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MINERAL RESOURCES INVENTORY

BUREAU OF LAND MANAGEMENT,

SCHELL RESOURCE AREA, ELY DISTRICT, NEVADA

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This information should be considered preliminary.
It has not been edited or checked for completeness or accuracy.

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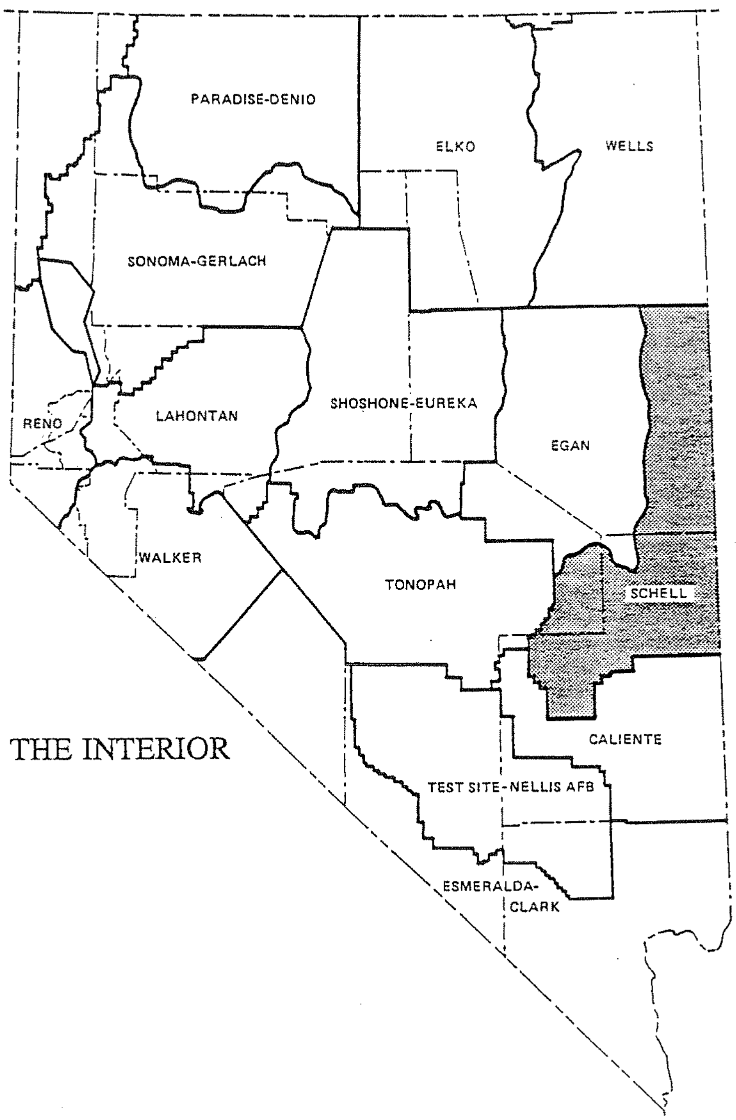
Bureau of Land Management,
Schell Resource Area, Ely District, Nevada



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SUMMARY

The Bureau of Land Management, Schell Resource Area, Ely District, includes in the order of 4.3 million acres of public lands in eastern Nevada. The area includes a large part of eastern White Pine County, and parts of northern Lincoln and eastern Nye Counties.

Silver-gold deposits were discovered in the Pleasant Valley (Eagle) district, in the northeastern part of the present Schell Resource Area, in 1859, but no major deposits developed. Silver-lead deposits were found in many districts within the resource area during the period of the 1860's through the 1870's; the Bristol/Jackrabbit district, with production of about $17 million is the largest of these. Silver and gold were discovered in the Atlanta district in the 1860's, and placer and lode gold deposits were found at Osceola in the Snake Range in the 1870's; tungsten was discovered in the southern Snake Range in 1889 and in the Kern Mountains about 1915. The Osceola gold deposits are credited with about $3 million production, and tungsten deposits in both the Snake Range and Kern Mountains total about another $3 million. In 1958, a large deposit of beryllium, associated with tungsten and fluorite, was discovered in the Lincoln district. This deposit has not been mined, but it is one of the largest high-grade beryllium resources in the United States.

There are currently no active mines in the Schell Resource Area, but precious and base metals were produced for over 100 years beginning about 1870 and potential exists for production of several metallic commodities, including silver, lead, zinc, tungsten, beryllium, manganese and gold; and industrial mineral commodities, including perlite and quartzite dimension stone.

At the present time, mining and prospecting activity in eastern Nevada, as well as in most other parts of Nevada and other western states as well, is confined to precious metals. Large blocks of mining claims are in evidence in many districts within the Schell Resource Area, and, in the late summer of 1990, drilling was being done in one district (Aurum) within the resource area.

INTRODUCTION

PURPOSE AND METHODOLOGY

The need for an updated and expanded mineral inventory of the Schell Resource Area has been recognized by the BLM, Ely District, in anticipation of planning requirements for land utilization in the 1990's. A mineral inventory, based mainly on a detailed literature search, was conducted for the district in 1980 (Oakeshott and others, 1980). Changes in mineral economics and mineral exploration concepts and methods have taken place since that time, however, requiring that a new, district-wide inventory be made. The object of the current mineral inventory is to describe the mineral resources of the public lands within the resource area and to comment on the potential for the occurrence and development of these resources.

Work within the Schell Resource Area was completed in three complementary stages.

First, records of all mineral occurrences within the district on file within the U.S. Geological Survey's Mineral Resource Data Set (MRDS) were obtained and examined. Deposit locations were plotted on topographic maps for field use, and additional literature search was done in some areas to augment information obtained from MRDS. Folios were prepared for each mining district within the study area which included MRDS forms, notes on mineral activity, and pertinent references.

Second, mining districts within the area were visited and individual properties were examined and described. Outlying prospects, as well as major mines, were examined in order to provide more complete and accurate information on occurrences than was found in literature sources. In each area examined, photos were taken to document activity, type of mine workings present, and to record geologic relationships. In addition, samples of typical ore mineralization were collected for analysis to investigate trace element associations in the ores. These samples were "high-graded" and usually collected from dumps, ore piles, or mineralized outcrops. The samples were prepared for analysis by the Nevada Bureau of Mines and Geology analytical laboratory, and were analyzed by the Branch of Geochemistry, U.S. Geological Survey through a cooperative agreement between that agency and the Nevada Bureau of Mines and Geology.

The third stage of this project consisted of evaluation of the data collected during the field examinations, study of geochemical associations, and the preparation of an inventory report.

Information collected as part of the BLM Schell Resource Area inventory project is presented in this report in the following form:

1) Summary report, which includes descriptions of mining districts and areas, with references and selected bibliography, and discussions of resource potential for the various metallic and industrial commodities that occur within the resource area.

2) Appendix A, descriptions of mines and prospects examined during the course of the project.

3) Appendix B, descriptions of ore samples collected, and analyses of these samples.

4) Appendix C, a set of 7 1/2' topographic maps showing locations of properties examined and sampled, plus locations from the MRDS files. The set is organized by each 30' by 60' quadrangle in the district, and an index map is provided. This map set not included as part of this report, but is on file in the Public Information Office, Nevada Bureau of Mines and Geology.

5) Appendix D, mineral resource map set, showing generalized outlines of areas of inferred mineral potential.

This report emphasizes metallic and industrial mineral occurrences (except sand and gravel) within the BLM Schell Resource Area. Sand and gravel is referred to in the report but is not covered in detail.

Generalizations regarding mineral potential included with the report represent the highest level of assessment that can be made with the data that are available but they are subjective at best. Potential is discussed by specific mineral commodity and commodities are referenced by mining district or area. Every commodity that has documented occurrences within the BLM Schell Resource Area is mentioned--some in detail, some only generally--and, depending on the level of information available, potential ratings have been assigned.

LOCATION

The Bureau of Land Management, Schell Resource Area, Ely District, consists of approximately 4.3 million acres of public land in eastern Nevada (Figure 1). The district includes most of the eastern half of White Pine County, a large part of northern Lincoln County, and an portion of eastern Nye County. The Goshute Indian Reservation is entirely enclosed within the Schell Resource Area, and three large segments of the Humboldt National Forest are within or partially within the resource area. Great Basin National Park is in the southern Snake Range, on the eastern border of the resource area. The Indian lands, National Forest lands, and the land within the National Park are not under BLM jurisdiction. The Indian lands are excluded from this inventory but we have included available information on both the Forest and Park lands.

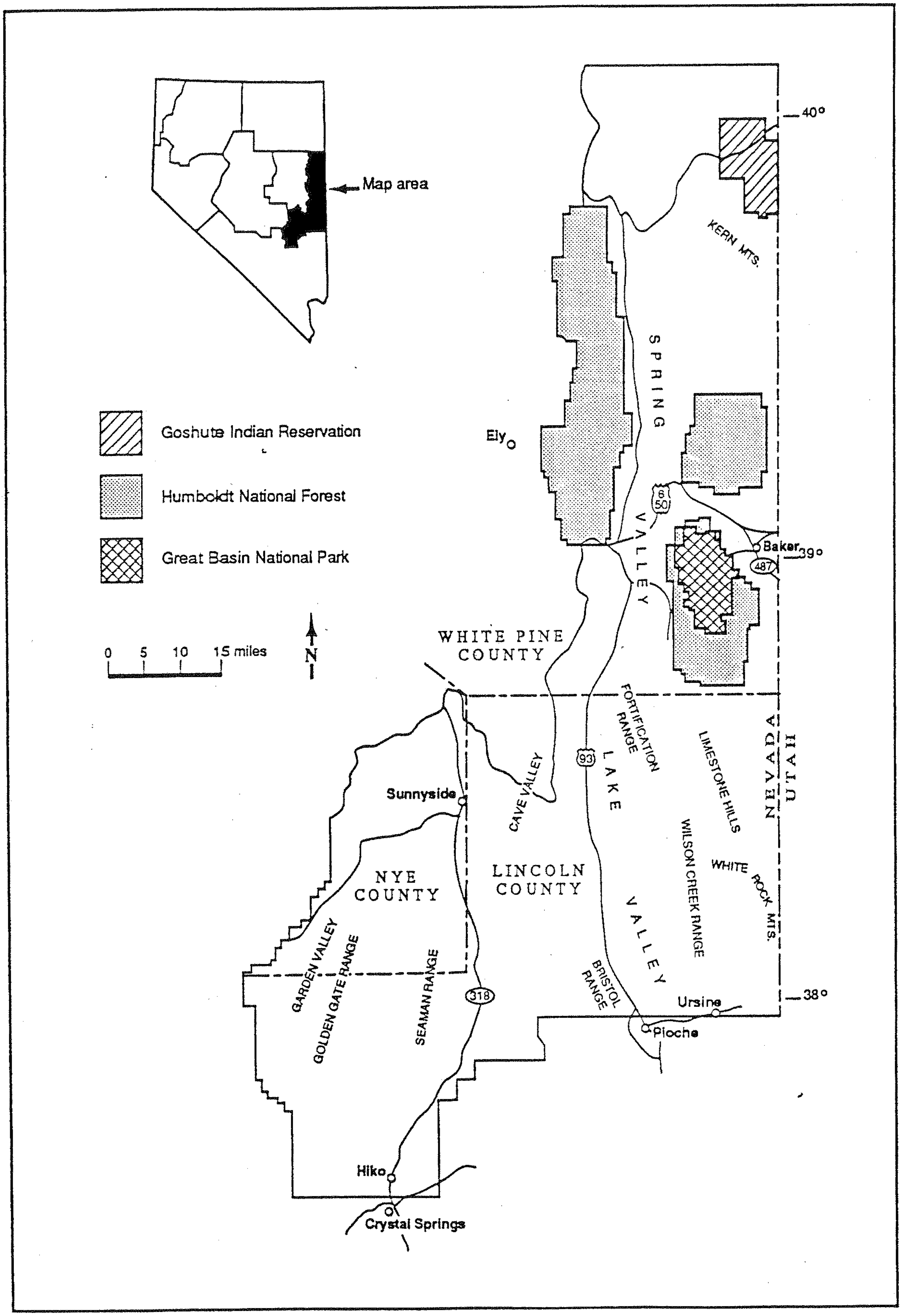


Figure 1. Schell Resource Area location map

HISTORY AND PRODUCTION

The first mineral discoveries in the portion of eastern Nevada now included within the Schell Resource Area were made in the Pleasant Valley (Eagle) district, Kern Mountains, in 1859. Gold-silver-bearing veins found at that time did not, however, develop into important mines.

