn)	200	10,000
Zirconium (Zr)	10	1,000
Thorium (Th)	100	2,000

Table 2.--Description of chemical methods used for analysis of rock samples from the Belmont district, Nevada.

Element determined	Analytical method	Determination limit (ppm)	Reference
Au	Atomic absorption	0.05	Thompson and others, 1968
Hg	Instrumental	0.02	Modification of Vaughn and McCarthy, 1964
As	Atomic absorption	5.0	Modification of Viets, 1978
Bi	--do--	1.0	--do--
Cd	--do--	0.1	--do--
Sb	--do--	2.0	--do--
Zn	--do--	5.0	--do--
Te	--do--	0.2	Modification of Hubert and Lakin, 1972
Tl	--do--	0.2	--do--

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[1] The determination limit is dependent upon sample weight. Stated limits imply use of optimum sample weight; higher limits of determination result from use of smaller sample weights.

EXPLANATORY NOTES FOR TABLE 3

Sample numbers: the third character in the eight-digit numbers indicates sample source; R, outcropping rock, often from a mine working; D, dump sample. The second character sampler; N, J. T. Nash. Letters A, B, etc. indicate multiple samples at the same locality.

Chemical data not reported:

Au (by emission spectrography)-- none detetected at 10 ppm;

Bi (by emission spectrography)-- one detected at 10 ppm; sample 5A, L(10).

Nb (by emission spectrography)-- six detected at 20 ppm; sample 4, L(20); 6, 20; 328, L(20); 330, L(20); 697, L(20); 699, 20 ppm.

Sn (by emission spectrography)--none detected at 10 ppm.

W (by emission spectrography)--3 detected at 50 ppm; sample 5A, 50; 5B, L(50); 330, 50 ppm.

Th (by emission spectrography)--none detected at 100 ppm.

TABLE 3.--ANALYTICAL DATA FOR ROCK SAMPLES FROM THE BELMONT DISTRICT, NYE COUNTY, NEVADA

[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown.]