Silver-lead deposits were found in many districts within the resource area during the period of the 1860's through the 1870's. Many of these districts, such as Pahranagat, Silver King, and Patterson, failed to develop into large, long-lived districts. Other districts such as Aurum and Bristol/Jackrabbit, while not large when compared with districts such as Ely, Pioche, or Eureka in other parts of Nevada, were substantial metal producers. Bristol/Jackrabbit, with recorded production in excess of $16,000,000, is the largest of the silver-base-metals districts in the Schell Resource Area.

Placer and lode gold deposits were found at Osceola in the Snake Range in the 1870's. Osceola developed into the largest placer district in eastern Nevada, credited with over $3,000,000 production. Silver and gold were discovered in the Atlanta district in the 1860's, but the district did not become an important large-scale precious metals district until the 1970's when open pit operations were commenced. The Atlanta mine is the only modern bulk-mineable disseminated gold deposit in the Schell Resource Area; presently inactive, the mine is credited with production of about 88,000 ounces gold and 1,710,000 ounces silver (Bonham, 1988, p. 24).

Tungsten was discovered in the southern Snake Range in 1889 and in the Kern Mountains about 1915. Three major tungsten districts eventually developed, Eagle in the Kern Mountains, and Tungsten and Shoshone, both in the southern Snake Range. Deposits in these districts produced tungsten intermittently, in some areas into the 1970's, but their total tungsten output is probably only around $3,000,000.

A unique and important deposit of beryllium associated with tungsten and fluorite was discovered in the Lincoln district of the southern Snake Range in 1958. Considerable development was done on the deposit but market competition, mainly from the beryllium-mining operation at Spor Mountain, Utah has prevented this deposit from being mined. This deposit is, however, possibly the second largest known beryllium resource in the United States (Barton, 1987, p. 338).

At the present time, mining and prospecting activity in eastern Nevada, as well as in most other parts of Nevada and other western states as well, is confined to precious metals. Within the Schell Resource Area, there are no operating metal mines at the present time but large blocks of mining claims are in evidence in many districts. During our examination work in the area, we found claim staking in progress in the western part of the Pahranagat district, and drilling was being done on a property in the northern part of the Aurum district

Nonmetallic or industrial mineral production (not considering sand and gravel) within the BLM, Schell Resource Area has been confined to perlite, quartzite dimension stone, marble dimension stone and crushed stone, and a small amount of phosphate rock (bat guano). Clay deposits are found in the Bristol district, a fluorite prospect is in the Cooper district, a garnet placer is on each side of Mount Moriah, and quartz crystal is found in a small area in the Freiberg district, but no production of these commodities is reported.

Presently, there are no industrial mineral mining operations within the resource area.

MINING DISTRICTS AND AREAS

Metallic and industrial mineral commodities are described within 33 separate mining districts and areas within the BLM Schell Resource Area (Figure 2).

ANTELOPE RANGE

Location

The Antelope Range is located east of the Schell Creek Range in northern White Pine County. The range lies between northern Spring Valley, to the west, and Antelope Valley, to the east.

History

Raymond, 1873, p. 203, mentions mining at the Nettie McCurdy mine, "22 miles east of Queen Springs, in the Antelope Range." Eight tons of ore were reported to have been shipped to the Big Smoky mill in 1871, and some 100 tons of "second-class ore" was said to remain on the dumps. The location of this mine is not known; small mine workings in Tunnel Canyon, on the east side of the Antelope Range, are in the general location described by Raymond. The Tunnel Canyon workings, however, do not show any evidence of metallic mineralization or production.

Geologic Setting

The central Antelope Range is underlain by Paleozoic sedimentary rocks; Ordovician-, Silurian-, and Mississippian-age rock crop out along the eastern margin of the range, while Devonian through Permian rocks crop out on the western side of the range.

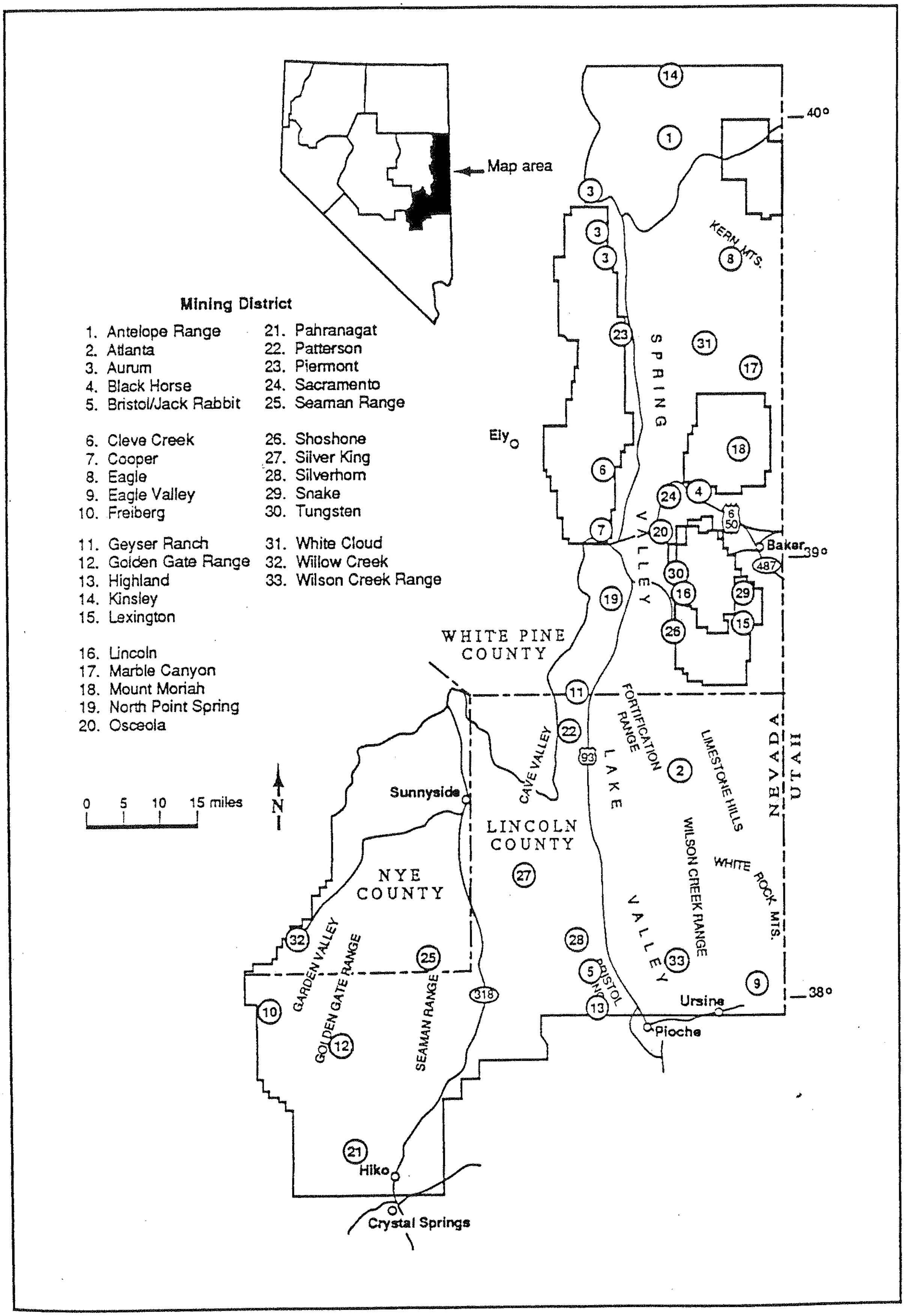


Figure 2. Schell Resource Area, Mining District/Area location map

Tertiary volcanic rocks cover both the northern and southern portions of the Antelope Range. Several small bodies of monzonite and quartz monzonite intrude the Paleozoic rocks and crop out along the crest of the range. In the northern part of the Paleozoic outcrop area, low-angle faults form the contacts between Permian and Ordovician-Silurian rocks, and between Pennsylvanian and Permian rocks.

Ore Deposits

There are no known ore deposits in the Antelope Range. Prospects in Tunnel Canyon, on the eastern side of the range, are associated with a low-angle fault contact between Ordovician-Silurian carbonate rocks and Permian shales and carbonate rocks. These prospects explore a black shale horizon and show no evidence of metallic mineralization.

Selected References

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

Raymond, R. W., 1873, Statistics of mines and mining in the states and territories west of the Rocky Mountains (for 1871): Washington, D. C., Government Printing Office, 566 p.

ATLANTA DISTRICT

Location

The Atlanta district, Lincoln County, is at the northern tip of the Wilson Creek Range about 30 miles northeast of the town of Pioche. The Silver Park district is a little over one mile southwest of the center of the Atlanta district; the two districts, however, are usually considered as one.

History

The Silver Park district was organized in the fall of 1869 (White, 1871, p. 97) and included several prospects where pockets of rich silver chloride ore were discovered. Small amounts of rich silver ore was selectively mined by hand from these prospects and shipped by wagon to smelters at Golconda in Humboldt County, about 400 miles to the north. Two mills were eventually constructed in the district, but they operated for only a short time. Activity declined after 1871 and stopped after about 1878. A total production of $33,468 is recorded from the district for the years 1870, 1871, 1875-1878, and 1917 (Couch and Carpenter, 1943, p. 83).

It is not known when the name Silver Park fell into disuse but, by 1906, the name Atlanta was associated with discoveries of free gold in outcrops about one mile northeast of the old Silver Park mines. The Atlanta Consolidated Gold Mining Co. was organized in 1911, underground development was done, and a minor amount of gold ore was produced and shipped by 1915 (Cox, 1981, p. 7). The Atlanta properties were prospected and examined in the 1930's, but the district was largely inactive until after World War II. Small amounts of siliceous, fluxing ore was shipped to the copper smelter at McGill between 1953 and 1955 and, in 1966, open pit mining operations began at the Atlanta mine. In 1975, Standard Slag Company assumed control of the mine and began processing ore at a rate of 120,000 to 135,000 tons per year (Cox, 1981, p. 9). Through 1980, the Atlanta mine is credited with production of 88,000 ounces of gold and 1,710,000 ounces of silver (Bonham, 1988, p. 24). Standard Slag ceased operations at Atlanta in 1984 and the mine remains closed. In 1983, a mill was constructed at Silver Park and a small amount of gold ore was processed at that location; Silver Park is also now inactive.

In the mid-1980's, several major mining companies, including Exxon Corp., explored in the Atlanta district. These projects were apparently not successful, as there is no activity in the Atlanta district at the present time (1990).

Geologic Setting

The northern Wilson Creek Range is composed mainly of widespread silicic volcanic rocks of Oligocene age which overlie eroded remnants of deformed Paleozoic sedimentary rocks. Within the Atlanta district, Paleozoic rocks crop out only at Atlanta Peak and the Atlanta mine, and at Silver Park. The Paleozoic rocks include Middle Ordovician limestone, Ordovician quartzite, and a thick sequence of Ordovician, Silurian, and Early Devonian dolomites. The Paleozoic rocks are complexly deformed, but generally strike northwest and dip to the northeast (Cox, 1981, p. 10-20, 25). The Oligocene volcanic rocks consist of a thick sequence of moderately to highly welded ash-flow tuffs, probably related to the Mount Wilson volcanic center. A few highly altered, dike-like occurrences of quartz porphyry are in the Atlanta mine pit and at the nearby Hulse (Blue Bird) mine (Cox, 1981, p. 22-23). At the Atlanta mine, intrusion of lenticular bodies of quartz porphyry has been controlled by the Atlanta mine fault, a major north-south-striking, 45^{o}-65^{o} west-dipping structure (Cox, 1981, p. 27-28).

Ore Deposits

Ore deposits in the Atlanta district occur in silicified breccia zones along faults. Carbonate rocks in the mine areas are extensively replaced by jasperoid. All of the deposits are closely related in mineralogy and structural control. The following descriptions of the deposits have been abstracted largely from Cox, 1981, p. 60-65.

At the Atlanta mine, mineralization occurs in highly silicified zones consisting of cryptocrystalline quartz developed along high-angle faults. The silicified zones are usually extensively brecciated; breccia fragments consist largely of carbonate rock, although quartzite, volcanic rock, and intrusive rock fragments are also present. Fragments are usually so silicified that identification is difficult, and often several periods of brecciation and silicification are indicated. Open spaces in the breccias are filled with limonite, barite, manganese oxides, clay, and drusy quartz. Pyrite was probably the most common sulfide prior to oxidation of the rock, but small amounts of marcasite, chalcopyrite, galena, and argentite are also present. Gold is present as microscopic particles of free gold. In addition to gold, silver, and minor base metals, the silicified, mineralized zones are usually enriched in arsenic, antimony, mercury, manganese, and barium.

Minor amounts of uranium are present in many of the mines and prospects in the district. The uranium occurs mainly in secondary oxidation products derived from pitchblende. Small amounts of uranium ore have been mined, however, from the Hulse or Blue Bird mine, south of the Atlanta gold mine.

In the Silver Park area, manto-like deposits of silver, gold, and base metals have been mined from areas where mineralization appears to follow bedding planes and joints in carbonate rocks. Large masses of goethite, psilomelane, and other manganese oxides are present along with bleached carbonate rock in the mineralized zones. These deposits, however, appear to be localized near intersections of high-angle faults with the carbonate rocks

Selected References

Angel, M. ed., 1881, History of Nevada, with illustrations and biographical sketches of its prominent men and pioneers: Oakland, California, Thompson and West, 680 p. (reprinted 1958 by Howell-North, Berkeley, California).

Bonham, H. F., Jr., 1989, *in* The Nevada mineral industry, 1988: Nevada Bureau of Mines and Geology Special Publication MI-1988, p. 19-25.

Cox, J. W., 1981, Geology and mineralization of the Atlanta district, Lincoln County, Nevada: M.S. thesis, University of Nevada, Reno, Reno, 83.

Couch, B. F., and Carpenter, J. A., 1943, Nevada's metal and mineral production: Nevada Bureau of Mines and Geology Bulletin 38 [University of Nevada Bulletin, v. 37, no. 4], 159 p.

Ekren, E. B., Orkild, P. P., and Dixon, G. L., 1977, Geologic map of Tertiary rocks, Lincoln County, Nevada: U.S. Geological Survey Map I-1041.

Hill, J. M., 1916, Notes on some mining districts in eastern Nevada: U.S. Geological Survey Bulletin 648, 214 p.

Tschanz, C. M., and Pampeyan, E. H., 1970, Geology and mineral deposits of Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 73, 188 p.

Toth, M. I., Stoneman, R. G., Blank, H. R., Jr., and Gese, D. D., 1986, Mineral resources of the White Rock Range Wilderness Study Area, Lincoln County, Nevada, and Beaver and Iron Counties, Utah: U.S. Geological Survey Bulletin 1728-B, 15 p.

AURUM DISTRICT

Location

The Aurum mining district, White Pine County, is centered in the northern part of the Schell Creek Range about 40 miles northeast of Ely. Most of the mines in the district are located either on the crest or on the eastern slope of the range, and are historically grouped into 5 separate subdistricts. The subdistricts, from north to south, are: Schellbourne (Schell Creek), located on the crest of the range north of Schellbourne Pass; Siegel (Queen Springs), located mainly at the crest of the range at the head of McCurdy Creek but extending south to include deposits on Siegel Creek, near the sites of the old camps of Centerville and Siegel; Silver Canyon, located at the head of Silver Canyon west of the site of old Aurum; Ruby Hill (Rubyville), located on the crest and western slope of the range on the divide between Ruby and Indian Creeks; and Muncy Creek (Silver Hill), located on the east side of the range at Muncy Creek. Most of the Aurum subdistricts and their mines are located within the Humboldt National Forest. The properties on the west side of the range, north of Schellbourne Pass, are within the BLM Egan Resource Area. The only areas within the Aurum district that are included in the BLM Schell Resource Area are the northeastern part of the Schellbourne subdistrict and the eastern edge of the Muncy Creek subdistrict.

History

The first discoveries of mineral-bearing lodes within the boundaries of the present-day Aurum district were made in 1870 and the Silver Mountain and Schell Creek districts were organized in that year. In 1871, the Queen Springs and Ruby Hill districts were formed and separated from the Schell Creek District. By 1872, stamp mills had been constructed at Centerville, north of Siegel Creek, and at Rubyville near the Ruby Hill mine. The mill at Rubyville never operated and the entire region was generally inactive by 1875. By 1880, the name Aurum had come into use for the entire district, and the more restrictive local names have since been applied only to the various subdistricts. In the early 1880's, lead-silver-manganese ores were discovered in the Siegel Creek area (Siegel subdistrict), lead-silver ores were found in the Silver Canyon area (Silver Canyon subdistrict), and copper-lead-silver ores were found in the Silver Mountain area (Muncy Creek subdistrict); these deposits have provided the major production from the district, although a minor amount of tungsten ore has been recovered from mines in the Schellbourne subdistrict. Years of highest production from the district were 1902-1907, 1913-1920, and 1933-1955; total production through 1968 is recorded at slightly under $1,500,000 (Hose and others, 1976, p. 43).

No mines have been active in any part of the Aurum district since the 1960's, but prospecting continues in all areas. Most recently, Freeport-McMoran Mining Co. explored a large block of mining claims between Lovell Peak and Spring Gulch, north of

Schellbourne Pass in the Schellbourne subdistrict in 1989. The old May Queen mines area, in the Siegel subdistrict south of Schellbourne Pass, was being actively explored by drilling in the late summer of 1990.

Geologic Setting

The oldest rocks exposed in the Aurum district are Precambrian quartzite and phyllite which crop out along the east flank of the Schell Creek Range. These rocks are overlain conformably by a nearly complete sequence of Paleozoic quartzite, shale, dolomite, and limestone which extend to the crest of the range. The sedimentary rocks are tilted steeply to gently westward, are displaced up to several miles by low-angle faults that generally follow the Pole Canyon Limestone, and are cut by normal and reverse faults of small and moderate displacement. Small stocks and dikes, ranging in composition from granite to andesite, cut the sedimentary rocks in places. In several localities in the district, replacement ore bodies have formed in carbonate rocks associated with the intrusive rock contacts. Large areas of the district near Schellbourne Pass are covered by an early Oligocene-age volcanic sequence consisting of rhyodacite, quartz latite, air-fall tuff, and welded ash-flow tuff. These lavas and tuffs appear to have been erupted from vents that now form dikes and shallow intrusive bodies that are offshoots of larger granitic plutons (Hose and others, 1976. p. 18, 43).

Ore Deposits

Schellbourne (Schell Creek) subdistrict

The first mineral discoveries made within the Aurum district may have been in this area. The mines and prospects, which occur southwest of Lovell Peak along the western crest of the range, explore silver- and tungsten-bearing replacement and vein deposits concentrated near faults in carbonate rocks. At the White Horse claim, quartz and calcite veins cut brecciated, silicified limestone of the Middle Cambrian Lincoln Peak Formation. The veins, which contain visible tungsten and copper minerals, parallel a northeast-striking fault zone.

Similar veins, containing only tungsten, occur at the Georgia claims at the mouth of Spring Gulch on the east side of the range. In this same area, however, lenses of jasperoid breccia occur in silicified zones in limestone.

Siegel (Queen Springs) subdistrict

Two more or less distinct mineralized areas occur within the Siegel subdistrict.

At the north end of the district, at the head of McCurdy and Queen Springs canyons, the May Queen group of silver-lead mines occurs along the crest of the Schell Creek Range. Mining followed a wide, silicified breccia zone; the brecciated, silicified, iron-oxide-stained outcrop of the zone extends south for some distance along the crest of the range. At the north end, the zone is in quartzite, but Hill (1916, p. 195) states that the country rock is a blue, somewhat dolomitic limestone. Hill also mentions that a highly-altered porphyry dike crosscuts the trend of the mineralized breccia\fissure zone. Ore consisted of argentiferous cerussite and anglesite which graded to argentiferous galena below the zone of oxidation, and ruby silver was also reported to be present.

To the southeast, at the Siegel and Gold Crown mines, silver-lead ores were mined from replacement ore bodies localized in the massive-bedded Cambrian Pole Canyon Limestone near its contact with the underlying Pioche Shale. Oxide ores consisted of silver chloride and lead and zinc carbonates in a gangue of manganese oxides, quartz, calcite, and iron oxides. Primary sulfide ore consisted of rhodochrosite, alabandite, pyrite, and galena (Hose and others, 1976, p. 43).

Silver Canyon subdistrict

Mines in this subdistrict are located in three separate areas along the extent of Silver Canyon, west of old Aurum.

At the head of the canyon, small deposits of argentiferous lead carbonate ore were mined from irregular replacement deposits along a steep fault zone and in limestone of the Lincoln Peak Formation. Down-canyon, to the east, at the Copper Queen (Signal) mine, copper-bearing ore was mined from replacement lenses formed in the Pioche Shale directly above its contact with Prospect Mountain Quartzite. Sulfides, including pyrrhotite, chalcopyrite, and some bornite, occur as lenticular pods in thin-bedded, silicated limestone and limy shale; considerable chlorite occurs with the ore, and oxidized portions of the ore contain azurite, malachite, and limonite-hematite gossan. An aplite sill crops out on the slope above the mineralized horizon. At the mouth of Silver Canyon, lead-silver ore was mined from replacement lenses formed in limestone of the Ordovician Pogonip Group along a steep, northeast-striking fault zone. The Pogonip rocks represent a small fault block, probably down-dropped along the eastern range front.

Ruby Hill (Rubyville) subdistrict

Little is known of the deposits at Rubyville. According to Hose and others (1976, p. 44), silver ores there are localized in irregular quartz veins and quartz replacement bodies along east-trending zones in dolomites. Hill (1916, p. 196) describes a north-striking ledge of quartz at the El Capitan mine said to carry argentite, some silver chloride, and copper carbonate; the mines were caved in 1913 when Hill studied the district and he did not visit Rubyville.