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	B-ppm s	Ba-ppm s	Be-ppm s
TND00309	38 35 40	116 52 21	.70	.05	.10	.020	500	50.0	1,000	15	150	2.0
TNR00310	38 35 40	116 52 21	1.50	.30	.50	.200	300	.7	N	70	700	3.0
TNR00311	38 35 46	116 52 20	5.00	3.00	2.00	.300	700	.5	N	100	200	2.0
TND00312	38 35 28	116 52 20	.70	.05	<.05	.020	50	200.0	500	30	100	2.0
TND00313	38 35 18	116 51 56	2.00	.30	.10	.150	1,000	3.0	N	70	700	10.0
TND00314	38 35 10	116 51 50	1.00	.20	.20	.100	300	500.0	N	70	700	3.0
TNR00315	38 34 59	116 51 48	3.00	.50	.10	.300	100	30.0	N	300	1,500	3.0
TNR00316	38 34 59	116 51 48	.30	.07	1.00	.030	100	70.0	N	30	150	1.0
TNR00317	38 34 59	116 51 48	.70	.05	.30	.030	70	2,000.0	N	30	300	1.5
TND00318	38 35 2	116 51 44	1.00	.05	.05	.020	20	5,000.0	500	30	100	1.5
TND00319	38 35 2	116 51 44	5.00	1.50	7.00	.200	1,000	20.0	N	300	2,000	10.0
TND00320	38 34 47	116 51 35	.70	.05	1.00	.020	150	150.0	N	20	150	2.0
TND00321	38 34 47	116 51 35	2.00	.70	3.00	.200	1,000	30.0	N	150	1,500	5.0
TND00322	38 34 43	116 51 36	.30	.02	.70	.030	50	300.0	200	15	70	N
TND00323	38 34 43	116 51 36	.50	.20	3.00	.150	150	7.0	N	70	500	<1.0
TND00324	38 34 45	116 51 39	1.00	.20	7.00	.100	200	200.0	N	30	300	1.5
TND00325	38 34 45	116 51 44	1.00	1.00	5.00	.150	500	30.0	N	50	1,000	1.5
TND00326	38 34 46	116 51 49	.70	.30	1.50	.020	1,500	3,000.0	N	20	100	2.0
TND00327	38 34 49	116 51 55	3.00	.50	.05	.300	200	15.0	N	500	500	5.0
TND00328	38 34 49	116 51 51	2.00	1.50	2.00	.300	1,000	5.0	N	700	1,500	5.0
TND00329	38 34 31	116 51 40	3.00	.05	.05	.020	15	7.0	300	10	70	<1.0
TND00330	38 34 31	116 51 40	3.00	.70	1.00	.500	100	3.0	<200	300	1,000	3.0
TND00331	38 34 31	116 51 54	2.00	.30	.07	.150	50	500.0	N	150	300	3.0
TND00332	38 34 31	116 51 54	3.00	1.00	5.00	.300	300	100.0	N	300	2,000	7.0
TNR00333	38 34 32	116 51 53	1.00	.10	.50	.070	500	3.0	N	20	300	1.5
TNR00334	38 34 32	116 51 53	5.00	.50	1.50	.500	100	5.0	300	300	700	5.0
TNR00336	38 34 39	116 51 54	1.50	.50	1.00	.500	50	1.5	N	500	700	1.0
TND00337	38 34 41	116 51 57	3.00	.15	.05	.100	1,500	1.5	200	70	300	2.0
TNR00338	38 34 41	116 51 57	7.00	.50	.70	.300	150	1.5	700	150	700	3.0
TNR00339	38 34 44	116 52 3	1.00	.20	3.00	.100	300	300.0	N	70	1,000	1.5
TNR00340	38 33 45	116 52 12	.70	.20	.10	.100	50	500.0	<200	50	500	2.0
TND00690	38 35 15	116 52 4	.15	.03	.20	.020	30	5.0	N	20	200	5.0
TND00691	38 35 22	116 52 11	3.00	.05	<.05	.020	700	700.0	300	30	150	2.0
TND00692	38 35 0	116 52 0	2.00	.30	.20	.070	300	10.0	N	50	1,500	2.0
TNR00693	38 35 7	116 51 57	.15	.03	.05	.015	10	1.0	N	<10	50	N
TND00694	38 35 6	116 52 0	7.00	.50	.05	.200	1,500	3.0	500	70	1,500	5.0
TND00695	38 34 59	116 52 1	7.00	.20	.20	.100	700	10.0	200	70	500	10.0
TNR00696	38 34 57	116 52 1	3.00	.20	.07	.200	30	50.0	<200	70	300	5.0
TNR00697	38 34 57	116 52 1	5.00	.50	<.05	.300	20	2.0	<200	300	700	5.0
TND00698	38 34 58	116 52 1	.10	.05	<.05	.030	20	50.0	N	20	200	1.0
TND00699	38 34 58	116 52 1	.20	.50	<.05	.050	100	50.0	N	150	300	10.0
TND00700	38 34 56	116 52 1	.20	.10	<.05	.050	100	1,000.0	<200	30	150	1.0
TND00701	38 34 51	116 52 2	1.50	.50	.20	.100	50	2.0	<200	70	500	1.0
TND00702	38 34 47	116 52 3	5.00	.70	.05	.200	2,000	20.0	200	200	300	5.0
TNR00703	38 34 45	116 52 4	.10	.03	<.05	.015	50	300.0	N	15	100	N