Muncy Creek (Silver Mountain) subdistrict

This area yielded more than half of the ore produced from the Aurum district, mostly from the Grand Deposit and Kansas mines (Hose and others, 1976, p, 44). At the Grand Deposit mine, zinc-lead-silver-copper ore was mined from replacement deposits formed in limestone of the Cambrian Lincoln Peak Formation along fault and fracture intersections. Much of the ore was oxidized and consisted of calamine, smithsonite, cerussite, azurite, malachite, anglesite, chrysocolla, and aurichalcite found on the floors of solution cavities formed along faults, at intersections of thin-bedded limestones with the faults, and in gash fractures associated with some of the faults (Hose and others, 1976, p. 44). Gangue minerals include iron oxides, calcite, and siderite. Unoxidized ore contained sphalerite and galena. The Grand Deposit mine is known by mineral collectors as a collecting location for aurichalcite and many museum-quality specimens have been obtained there. At the Kansas mine polymetallic replacement deposits have formed in skarn associated with the contact between dikes of syenitic porphyry and Cambrian Pole Canyon Limestone. In places, the limestone is metamorphosed to garnet-epidote skarn as much as 15 feet from the dike contacts. The ore consisted of chalcopyrite and bornite with hematite, magnetite, actinolite, garnet, and epidote. Near surface ores contained malachite, azurite, limonite, and manganese oxides.

<u>Selected References</u>

Hill, J. M., 1916, Notes on some mining districts in eastern Nevada: U.S. Geological Survey Bulletin 648, 214 p.

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

BLACK HORSE DISTRICT

Location

The Black Horse district, White Pine County, is located in the northern Snake Range, east of Sacramento Pass. The district extends from U.S. Highway 50 in Sacramento Pass northeast to the drainage of Silver Creek on the southwest slope of Mount Moriah. Most of the mines of the district are located in the vicinity of Black Horse Canyon and the old camp of Black Horse. Outlying properties in the upper basin of Silver Creek, about 4 miles north of Black Horse and near the mouth of Silver Creek, about 6 miles southeast of Black Horse, are also included in the Black Horse district. Most of the Silver Creek basin area, including the Tilford mine, is within the Humboldt National Forest.

History

Gold was discovered here in 1905 when a lone prospector, seeking shelter from storm, chipped mineralized rock from the ledge beneath which he was taking refuge. A rush developed, involving most of the miners from the nearby camp of Osceola (Paher, 1970, p. 263), and the district, named for the black horse ridden by the prospector, was organized the same year. The district was active between 1906 and 1913, producing about $102,500 from the San Pedro and Black Horse mines (Hose and others, 1976, p. 46). A small production is recorded for 1918, but the district was essentially quiet until 1933 when lead-silver ore was discovered at the Bellander mine, at the mouth of Silver Creek on the east end of the district. Tungsten was discovered in ore from the Black Horse mine about 1941; tungsten was produced from the mine in 1941, between 1943-1944, and in 1953. Total recorded production from the Black Horse district, 1906-1954, is about $108,104 in gold, silver, lead, zinc, and copper (Hose and others, 1976, p. 46), and about 481 units of WO_3 (Stager and Tingley, 1988, p. 207). A placer gold deposit was examined in Miller Basin Wash, in the north part of the district, in 1935, but no mining was done in that area.

No activity was noted in the district in the summer of 1990.

Geologic Setting

In the western part of the district, near the Black Hawk mine, a décollement fault that dips north-northwest separates a lower plate of Precambrian quartzite and argillite from an upper plate of Middle and Late Cambrian limestone, shaly limestone, and carbonaceous shale. The sedimentary rocks, especially those of the upper plate, are cut by other faults in nearly all attitudes. Large individual fault blocks are tilted gently to steeply north or northwest, or are overturned. In the southeastern part of the district, in the area of the Bellander mine, conglomerate strata of indeterminate thickness strike generally northward. dip westward, and overlie Tertiary volcanic rocks (Hose and others, 1976, p. 46-47).

Ore Deposits

The largest ore bodies in the district are veins and replacement deposits along faults in limestone. The principal mines in the district are the Black Horse (Gold King), Bellander, and Tilford (Hose and others, 1976, p. 47).

At the Black Horse mine, gold- and silver-bearing carbonate and quartz-carbonate veins cut limestone and limy shale; the veins occur along bedding faults in the Pioche Shale within a few hundred feet of the northeast-trending contact between it and the underlying Prospect Mountain Quartzite. Most mineralized veins and shear zones strike northwest and dip steeply to moderately southeast. Scheelite was found to be present in one of the veins on the property, and was mined in one area to a depth of about 100 feet (Hose and others, 1976, p. 47).

At the Bellander mine, pods of lead-silver ore occur with manganese- and iron-oxide staining along a bedding fault that strikes north and dips 35° west in Tertiary conglomerate (Hose and others, 1976, p. 47).

The Tilford mine, in upper Silver Creek, followed northeast-trending, gossany veins in limestone. The veins are reported by Hose and others (1976, p. 47) to contain gold and silver along with iron- and copper-staining in a narrow calcite vein.

Selected References

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

Paher, S. W., 1970, Nevada ghost towns and mining camps: Berkeley, California, Howell-North Books, 492 p.

Stager, H. K., and Tingley, J. V., 1988, Tungsten deposits in Nevada: Nevada Bureau of Mines and Geology Bulletin 105, 256 p.

Wood, R. H., II, 1983, Mineral investigation of the Mount Moriah roadless area, White Pine County, Nevada: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 50-83, 27 p.

BRISTOL/JACKRABBIT DISTRICT

Location

The Bristol/Jackrabbit district is located in the northern Bristol Range, about 16 miles north-northwest of Pioche. Most of the mines in the district are located on the northern tip of the range, south of Bristol Pass. Historically, the Bristol district included mines on the western side of the Bristol Range, centered around Bristol, while the Jackrabbit district was centered around the town of Jackrabbit, on the east side of the range. In this report, the Bristol and Jackrabbit districts have been combined into one district. The district has been expanded several miles to the south to include the Silver Pick mine and the quarries near Blind Mountain Spring, in the Bristol Range, and several miles to the west to include properties south of Fairview Wash, along the east flank of the West Range.

History

Silver was discovered on the western flank of the Bristol Range in 1870 (Paher, 1970, p. 305), and the Bristol district was organized in April of 1871 (Whitehill, 1873, p. 111). The Jackrabbit deposit (Day mine, Jackrabbit mine) was discovered in 1876 (Paher, 1970, p. 305). A smelter, and later a 5-stamp mill, was built at Bristol Well in Fairview Wash west of Bristol, and ores from both mine camps were hauled there for treatment. The Hillside orebody, on the western crest of the range above Bristol, was discovered in 1877 and, between 1878 and 1906, is credited with a production of $2,000,000; adjacent mines, including the May Day, Tempest, Gypsy, National, Vesuvius, and Great Eastern produced about $1,000,000 during the same time (Tschanz and Pampeyan, 1970, p. 129). Mines at Jackrabbit, on the east side of the range, are estimated to have produced $2,500,000 prior to 1906. A branch line of the Pioche Pacific Railroad, known locally as the "Jackrabbit Road", was completed from Pioche to Jackrabbit in December 1891 and, by the spring of 1892, ore could be hauled from the Jackrabbit mines to the smelter in Pioche (Myrick, 1963, p. 698-699). A tram line was constructed connecting the mines at Bristol with Jackrabbit and the railhead and, after about 1911, operations in both districts were consolidated (Hill, 1916, p. 127). Production from the Bristol/Jackrabbit district was more or less continous until 1961, when low metal prices forced closure of the mines; Since 1961, the Bristol mine has been held on standby basis with occasional shipments of select-grade ore (Gemmill, 1968, p. 1131-1132). Total recorded production of the district, through 1958 is $17,209,300 mainly in silver, lead, copper, and zinc with minor gold and manganese (Tschanz and Pampeyan, 1970, p. 133). In the late 1970's Kerr-McGee Corporation acquired most of the mines in the Bristol/Jackrabbit district. Kerr-McGee has done surface and underground exploration, including some drilling, but the properties are now inactive and remain on standby. Some of the surface plant is still in place at the Snyder shaft at Bristol, and the mine is accessible; however, all equipment has been removed from Jackrabbit and the mines are not accessible.

Geologic Setting

The following section has been abstracted from Tschanz and Pampeyan (1970, p. 91-92 and 129-134).

The main mass of the Bristol Range is composed of Lower and Middle Cambrian rocks including the Prospect Mountain Quartzite, Pioche Shale, Lyndon Limestone, and the Highland Peak Formation. These units crop out along the west side of the range and make up most of the high part of the mountains. A few small patches of Upper Cambrian rocks cap the highest peaks. At the north end of the range, these rocks are overridden by the Bristol thrust plate, a west-dipping plate of brecciated dolomite and quartzite of probable Middle Devonian age. Near the Bristol mine, the thrust overrode Pioche Shale, Lyndon Limestone, and the lower part of the Highland Peak Formation. The Highland Peak Formation contains nearly all of the ore deposits. A north-trending fault, the Iron mine fault, separates the productive part of the district in the Highland Peak Formation from the older Cambrian rocks on the west. Near Blind Mountain in the southern part of the range, a down-faulted remnant of this thrust plate is intruded by a quartz monzonite stock. The rocks near the stock, including volcanic rocks of possible Cretaceous to Oligocene age, have been metamorphosed.

The West Range, west of Bristol, is composed almost entirely of the Devonian Guilmette Formation and Pilot Shale. The Devonian rocks are unconformably overlain by Tertiary volcanic rocks, but a plate of brecciated dolomite and quartzite along the east side of the range has apparently thrust or slid onto the volcanic rocks.

Ore Deposits

The Bristol and Jackrabbit properties produced oxidized ore from irregular, veinlike, or pipelike replacement deposits that generally occur along intersecting fissure systems within the Highland Peak Formation.

At Bristol, the biggest replacement ore bodies were located 50 feet to several hundred feet horizontally into the hanging wall away from the N80°E-striking, 45°S-dipping May Day fault. Some ore bodies extend almost continuously from surface to the 1,700 level, a vertical distance of about 1,200 feet. Sulfide ores have not been encountered at Bristol (Gemmill, 1968, p. 1139-1140).

The Black Metals mine, at Jackrabbit, produced ore from a concentrically zoned, vertical pipe from which bedded replacement deposits extend into the gently dipping limestones of the Highland Peak Formation along three stratigraphic horizons. The ore pipe occurs along a breccia zone about 25 feet wide, which strikes N25°E. The center of the ore pipe contained rich lead-silver ore, but successive exterior zones were progressively richer in manganese and leaner in lead and silver (Tschanz and Pampeyan, 1970, p. 134).

Other properties in the Bristol Range include the Woodbutcher silver-gold mine on the west side of the range, north of Blind Mountain; the Monarch mine on the range crest, north of Roe Peak; and small marble prospects on the west side of Blind Mountain. Two areas in the West Range have been prospected for clay.

At the Woodbutcher mine, precious metals mineralization occurs in a silicified breccia formed along a fault separating Cambrian quartzite from shale and carbonate rocks. Mineralization at the Monarch occurs in a quartz vein which follows bedding in gray dolomite in the upper part of the Highland Peak Formation (Tschanz and Pampeyan, 1970, p. 138).

The marble prospects near Blind Mountain Spring are in a carbonate horizon in the Devonian Guilmette Formation which has been intruded and metamorphosed by a body of quartz monzonite. Marble is exposed over a fairly large area, and has been explored by a shallow decline, test pits, and apparently some diamond drilling. Very little, if any, marble has been produced and the potential of the deposit is not known.

Clay occurs in underground workings near Bristol Well and at the Bristol mine. Clay at both occurrences is mainly montmorillonite with low swelling capacity, but kaolinite and illite are also present (Papke, 1970, p. 22). The Bristol Well clay deposit occurs in brecciated Devonian dolomite and quartzite that has been intruded by a north-northeast trending dike. The dike has been altered almost completely to montmorillonite and minor kaolinite. The clay does not outcrop, but was encountered in a shaft sunk to explore a gossan outcrop (Papke, 1970, p. 22). Papke also mentions that clays outcrop in association with pyroclastic rocks southeast of the area of the old shaft. This is the area described by Tschanz and Pampeyan (1970, p. 92) where Devonian rocks have been thrust over, or have slid onto Tertiary volcanic rocks; the clay occurs in both upper and lower plates of this structure.

Varying amounts of impurities occur in clay from both the Bristol Well and Bristol mine locations, including silica and feldspar. Some samples contain gypsum or calcite. Colors range from off-white or gray to light orange. There are almost no surface exposures of clay at either locality, and the described underground occurrences are small.

Selected References

Gemmill, P., 1968, The geology of the ore deposits of the Pioche district, Nevada, *in* Ridge, J. D., *ed*, Ore deposits in the United States, 1933-1967, The Graton-Sales Volume: New York, The American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., v. II, p. 1132-1147.

Hill, J. M., 1916, Notes on some mining districts in eastern Nevada: U.S. Geological Survey Bulletin 648, 214 p.

Myrick, D. F., 1963, Railroads of Nevada and eastern California, Volume Two--The Southern Roads: Berkeley, California, Howell-North Books, 933 p.
Paher, S. W., 1970, Nevada ghost towns and mining camps: Berleley, California, Howell-North Books, 492 p.
Papke, K. G., 1970, Montmorillonite, bentonite, and Fuller's earth deposits in Nevada: Nevada Bureau of Mines and Geology Bulletin 76, 47 p.
Tschanz, C. M., and Pampeyan, E. H., 1970, Geology and mineral deposits of Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 73, 188 p.
Westgate, L. G., and Knopf, A., 1932, Geology and ore deposits of the Pioche district, Nevada: U.S. Geological Survey Professional Paper 171, 79 p.
Whitehill, H. R., 1873, Biennial report of the State Mineralogist of the state of Nevada for the years 1871 and 1872: Carson City, Nevada.

CLEVE CREEK DISTRICT

Location

The Cleve Creek district, White Pine County, is in the central part of the Schell Creek Range about 15 miles east of Ely. The district includes prospects on the south side of Cleve Creek, near its mouth, and the Kolchek mine and adjacent prospects west of Kolchek Basin. All of the known mines and prospects in this district are within the Humboldt National Forest.

History

Gold-silver ore was discovered in this district in 1907 by Alex Kolchek (Stager and Tingley, 1988, p. 211). A 4-ton amalgamating and concentrating mill was erected on the property in 1923, about 75 tons of ore was treated, and a ton of concentrate containing 2 ounces of gold and 55 ounces of silver was sold (NBMG Files). The area was prospected for tungsten beginning about 1946 and, between 1946 and 1953, tungsten ore was mined from the Kolchek mine. Additional shipments of gold ore were also made during this time. Total recorded production from the district is 86 ounces of gold, 363 ounces of silver (Hose and others, 1976, p. 50) and 442 units of WO_3 (Stager and Tingley, 1988, p. 211). There is evidence of recent claim staking in Kolchek Basin, but the area was not active in the summer of 1990.

Geologic Setting

The rocks exposed in the area of the Kolchek mine include the Lower Cambrian Prospect Mountain Quartzite and Pioche Shale, and Middle Cambrian Pole Canyon Limestone which have been tilted westward, cut by faults in several systems, and intruded by quartz diorite (?) porphyry dikes. The Pioche Shale contains a limestone bed, 6- to 12-feet-thick, near its base. This limestone horizon, known as the CM bed , is considerably altered in the Kolchek mine area and is mineralized with iron oxide and calcium carbonate minerals. The quartz porphyry is highly weathered; it does not form outcrops in the mine area, but has been exposed in cuts and trenches (Smith, 1954, p. 2). The sedimentary rocks are cut and displaced by two major fault systems: one strikes N65°W and dips steeply to the southwest (the Kolchek fault system), and a second that strikes N45°E and mostly dips southeast (Stager and Tingley, 1988, p. 211-212).

Ore Deposits

The ore bodies at the Kolchek property are of two kinds, gold- and silver-bearing quartz veins (Cash mine), and scheelite-bearing carbonate and quartz veins and replacement bodies in a zone parallel to and in the footwall of the Kolchek fault (Kolchek mine). The gold-silver ores are low grade and were mined partly because a premium was available for their high silica content. Although they occur in the same mineralized zone, they were generaly mined in different stopes from the tungsten ores. The tungsten ore bodies are scheelite-bearing quartz veins, quartz carbonate veins, and replacement bodies along fracture zones in limestone north of the Kolchek fault (Smith, 1954, p. 2-3). The Cash mine and Kolchek mine are the same mine; the Cash mine refers to gold-silver ore stopes in the upper part of the Pole Canyon Limestone, and the Kolchek mine refers to tungsten ore stopes mined in the lower Pole Canyon Limestone at the same location (Stager and Tingley, 1988, p. 211-213).

The only other known mining activity in this district is near the mouth of Cleve Creek where two shafts and connecting underground workings explore a zone of quartz veining and silicification in Prospect Mountain Quartzite. Vein material contains sparse tetrahedrite.

Selected References

Drewes, H., 1967, Geology of the Connors Pass quadrangle, Schell Creek Range, east-central Nevada: U.S. Geological Survey Professional Paper 557, 93 p.

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

Smith, R. M., 1954, DMEA 3217 (Tungsten), Cleve Creek Mines, Inc., Kolchek tungsten mine, White Pine County, Nevada: Nevada Bureau of Mines and Geology White Pine County general file, Item 69, 4 p.

Stager, H. K., and Tingley, J. V., 1988, Tungsten deposits in Nevada: Nevada Bureau of Mines and Geology Bulletin 105, 256 p.

COOPER DISTRICT

Location

The Cooper district, White Pine County, is located on the eastern slope of the Schell Creek Range in the vicinity of Majors Place on U.S. Highway 50. The mines in the district are located in the lower eastern foothills of the range about one to one and one half miles north of Majors Place. Prospects on Rattlesnake Knoll, about 4 miles east of Majors Place, are also included in the Cooper district.

History

Mines were discovered and the district was organized in May, 1869 (White, 1871, p. 94). Early claims in the district were the Rappahannock, Potomac, Blue Lead, Carrick, California, Fairplay, and Cooper. The Cooper claim may be the area now know known as the Capitol Hills claims. Very little work appears to have been done on these claims, and no production is recorded. Recently, considerable bulldozer work has been done in the area of the old mines, but there was no activity in evidence in August, 1990. To the east, at Rattlesnake Knoll, a block of claims was staked in March, 1990, but that area, too, was quiet in the summer of 1990.

Geologic Setting

The eastern slope of the Schell Creek Range in the vicinity of the Cooper district is underlain by Cambrian rocks including Lower Cambrian Prospect Mountain Quartzite and Pioche Shale, Middle Cambrian Pole Canyon Limestone, Middle to Upper Cambrian Lincoln Peak Formation, and Upper Cambrian to Middle Ordovician limestone (Tschanz and Pampeyan, 1970, pl. 1). These rocks dip generally to the west, and the oldest formations crop out on the low eastern flank of the range. All or portions of the contacts between all of these formations are formed by low-angle faults, and the outcrop pattern of these rocks is that of a series of long, narrow, north-trending thrust slivers.

Rattlesnake Knoll, the eastern outlier of the district in Spring Valley, is composed of lithic-rich, dacitic welded tuff and volcanic breccia of Oligiocene (?) age (Drewes, 1967, p. 83). The small volcanic outcrop is surrounded by alluvium.

Ore Deposits

On the Capitol Hill claims, workings follow a northwest-striking, 20° northeast-dipping zone of quartz veining formed along bedding in a limy shale unit within the Pole Canyon Limestone. The section of veining is about 10 feet thick but individual veins are only 1- to 2-inches thick. The veins are stained with hematite and contain sparse tetrahedrite and green copper-oxide minerals. A low-angle fault contact separates the limy unit from a paper-shale unit to the west; massive Pole Canyon limestone crops out to the east. Both limy shale and massive limestone are in the lower plate of a thrust fault and mineralization is confined to the limy shale, directly beneath the thrust contact.

At Rattlesnake Knoll, pale green to light gray fluorite coats bouldery rubble and cements breccia fragments in lithic-rich welded tuff. Along the west side of the small hill, the rubble breccia occurs along north-south-striking, near-vertical fault zone. Calcite and iron-oxide-rich gossan fill vugs in the fault breccia. According to Papke (1979, p. 66-67), the principal exposure of fluorspar on the property is in a 17-foot-deep shaft near the center of the knoll where fluorite partly replaces rock over a 6- to 8-foot width along an east-west, vertical fault zone. Papke (1979, p. 66), describes the wall rock at this deposit as an epiclastic volcanic breccia that contains abundant subrounded quartzite, limestone, volcanic, and metamorphic fragments. Drewes (1967, p. 83) classifies the host rock as a fragmental dacite vitrophyre.

Selected References

Drewes, H., 1967, Geology of the Connors Pass quadrangle, Schell Creek Range, east-central Nevada: U.S. Geological Survey Professional Paper 557, 93 p.

Papke, K. G., 1979, Fluorspar in Nevada: Nevada Bureau of Mines and Geology Bulletin 93, 77 p.

Tschanz, C. M., and Pampeyan, E. H., 1970, Geology and mineral deposits of Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 73, 188 p.

White, A. F., 1871, Report of the mineralogist of the State of Nevada for the years 1869 and 1870: Carson City, Nevada, 128 p.

EAGLE DISTRICT

Location

The Eagle district, White Pine County, includes all of the Kern Mountains and the adjacent Red Hills. The district extends from the Utah border, east of Pleasant Valley, west to the Red Hills, which lie near the intersection of Spring Valley and Antelope Valley. The district includes a large area, parts of which have been known as the Pleasant Valley, Kern, Regan, Red Hills, and Tungstonia districts.

History

Showings of silver and gold were discovered in this vicinity in 1859 by employees of the Overland Mail Company, but the first claim, on the Mammoth mine, was not located until June 1868 (White, 1871, p. 81-82). The Pleasant Valley district, covering a section of the Kern Mountains extending for about fifteen miles northwest and five or six miles wide on the south side of Pleasant Valley, was organized in April 1869. In May of 1869, discoveries were made on the west side of the Kern Mountains (probably in the vicinity of the Glenco mine/Union claim in Lowes Canyon) and the Kern district was organized, taking in all of the Kern Mountains, including the earlier Pleasant Valley district. Miners in both areas agreed to merge the districts into one, and the name Kern was retained for the district (White, 1871, p. 82). There is no production recorded from this early period of mining, although Hill (1916, p. 205) reported that the Glenco mine was worked in the early 1880's.

In 1872, the district was enlarged to include the Red Hills, west of the original district, and the name of the district was changed to Eagle (Hill, 1916, p. 204-205). Production of about $120,000 in lead, silver, some copper, and minor amounts of zinc and gold is recorded from properties in the Red Hills between 1908-1919, 1923-1927, 1934-1942, and 1945-1958 (Hose and others, 1976, p. 52).