TABLF 3.--ANALYTICAL DATA FOR ROCK SAMPLES FROM THE BELMONT DISTRICT, NYE COUNTY, NEVADA--Continued

Sample	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sr-ppm s	V-ppm s
TND00309	N	N	<10	100	20	N	10	200	N	N	<100	300
TNR00310	N	7	50	100	50	N	30	10	N	7	N	500
TNR00311	N	20	100	20	70	N	50	15	N	15	200	100
TND00312	N	5	<10	300	<20	30	5	1,500	300	N	N	300
TND00313	N	10	10	20	20	10	20	10	N	7	N	150
TND00314	<20	7	10	1,500	20	20	30	3,000	1,000	5	N	1,000
TNR00315	<20	15	70	1,000	30	N	70	700	<100	10	N	200
TNR00316	N	5	<10	200	20	N	10	300	<100	<5	N	200
TNR00317	N	5	10	2,000	20	100	10	2,000	1,000	N	N	500
TND00318	100	N	N	15,000	N	150	10	15,000	7,000	N	N	150
TND00319	20	15	70	100	30	50	100	100	N	10	100	500
TND00320	N	5	10	3,000	20	500	20	7,000	<100	N	N	100
TND00321	20	10	50	200	30	30	70	700	N	10	<100	500
TND00322	N	5	<10	2,000	20	300	5	7,000	200	N	<100	1,000
TND00323	N	5	20	50	30	N	15	70	N	5	100	150
TND00324	N	<5	10	200	20	N	10	700	200	5	150	100
TND00325	<20	10	30	500	20	7	15	700	<100	7	150	300
TND00326	20	7	<10	7,000	<20	1,000	7	15,000	500	<5	<100	50
TND00327	N	10	100	150	50	20	100	700	100	10	100	200
TND00328	30	10	100	50	50	15	30	150	N	10	100	150
TND00329	N	7	<10	30	<20	N	20	10	N	<5	N	30
TND00330	<20	10	100	100	50	30	100	50	N	10	<100	300
TND00331	20	7	50	10,000	20	500	100	5,000	700	5	N	700
TN000332	50	7	150	300	50	300	50	5,000	200	10	200	700
TNR00333	N	5	20	15	20	10	10	20	N	<5	<100	100
TNR00334	20	15	100	300	70	30	70	70	N	15	100	500
TNR00336	20	7	100	30	50	20	15	10	N	10	<100	500
TND00337	N	15	20	50	50	20	70	15	N	5	<100	200
TNR00338	30	10	100	70	50	30	70	50	N	10	<100	500
TNR00339	20	5	50	1,000	20	100	20	5,000	100	<5	<100	1,500
TNR00340	N	5	20	100	20	30	7	3,000	300	<5	<100	200
TND00690	N	N	<10	20	20	N	5	150	N	<5	<100	15
TND00691	N	5	<10	700	<20	70	5	3,000	700	<5	<100	30
TND00692	N	15	15	20	<20	N	50	50	N	<5	<100	100
TNR00693	N	N	10	5	<20	N	7	10	N	<5	<100	15
TND00694	N	15	100	100	20	10	50	30	N	10	<100	200
TND00695	N	N	30	100	20	10	50	100	N	7	<100	200
TNR00696	N	5	50	200	20	10	50	2,000	200	5	<100	200
TNR00697	N	7	150	70	50	20	70	20	N	10	<100	500
TND00698	N	N	15	50	<20	N	10	30	N	N	<100	50
TND00599	N	7	<10	20	N	N	10	50	N	5	N	30
TND00700	N	N	10	150	N	N	10	2,000	1,500	<5	<100	70
TND00701	N	N	20	50	N	10	50	15	N	5	<100	100
TND00702	N	20	100	150	50	30	100	70	N	10	100	500
TNR00703	N	N	10	200	N	N	10	2,000	100	<5	<100	200