In 1910, the Regan huebnerite-bearing quartz veins were discovered on the southwestern flank of the Kern Mountains. A tungsten mill was erected near Mike Springs in 1915 and enlarged in 1916. The Tungstonia mine, the only mine at the new camp of Tungstonia, operated during World War I and again between 1938 and 1942. At this time, the district became known as the Regan or Tungstonia district (Hose and others, 1976, p. 52). Small intermittent shipments of huebnerite concentrate were made from the property between 1945-1952, but the mine has been inactive since that time. Scheelite was found to occur associated with silver minerals in some of the old Kern district-era properties on the north end of the district in 1940, and tungsten ore was shipped from these deposits in 1944 and 1954-55. Total tungsten production from the district is recorded at 8352 units of WO_3 (Stager and Tingley, 1988, p. 213-217).

There are new claim posts in evidence in several parts of the district, but, in August, 1990 no activity was noted.

Geologic Setting

The Kern Mountains lie in the eastern Great Basin within a belt of metamorphic core complexes that include the Snake Range to the south in White Pine County, and the Deep Creek Range to the east in Utah. The Kern Mountains consist of a granitic core surrounded by structurally complex rocks that include both a metamorphic envelope and an unmetamorphosed but much attenuated sedimentary cover (Ahlborn, 1977, p. 117).

The granitic core of the Kern Mountains is a complex body composed of two main intrusive masses, the Tungstonia and the Skinner Canyon plutons. Both intrusions have well-defined border facies of leucocratic and generally aplitic rocks. The core facies of the larger intrusion (Tungstonia granite) is a two-mica granite containing conspicuous books of muscovite up to 2 inches across; the smaller intrusion (Skinner Canyon granite) lacks muscovite. Within the core facies of both intrusions are abundant aplite dikes. Based on Rb-Sr isotopic data, the emplacement of the Tungstonia body occurred 60 m.y. ago, and the Skinner Canyon intrusion crystallized between 30 and 45 m.y. ago (Best and others, 1974, p. 1277).

The plutonic complex intrudes limestones and shales of Ordovician through Pennsylvanian age and the plutonic rocks are surrounded by a persistent contact aureole consisting of marble, calc-silicate rocks, mica schists, and quartzite. The most striking and evident structure in the sedimentary cover around the Kern Mountains is a complex series of low-angle faults emplacing younger strata upon older. Two generations of low-angle faults are exposed: an older set which is regional in extent and likely the result of the late Mesozoic Sevier orogeny, and younger low-angle faults that are the result of local Tertiary uplift and intrusion (Ahlborn, 1977, p. 117).

The Red Hills, to the west of the Kern Mountains core complex, are underlain by Ordovician Pogonip Limestone and Eureka Quartzite. The rocks are tilted 10° to 50° westward, and are cut by both normal and bedding-plane faults (Hose and others, 1976, p. 52).

Ore Deposits

Silver mineralization occurs in quartz veins, quartz segregations, and along structures in silicated limestone in several localities around the margins of the Kern Mountains pluton. Old workings south of Pleasant Valley, on the north side of the mountains, expose a manganese-oxide-stained quartz vein containing disseminated tetrahedrite as well as copper-oxide-mineral coatings. At the Antelope mine, on the northwest tip of the mountains, quartz veins up to 2-feet wide occur along a northwest-trending, near-vertical fault. Ore shoots in the veins are irregular lenses as much as 50 feet long containing silver-bearing tetrahedrite, malachite, azurite, chalcocite, and fluorite (Hose and others, 1976, p. 53). Both silver and tungsten ores were mined from this vein; some of the tungsten ores averaged about 4 percent WO_3, and silver ores averaged about 28 ounces silver per ton (Stager and Tingley, 1988, p. 214). In an interesting occurrence about 2 miles south of the Antelope mine, clots and disseminations and clots of galena and tetrahedrite occur in bands of massive white tremolite formed in limestone which has been cut by finger-like dikes of quartz monzonite. Old workings on the Union patented claim in Lowes Canyon explored a large mass of white quartz containing galena and tetrahedrite associated with a limestone-intrusive contact; this is thought to be the site of the old Glenco mine mentioned by Hill (1916, p. 205).

Tungsten has been mined from two types of occurrences within the Eagle district: from huebnerite-bearing veins at Tungstonia; and from scheelite-bearing veins cutting marble and weak skarn zones at the Antelope, Rees and Yellow Jacket properties. At Tungstonia, huebnerite occurs in a system of quartz veins that cut the Tungstonia pluton. The veins are about 100 feet or more apart and extend over an area about 1 mile long and one-half mile wide; there are five principal veins, but most mining has taken place in the two western-most veins. The veins strike about N20°E and dip about 60°E. Huebnerite occurs along with argentiferous galena, sphalerite, chalcopyrite, pyrite, and fluorite in irregular ore shoots within the quartz veins. Ore shoots range from a few inches to 22 feet thick, and have been mined to a depth of about 200 feet (Stager and Tingley, 1988, p. 215). At the Rees mine, scheelite occurs in a quartz vein that occupies a N75°E-striking fault zone cutting bleached and silicified limestone. The Antelope mine is described in the preceding paragraph. The ore at the Yellow Jacket prospect, on the east side of the Kern Mountains, resembles greisen. Scheelite occurs with chlorite, quartz, calcite, and possibly fluorite in silicated carbonate rocks associated with pegmatite dikes and sills. Scheelite is also known to occur on claims southeast of Tungstonia. Prospects in this area that have exposed minor amounts of scheelite occur in silicated dolomite cut by numerous quartz veins (Stager and Tingley, 1988, p. 214-215).

Base-metals deposits in the Red Hills are very different from mineral deposits to the east in the central part of the Eagle district. In the Red Hills, replacement deposits in zones of brecciation as much as 20 feet wide occur along faults that cut Ordovician limestones and quartzite. Exposures at the Red Hills mine, in the north part of the mining area, indicate that the replacement lenses formed in carbonate horizons at or below contacts with quartzite where the rocks have been intersected by northeast-striking structures. The siliceous replacement lenses extend along bedding away from the cross-cutting structures, and are enveloped by soft, manganese-oxide-rich gossan. Minerals present include cerussite, malachite, azurite, black calcite, fluorite, and abundant iron- and manganese-oxides. Hose and others (1976, p. 53), report bismuthinite at the Red Hills mine.

<u>Selected References</u>

Ahlborn, R. C., 1977, Mesozoic-Cenozoic structural development of the Kern Mountains, eastern Nevada-western Utah: Brigham Young University Geology Studies, v. 24, part 2, p. 117-131.

Best, M. G., Armstrong, R. L., Graustein, W. C., Embree, G. F., and Ahlborn, R. C., 1974, Mica granites of the Kern Mountains, eastern White Pine County, Nevada: remobilized basement of the Cordilleran Miogeosyncline?: Geological Society of America Bulletin v. 85, p. 1277-1286.

Hill, J. M., 1916, Notes on some mining districts in eastern Nevada: U.S. Geological Survey Bulletin 648, 214 p.

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

Sayeed, U. A., 1973, Petrology and structure of the Kern Mountains plutonic complex, White Pine County, Nevada and Juab County, Utah: Ph.D. dissertation, The University of Nebraska, Lincoln, Nebraska, 134 p.

Stager, H. K., and Tingley, J. V., 1988, Tungsten deposits in Nevada: Nevada Bureau of Mines and Geology Bulletin 105, 256 p.

White, A. F., 1871, Report of the mineralogist of the State of Nevada for the years 1869 and 1870: Carson City, Nevada, 128 p.

EAGLE VALLEY DISTRICT

Location

Several small mining areas scattered along the Nevada-Utah border in the Mahogany Mountains, east of Ursine, Nevada, are gathered under the general name Eagle Valley district. In Nevada, the areas include the Fay mining area, south of Deerlodge Canyon; the Deerlodge area, north of Deerlodge Canyon; and the Stateline Canyon area, several miles north of Deerlodge Canyon. Also included in the Eagle Valley district is the Horsethief Spring area in the southern Wilson Creek Range, east of Eagle Valley reservoir. The Horsethief Spring area has had no recorded production, and has historically not been included in the Eagle Valley district. No other mining areas are close by, however, and the Horsethief Spring prospects are logically included in the Eagle Valley district.

To the east, across the Utah state line, extensions of the Fay-Deerlodge area are included in the Gold Springs district and the Stateline Canyon area extends into Utah's Stateline district. A large portion of the Deerlodge-Fay-Gold Springs district is within Nevada, while most of the Stateline Canyon area -Stateline district is in Utah.

Only the northern part of the Eagle Valley district, the area north of Gold Bug Mountain, on the north side of upper Deerlodge Canyon, is within the BLM Schell Resource Area; the major portion of the district is within the Caliente Resource Area.

History

According to Perry (1976, p. 24), prospecting was done near Gold Springs, Utah as early as the 1870's, but discoveries in the Stateline and Deerlodge areas were not made until about 1896 (Tschanz and Pampeyan, 1970, p. 156). The largest mine in the Nevada part of the district, the Horseshoe mine near Fay, reported its greatest production between the years 1900-1903. Some production is reported for the years up to 1911, then nothing until 1932 when a revival of the district began which lasted until World War II. Following the war, a brief period of production (1949-1951) produced a few thousand dollars. Total production of the Eagle Valley district, 1900-1951 is recorded at $423,000 (Tschanz and Pampeyan, 1970, p. 159).

When this district was last visited, in 1983 and 1984, recent exploration activity was noted in most of the area. Large blocks of new claims were in evidence, and many properties showed signs of recent sampling. There was no activity in the Nevada portion of the district in June, 1984, but a small mining operation was underway east of the Confidence mine, in Utah. In 1986, Stout Construction Co. was reported to be mining at the Confidence mine in the Nevada part of the district, but this operation is now inactive (BLM mineplan notices data base, 5-1-90).

Geologic Setting

With the exception of the Horsethief Springs area, all of the Eagle Valley district is underlain by Tertiary volcanic rocks, mainly andesitic and latitic flows, tuffs and breccias (Tschanz and Pampeyan, 1970, p. 159). The prospects near Horsethief Spring are within Upper Cambrian carbonate rocks. The Mount Wilson and Parsnip Peak volcanic centers lie to the northwest of Eagle Valley, and the large Caliente caldron complex lies several miles to the south. Volcanic rocks in the Eagle Valley area may be related to either of these centers, or may be related to volcanic complexes centered to the east in Utah.

Ore Deposits

Mineral deposits within the Deerlodge-Fay-Stateline portion of the Eagle Valley district consist of crustified fissure fillings that contain chalcedonic and comb quartz, adularia, lamellar carbonate, and some fluorite along with pyrite, copper carbonate minerals, and free gold. Cerargyrite is reported from the Tempa (White Horse, Silver Star) mine, north of Deerlodge Canyon (Tschanz and Pampeyan, 1970, p. 160). Perry (1976, p. 23) and Tschanz and Pampeyan (1970, p. 159) mention the presence of gold telluride minerals in the district. Andesitic and rhyolitic wall rocks are highly silicified and laced with quartz veinlets along the margins of the mineralized fissures. The wall rocks are commonly brecciated some distance away from the veins, and the veins themselves sometimes contain silicified wall rock fragments. Bands of dark, fine-grained sulfides (and possibly tellurides) were noted in specimens from several of the mines. Strike directions of the various mineralized fissures range from N80°W, N50°W, N-S, to N20°-35°E. Veins seen at the largest mine in the Nevada portion of the district, the Horseshoe, strike N-S. Another, the Snowflake, described by Perry (1976, p. 37-38) as the largest vein system in the district, extends on a N15°20°W trend from Gold Springs Wash in Utah, to the northeast side of Buck Mountain in Nevada, where the system is surrounded by an envelope of quartz stockworks-veining about 100 feet wide. North of Deerlodge Canyon, the Tempa (White Horse or Silver Star) mine is located midway along an impressive N35°E-trending silicified zone that has a strike length of at least 7000 feet. This structural trend can be seen near the mine in the southeast corner of Section 13, T1N, R70E, and it extends through the Tempa mine area and on to the area of the prospects on the southwestern flank of Gold Bug Mountain. To the north of the central part of the Eagle Valley district, the Confidence mine is located on a N80°W-striking structure that is traceable in outcrop for at least 3500 feet. The old Bergin mine, in Utah, is on the southeastern projection of this structure.

Mineralization seen in the Horsethief Springs area is very different from that seen to east in the Deerlodge-Fay vein systems. At Horsethief Springs, carbonate rocks of Upper Cambrian age (Tschanz and Pampeyan, 1970, pl. 2) host the mineralization. Old prospects within this area explore areas of silicification and jasperoid which formed along shear structures in the carbonate rocks. Pods of massive manganese- and iron-oxide have been explored by shallow shafts, and lenses of white, crystalline barite are exposed in two prospect pits. Recent prospecting activity in this area isprobably for disseminated gold.

Geochemical Relationships

Sample results from select ore samples from the Eagle Valley district show almost no variability. Silver was reported present in all samples, in amounts ranging from trace to 2000 ppm; and all samples reported gold, in amounts from .05 to 1.3 ppm. Copper, lead, zinc, antimony, and arsenic values were all very low.

Selected References

Ekren, E. B., Orkild, P. P., and Dixon, G. L., 1977, Geologic map of Tertiary rocks, Lincoln County, Nevada: U.S. Geological Survey Map I-1041.

Gese, D. D., 1985, Mineral resources of the White Rock Range Wilderness Study Area (NV-040-202) Lincoln County, Nevada, and Beaver and Iron Counties, Utah: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 31-85, 12 p.

Perry, L. I.,1976, Gold Springs mining district, Iron County, Utah, and Lincoln County, Nevada: Utah Geology, v. 3, no. 1, p.23-49.

Thompson, K. C., and Perry, L. I., 1975, Reconnaissance study of the Stateline mining district, Iron County, Utah: Utah Geology, v. 2, no. 1, p. 27-47.

Toth, M. I., Stoneman, R. G., Blank, H. R., Jr., and Gese, D. D., 1986, Mineral resources of the White Rock Range Wilderness Study Area, Lincoln County, Nevada, and Beaver and Iron Counties, Utah: U.S. Geological Survey Bulletin 1728-B, 15 p.

Tschanz, C. M., and Pampeyan, E. H., 1970, Geology and mineral deposits of Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 73, 188 p.

FREIBERG DISTRICT

Location

The Freiberg district, Lincoln County, is located in the northern Worthington Mountains. The historic mines of the district are located in the central part of T1N, R57E, on the north flank of Worthington Peak. Two small prospects in the foothills of the Quinn Canyon Range, across the narrow part of Sand Springs Valley to the northwest of the Worthington Mountains, are also included in the Freiberg district.

History

According to Angel (1881, p. 485) ore was discovered and the Worthington district was organized in the fall of 1865. No work was done in the area until 1869, when additional discoveries were made to the south of the original properties, and the district was renamed Freyberg (White, 1871, p. 100). By 1872, the district was known by its present name, Freiberg, and 40 tons of ore were reportedly shipped from the Shonte mine in that year (Whitehill, 1873, p. 113). However, the earliest recorded production from the district was in 1919 when oxidized silver-lead ore was shipped from the Roadside property. More ore was shipped in 1921, and other shipments were made through 1948. Total recorded production from the district, through 1968 is $18,000 (Tschanz and Pampeyan, 1970, p. 173). Between 1980 and 1982, the Freiberg Mining Corp. was active in the district. Many of the old properties were explored and ore was mined from a pit at the north end of the district. An attempt was made to heap-leach this ore with cyanide. Leach pads and a solution recovery system were constructed, but the operation was apparently unsuccessful, and no production was recorded. There was no activity in the district at the time of our first examination (Fall, 1983), the district was not active in 1989, and it was apparent that no work had been done during the intervening years.

Geologic Setting

Rocks in the Freiberg district consist of complexly faulted lower Paleozoic carbonate rocks which have been intruded by two granite stocks. Many granitic and lamprophyre dikes cut the area, and the most of the limestone around the stocks has been converted to marble. Except for the tungsten prospects in the contact aureole of the western stock, most of the mines and prospects of the district are in limestones of the Ordovician Pogonip Group near the contact of the eastern stock. Two major thrust faults have been mapped in the Worthington Mountains. The Freiberg thrust, exposed along the crest and western side of the range, contains Ordovician rocks which have been moved eastward over all formations ranging from the Ordovician Pogonip Formation in the mineralized area, to Mississippian Scotty Wash Quartzite in the southern part of the range. At the north end of the range, complexly faulted post-Pogonip rocks appear to be the remnant of a second, lower thrust sheet. The ore bodies in the Freiberg district occur in rocks below both thrust sheets (Tschanz and Pampeyan, 1970, p. 172-173).

Ore Deposits

Two types of ore deposits have been explored within the Freiberg district; small, irregular replacement lenses or veins in altered limestone which contain silver-bearing sulfides, and skarn deposits which contain scheelite.

The silver-bearing base-metal sulfide veins formed along faults and are marked on the surface by jasperoid-gossan zones which cut silicified and silicated (to weak skarn) limestone. Galena, sphalerite, and pyrite occur in calcite-cemented limestone breccia along these zones. The oxidized portions of the breccias contain cerussite, malachite, and iron- and manganese-oxides. These deposits were mined mainly for their silver, lead, and zinc content, although some gold was also recovered.

In the deposits on the northwest tip of the district, sparse scheelite occurs in an epidote-calcite-diopside-quartz skarn. The skarn is very weakly developed, and there has been no tungsten production from the deposit.

Geochemical Relationships

Ore samples collected from the central Freiberg district are high in lead, zinc, copper, cadmium, and bismuth with low silver values. Some, but not all have high arsenic and antimony associated with the lead-zinc-copper and tin is present in five of the six samples taken in the east part of the district. Trace amounts of gold are present in four samples; one sample reported 1.6 ppm gold. The one sample collected from the skarn deposit contains high molybdenum as well as tungsten.

Selected References

Angel, M. ed., 1881, History of Nevada, with illustrations and biographical sketches of its prominent men and pioneers: Oakland, California, Thompson and West, 680 p. (reprinted 1958 by Howell-North, Berkeley, California).

DuBray, E.A., Blank, H. R., Jr., and Wood, R. H. II, 1986, Mineral resources, geology, and geophysics of the Worthington Mountains Wilderness Study Area, Lincoln County, Nevada: U.S. Geological Survey Bulletin 1728-A. 11 p.

Tschanz, C. M., and Pampeyan, E. H., 1970, Geology and mineral deposits of Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 73, 188 p.

White, A. F., 1871, Report of the mineralogist of the state of Nevada for the years 1869 and 1870: Carson City, Nevada.

Whitehill, H. R., 1873, Biennial report of the State Mineralogist of the state of Nevada for the years 1871 and 1872: Carson City, Nevada.

Wood, R. H., II, 1985, Mineral resources of the Worthington Mountains Study Area, Lincoln County, Nevada: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 69-85, 47 p.

GEYSER RANCH AREA

Location

The Geyser Ranch area is located in the Schell Creek Range about thirty-five miles south of Ely. The area lies on the east flank of the range, along the common border of White Pine and Lincoln counties. The mines in the area are located on the east flank of Mount Grafton. Properties south of the county line, in Lincoln County, are sometimes included in the Patterson district which is centered at Patterson Pass about 5 miles to the south.

History

Little is known of the mining history of this area. Early activity probably coincided with work in the adjacent Patterson Pass district, and may have commenced about 1869. The ruins of a stamp mill, located at the Lake Valley or Geyser mine in the Lincoln County part of the district indicates activity during the period 1900 to the 1930's. Schrader, 1931, p. 7, states that in 1920 and 1921, the Lake Valley Mining Co. shipped some siliceous silver ore and began building a 50-ton cyanide plant, in which, between 1922-1925, it produced some silver bullion. The location of this mine and mill are not described, but it may well have been the Lake Valley or Geyser mine. The Deer Trail tungsten deposit in White Pine County was discovered in 1918, and produced 47 units of WO_3 in 1956 (Stager and Tingley, 1988, p.217). There has been no other recorded production from the area. During the 1980's activity in the area has been limited to claim staking and limited prospecting in the southern part of the district

Geologic Setting

The Schell Creek Range in the vicinity of the Geyser Ranch area is underlain mainly by a thick sequence of Cambrian quartzite, shale, and limestone. The entire ridgecrest area near Mount Grafton and much of the steep west flank of the range is underlain by Lower Cambrian Prospect Mountain Quartzite. The Lower Cambrian Pioche Formation, mainly shale with minor amounts of quartzite and limestone, and Middle Cambrian Pole Canyon Limestone overlie the Prospect Mountain Quartzite on the east. Except where locally disturbed by faulting, the sedimentary rocks dip 30° to 40° to the east. Younger Paleozoic sedimentary rocks crop out on the west flank of the Schell Creek Range, west of the Geyser area.

Ore Deposits

At the Deer Trail mine in White Pine County about a mile east of Mount Grafton, huebnerite, with a little scheelite, occurs in a 2- to 3-feet-wide quartz vein that cuts Prospect Mountain Quartzite. The vein strikes N60° to 70°E and dips 40° to 50° southeast; the vein has been exposed by trenching for about 400 feet along strike (Stager and Tingley, p. 214. About 1.5 miles southeast of the Deer Trail mine, huebnerite-bearing quartz veins associated with fluorite and silver minerals occur at the Lake

Valley or Geyser mine (Stager and Tingley, 1988, p. 107). The Lake Valley deposit was mined for silver between 1920-1925.

Selected References

Chatman, M. L., 1986, Mineral resources of a part of the Mount Grafton Wilderness Study Area (NV-040-169), Lincoln and White Pine Counties, Nevada: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 29-86, 77 p.

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

Schrader, F. C., 1931, Notes on ore deposits at Cave Valley, Patterson district, Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 10 [University of Nevada Bulletin, v. 25, n. 3], 16 p.

Stager, H. K., and Tingley, J. V., 1988, Tungsten deposits in Nevada: Nevada Bureau of Mines and Geology Bulletin 105, 256 p.

Tschanz, C. M., and Pampeyan, E. H., 1970, Geology and mineral deposits of Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 73, 188 p.

Van Loenen, R. E., Blank, H. R., Jr., Barton, H., and Chatman, M. L., 1987, Mineral resources of the Mount Grafton Wilderness Study Area, Lincoln and White Pine Counties, Nevada: U.S. Geological Survey Bulletin 1728-F, 24 p.

GOLDEN GATE RANGE

Location

The Golden Gate Range lies between Garden Valley and Coal Valley in northwestern Lincoln County. The only known mining property is on the southeastern flank of the range about 4 miles north of Murphy Gap.

History

Nothing is known of the mining history of the area. Debris and machinery parts scattered about the mine site indicate that the latest activity was probably in the 1950's. Shafts at the site are shallow, and probably produced little, if any, ore.