TABLE 3.--ANALYTICAL DATA FOR ROCK SAMPLES FROM THE BELMONT DISTRICT, NYE COUNTY, NEVADA--Continued

Sample	Y-ppm s	Zn-ppm s	Zr-ppm s	Au-ppm aa	Te-ppm aa	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa	Tl-ppm aa
TND00309	10	N	N	.08	.6	--	370	1.7	N	52	.5
TNR00310	30	N	100	<.05	N	110	170	.8	N	5	.6
TNR00311	20	N	100	<.05	N	<5	185	.6	N	N	.5
TND00312	N	N	N	.08	12.5	--	360	2.4	N	--	.4
TND00313	10	N	50	<.05	N	150	40	.4	N	N	1.2
TND00314	50	1,000	70	<.05	1.9	130	--	19.0	N	--	.8
TNR00315	10	2,000	150	N	N	130	--	3.4	N	80	2.3
TNR00316	<10	1,000	20	<.05	.5	30	--	.7	N	50	<.2
TNR00317	10	1,500	20	N	1.4	110	--	24.0	N	--	.2
TND00318	N	5,000	20	.05	10.2	--	--	--	N	--	.4
TND00319	20	500	150	N	N	80	--	1.8	N	10	2.0
TND00320	N	3,000	15	<.05	6.7	85	--	30.0	44	76	2.0
TND00321	30	1,500	70	<.05	.5	120	--	16.0	2	40	2.5
TND00322	15	200	50	N	1.6	--	--	6.0	6	--	N
TND00323	10	<200	200	N	.2	30	370	1.6	N	6	.5
TND00324	10	200	100	<.05	2.3	35	--	2.6	N	--	.6
TND00325	10	300	200	N	.4	60	--	2.1	N	58	.6
TND00326	<10	3,000	20	.06	10.5	110	--	--	N	--	.2
TND00327	20	300	150	N	.4	80	--	1.7	N	--	2.8
TND00328	15	<200	150	N	N	60	260	--	N	10	2.6
TND00329	N	N	20	N	N	--	95	.5	N	6	.2
TND00330	20	200	200	<.05	N	130	--	.9	N	8	2.1
TND00331	15	5,000	70	<.05	1.8	130	--	--	N	--	1.1
TND00332	30	700	200	<.05	N	15	--	--	N	--	1.6
TNR00333	<10	N	50	N	N	N	65	.4	N	1	N
TNR00334	30	200	200	.06	N	--	--	--	N	27	2.1
TNR00336	20	N	200	<.05	N	45	70	--	N	N	1.0
TNR00337	20	200	100	N	N	--	--	3.0	N	3	.6
TNR00338	15	<200	150	<.05	N	--	240	--	N	14	1.2
TNR00339	10	2,000	50	<.05	1.6	60	--	--	N	--	.4
TNR00340	<10	N	50	.05	1.1	100	90	.9	2	--	.5
TND00690	<10	N	50	.07	N	10	5	.2	N	1	.9
TND00691	N	300	20	.45	100.0	--	--	.7	N	--	.2
TND00692	10	500	150	N	1.0	30	--	.6	N	5	.5
TNR00693	N	N	20	<.05	.2	20	5	.2	N	2	N
TND00694	15	N	50	.06	.2	--	155	.5	N	7	1.7
TND00695	20	300	20	.11	N	--	--	.8	N	12	1.0
TNR00696	10	700	100	.06	4.4	40	--	.4	N	--	1.3
TNR00697	20	200	200	<.05	N	50	--	1.2	N	8	3.2
TND00698	10	N	20	.06	N	10	110	.3	N	3	.2
TND00699	10	N	30	.06	N	N	35	.2	N	7	2.0
TND00700	<10	N	20	N	3.2	50	45	2.6	N	--	2.3
TND00701	10	N	70	.05	N	90	140	1.5	N	3	.7
TND00702	20	500	150	.05	N	--	--	6.4	N	12	2.7
TNR00703	N	N	<10	N	.4	N	135	.4	N	--	<.2

TABLE 3.--ANALYTICAL DATA FOR ROCK SAMPLES FROM THE BELMONT DISTRICT, NYE COUNTY, NEVADA--Continued

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	B-ppm s	Ba-ppm s	Be-ppm s
TND00704	38 34 52	116 52 5	3.00	.50	.20	.300	700	3.0	<200	300	1,000	5.0
NT4	38 34 48	116 51 39	5.00	3.00	5.00	.500	500	30.0	N	100	1,500	2.0
NT5A	38 34 45	116 51 42	3.00	.20	.50	.070	300	70.0	N	20	200	1.5
NT5B	38 34 46	116 51 42	2.00	.50	15.00	.100	700	50.0	N	30	500	2.0
NT6A	38 34 59	116 51 48	7.00	.70	.70	.200	700	20.0	500	150	1,500	5.0

TABLE 3.--ANALYTICAL DATA FOR ROCK SAMPLES FROM THE BELMONT DISTRICT, NYE COUNTY, NEVADA--Continued

Sample	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sr-ppm s	V-ppm s
TND00704	N	10	150	100	70	15	150	50	N	10	<100	1,000
NT4	20	15	100	150	70	20	50	200	<100	15	150	150
NT5A	N	7	30	200	20	5	10	1,500	300	5	100	200
NT5B	N	5	50	100	20	10	15	1,500	<100	5	500	200
NT6A	50	30	100	100	70	50	100	200	N	15	100	1,000

TABLE 3.--ANALYTICAL DATA FOR ROCK SAMPLES FROM THE BELMONT DISTRICT, NYE COUNTY, NEVADA--Continued

Sample	Y-ppm s	Zn-ppm s	Zr-ppm s	Au-ppm aa	Te-ppm aa	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa	Tl-ppm aa
TND00704	50	700	200	.15	N	N	--	2.9	N	9	3.2
NT4	30	500	150	--	--	--	--	--	--	--	--
NT5A	10	500	50	--	--	--	--	--	--	--	--
NT5B	30	N	100	--	--	--	--	--	--	--	--
NT6A	50	1,000	150	--	--	--	--	--	--	--	--

Table 4.--Statistical summary of analytical results for rock samples from Belmont, Nevada.

[Values for major elements in weight percent, all others in parts per million; abbreviations: B, not determined; L, less than limit of determination; G, greater than limit of determination; N, not detected; ***, not computed]

Column	Minimum	Maximum	Geometric mean	Geometric deviation	Valid	B	L	N	G
S-Fe%	.10	7.0	1.40	3.2	50	0	0	0	0
S-Mg%	.02	3.	.23	3.5	50	0	0	0	0
S-Ca%	.05	15.	.47	5.4	43	0	7	0	0
S-Ti%	.015	.5	.096	3.0	50	0	0	0	0
S-Mn	10.	2000.	185.	4.1	50	0	0	0	0
S-Ag	.5	5000.	28.	10.0	50	0	0	0	0
S-As	200.	1000.	362.	1.7	13	0	7	30	0
S-Au	***	***	***	***	0	0	0	50	0
S-B	10.	700.	70.	3.0	49	0	1	0	0
S-Ba	50.	2000.	402.	2.7	50	0	0	0	0
S-Be	1.	10.	2.8	2.0	45	0	2	3	0
S-Bi	***	***	***	***	0	0	1	49	0
S-Cd	20.	100.	27.	1.78	13	0	4	33	0
S-Co	5.	30.	8.5	1.63	40	0	1	9	0
S-Cr	10.	150.	39.	2.6	40	0	9	1	0
S-Cu	5.	15000.	161.	5.6	50	0	0	0	0
S-La	20.	70.	31.	1.7	38	0	7	5	0
S-Mo	5.	1000.	34.	3.8	35	0	0	15	0
S-Nb	20.	20.	20.	***	2	0	4	44	0
S-Ni	5.	150.	25.	2.8	50	0	0	0	0
S-Pb	10.	15000.	256.	9.6	50	0	0	0	0
S-Sb	100.	7000.	390.	3.1	17	0	6	27	0
S-Sc	5.	15.	8.	1.5	31	0	12	7	0
S-Sn	***	***	***	***	0	0	0	50	0
S-Sr	100.	500.	135.	1.6	14	0	24	12	0
S-V	15.	1500.	202.	3.0	50	0	0	0	0
S-W	50.	50.	50.	***	2	0	1	47	0
S-Y	10.	50.	17.	1.68	37	0	6	7	0
S-Zn	200.	5000.	675.	2.74	29	0	3	18	0
S-Zr	15.	200.	70.	2.38	47	0	1	2	0
S-Th	***	***	***	***	0	0	0	50	0
AA-Au	.05	.45	.07	1.8	16	4	16	14	0
AA-Te	.20	100.	1.5	4.7	24	4	0	22	0
AA-As	10.	150.	57.	2.2	29	16	1	4	0
AA-Zn	5.	370.	92.	3.4	20	30	0	0	0
AA-Cd	.20	30.	1.4	3.8	37	13	0	0	0
AA-Bi	2.	44.	5.7	4.3	4	4	0	42	0
AA-Sb	1.	80.	9.5	3.4	27	20	0	3	0
AA-Tl	.20	3.2	.91	2.7	41	4	2	3	0