Geologic Setting

The eastern Golden Gate range is composed of a westward-tilted block of Paleozoic rocks, consisting of the Guilmette Formation, Pilot Shale, Mississippian limestone, Chainman Shale, Scotty Wash Quartzite, and Pennsylvanian limestone and sandstone. The oldest rocks form the steep eastern face of the range, which is bounded by an inferred normal fault, the Golden Gate fault (Tschanz and Pampeyan, 1970, p. 95). The Pahranagat Range thrust plate is interpreted to project north into the Golden Gate Range. The lower boundary of this plate, which contains Ordovician, Silurian, and Devonian rocks that are thrust over Devonian and Mississippian rocks, passes along the east side of the range slightly west of the one prospect site.

Ore Deposits

The one prospect known to exist in this area explores an east-west-striking gossany lens of jasperoid formed in limestone. The prospect lies to the east of the trace of the Pahranagat Range thrust, in rocks in the lower plate of the thrust. Other parallel fracture zones cut the limestone, and are marked by narrow, pod-like jasperoid lenses.

Geochemical Relationships

Only one ore sample was collected from this area, but it gave unexpected results. The sample contained essentially no gold, silver, lead, or copper, and only a minor amount of zinc. Arsenic was anomalous, but almost no antimony was reported present. Chrome at 2000 ppm, and vanadium at 1500 ppm were very anomalous.

Selected Reference

Tschanz, C. M., and Pampeyan, E. H., 1970, Geology and mineral deposits of Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 73, 188 p.

HIGHLAND DISTRICT

Location

The Highland district, Lincoln County, is located in the northern Highland range and southern Bristol range and generally includes the area from near Arizona Peak to north of Stampede Gap. The Highland district is sometimes included with the Pioche district to the east and some properties are shared with the Comet district to the south. The Bristol/Jackrabbit district lies north of the Highland district; latitude 38° marks the boundary between these two districts. Most of the mines in the district are clustered about Arizona Peak on the east side of the Highland range and around Stampede and Manhattan Gap on the range crest near the junction of the Highland and Bristol ranges.

Only part of the Highland district, in the southern Bristol Range around Stampede Gap, is within the BLM Schell Resource Area; mines to the south in the Highland Range are in the Caliente Resource Area.

History

Silver discoveries were made on the eastern side of the Highland Range in 1868 and a camp was built near Highland spring the next year (Paher, 1970, p. 305). Ore was transported from the mines by wagon to a smelter at Bristol Well. Iron ore from the Manhattan mine at Manhattan Gap and oxidized lead-silver ores from the Mendha mine were used as fluxing ores at the smelter. A mill at Floral Spring, south of Highland Spring, was used to concentrate other silver ores from the district and these concentrates were also sent to the Bristol Well smelter. Accurate production figures for the Highland district have not been kept; after 1935 production has been generally lumped with the Pioche district. Tschanz and Pampeyan (1970, p. 147) estimate a gross production value of about $2,000,000 from the district, mainly in lead, silver, gold, copper, and manganese. The major production years were 1872 to 1932.

In 1983-1984, the only activity noted in the Highland district was in the vicinity of the Forlorn Hope - Mountain Lion mines on the western side of the district. Many areas there had been recently sampled, and new drill sites were seen south of the Mountain Lion mine. BLM records do not indicate any activity in the district at the present time (BLM mineplan notices data base, 5-1-90).

Geologic Setting

The Highland district is underlain principally by Cambrian rocks that were locally intruded by small stocks and dikes of quartz monzonite and granite porphyry. The main part of the Highland and Bristol Ranges is made up of an east-tilted block of Pioche Shale, Lyndon Limestone, Chisholm Shale, and limestone of the Highland Peak Formation which has been overridden by thrust plates of Upper Cambrian rocks. This thrust, termed the Highland thrust plate, is thought to underlie Arizona Peak and to have overridden the Pioche Hills to the east as well. The thrust sheet is highly faulted and is now eroded from large portions of the Highland range. In the area of Manhattan Gap, the Cambrian rocks were intruded and metamorphosed by a small stock of quartz monzonite.

Ore Deposits

Three general types of ore occurrences are present within the limits of the Highland district. The principal ore deposits are siliceous replacement veins in the thrust plate of Upper Cambrian rocks on Arizona Peak and bedded replacement deposits related to them. The second type of occurrence consists of skarn and quartz vein deposits related to the small intrusive center near Manhattan Gap. The third type of occurrence is limited to one property, the Forlorn Hope mine on the southeastern margin of the district. The Forlorn Hope is a manganese-rich zinc-lead replacement deposit in the Pioche Shale, similar to replacement deposits found in the Comet and Pioche districts to the south .

The replacement veins follow N70°-85° W fissures and ore occurs both along the fissures and in limestones adjacent to the fissures. Siliceous gossans with jasperoid and iron and manganese oxides form the surface expressions of these veins, and the ore consisted of lead carbonate with values in both silver and gold. Ore from the Manhattan mine at Manhattan Gap consisted of massive iron gossan in garnet skarn. Thick quartz veins cut the skarn and continue to the southwest for about two thousand feet. The manganese-zinc-lead replacement orebody at the Forlorn Hope mine appears to be similar to deposits to the south in the Comet district, and consists of quartz-manganosiderite-sphalerite-galena lenses that occur in a member of the Cambrian Pioche Shale.

It does not appear that the Pioche Shale has been extensively explored for replacement ore to the north of the Forlorn Hope mine, where the lower portion of the Pioche Shale is partially covered by the Highland thrust. Replacement bodies could exist in this area in favorable horizons which do not outcrop.

Geochemical Relationships

All of the ore samples collected from the Highland district show certain similarities; as expected, most are high in zinc, lead, copper, arsenic, and manganese. Silver was reported from all samples, but the values are not exceptionally high. The vein-replacement ores contain low but consistent antimony values and about half of these samples have anomalous tin and tungsten values. Samples taken from the Manhattan Gap area are high in molybdenum and tungsten but contain no antimony and only low lead-zinc values. The one sample from the manganese replacement deposit (Forlorn Hope mine) has high manganese, zinc, lead with moderate arsenic, no antimony, and low tin values. This association is also seen in samples from the Comet district to the immediate south of the Forlorn Hope mine.

Selected References

Gemmill, P., 1968, The geology of the ore deposits of the Pioche district, Nevada, *in* Ridge, J. D., *ed*, Ore deposits in the United States, 1933-1967, The Graton-Sales Volume: New York, The American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., v. II, p. 1132-1147.

James, L. P., and Knight, L. H., 1979, Stratabound lead-zinc-silver ores of the Pioche district, Nevada--unusual "Mississippi Valley" deposits *in* Newman, G. W. and Goode, H. D., *eds*, 1979 Basin and Range Symposium and Great Basin Field Conference: Rocky Mountain Association of Geologists and Utah Geological Association, p. 389-396.

Merriam, C. W., 1954, Cambrian rocks of the Pioche mining district, Nevada: U.S. Geological Survey Professional Paper 469, 59 p.

Paher, S. W., 1970, Nevada ghost towns and mining camps: Berkeley, California, Howell-North Books, 492 p.

Tschanz, C. M., and Pampeyan, E. H., 1970, Geology and mineral deposits of Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 73, 188 p.

Westgate, L. G., and Knopf, A., 1932, Geology and ore deposits of the Pioche district, Nevada: U.S. Geological Survey Professional Paper 171, 79 p.

KINSLEY DISTRICT

Location

The Kinsley district is in the southern part of the Kinsley Mountains in southern Elko and northern White Pine Counties. The mining properties are all grouped at the south end of the mountains about a stock of quartz monzonite porphyry. The stock crosses the county line; properties on its north contact are in Elko County and properties on its south contact are in White Pine County. Only the White Pine County part of the district is within the BLM Schell Resource Area.

History

Mineral showings were discovered in what were then known as the Antelope Mountains in December 1862 and the district was organized as the Antelope district. However, little development work was done until 1865 when the croppings were rediscovered by George Kingsley and the Kingsley district was organized (White, 1871, p. 63). Sometime thereafter, Kingsley was changed to Kinsley, the name in current use. The earliest mining probably took place on copper-lead-zinc-rich gossan outcrops along the northeast and southwest margins of the intrusive body that occupies the center of the district. The earliest records of production are for 1886-1887, after which there was little production until 1909-1917; additional production is recorded for 1930 and 1940-1945. Total recorded production from the district for 1862-1945 is about $11,104 in silver, lead, copper, and gold (Hose and others, 1976, p. 56). Scheelite was discovered in the Elko County part of the district in 1939, and a small amount of tungsten ore was mined in 1944 and between 1954-1956 (Stager and Tingley, 1988, p. 60-61).

In 1963, both the Doty and Morning Star areas were core drilled from surface, but no ore was found. In 1966 a deposit of marble was developed in the southwest part of the district on and north of the county line. Some marble was produced, but the deposit is not active at the present time. Recent activity in the district has been confined to the Elko County part of the district where Cominco Resources International and U.S. Minerals Exploration, in a joint venture, have delineated a disseminated gold deposit in an area north of the historic mines. Published reserve figures for the Kinsley Mountain gold deposit, which lies outside the Schell Resource Area, are 2.6 million tons at a grade of 0.046 ounces gold per ton (Bonham, 1989, p. 20).

Geologic Setting

Most of the southern half of the Kinsley Mountains is underlain by Cambrian dolomitic limestones which have been intruded by a Tertiary quartz monzonite stock. The stock is about a mile across in outcrop, and associated quartz monzonite and aplite dikes radiate from it. Near the stock, the limestones are locally metamorphosed to skarn and marble; these rocks are hosts for all of the known mineral deposits in the southern part of the district.

Ore Deposits

At the properties on the south margin of the intrusive body, lead-copper-silver ores occur as small replacement lenses and pods along northeast- and northwest-trending faults which cut silicated carbonate rocks. Outcrops are composed of gossany material and jasperoid and commonly contain green copper oxide minerals. Ore from the Morning Star mine consisted of chrysocolla, malachite, azurite, and limonite with minor amounts of melaconite (copper pitch), chalcocite, bornite, chalcopyrite, and pyrite. Carbonate wall rocks near the replacement lenses show stockwork webbing of manganese- and iron-oxide-stained silica. The Morning Star ore bodies were as much as 50 feet long, and were mined from stopes 5 feet wide or less, to a depth of 275 feet (Hose and others, 1976, p. 56).

Geochemical Relationships

Samples collected from the Kinsley and Morning Star mines showed a base-metal-rich skarn association of copper, lead, zinc with very high arsenic, antimony, and bismuth. Some silver is present along with trace amounts of gold.

Selected References

Bonham, H. F., Jr., 1989, *in* The Nevada mineral industry, 1988: Nevada Bureau of Mines and Geology Special Publication MI-1988, p. 19-25.Hill, J. M., 1916, Notes on some mining districts in eastern Nevada: U.S. Geological Survey Bulletin 648, 214 p.

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

Stager, H. K., and Tingley, J. V., 1988, Tungsten deposits in Nevada: Nevada Bureau of Mines and Geology Bulletin 105, 256 p.

White, A. F., 1871, Report of the mineralogist of the state of Nevada for the years 1869 and 1870: Carson City, Nevada.

LEXINGTON DISTRICT

Location

The Lexington district, White Pine County, is located on the eastern side of the southern Snake Range about 12 miles southwest of Garrison, Utah. The district extends from the drainage of Big Wash, on the north, to Black Canyon, on the south. All of the district is within the Humboldt National Forest and, with the sole exception of the Lexington Canyon (Bonanzy) mine, all of the known mines and mineral properties are now within Great Basin National Park.

History

A gold ledge was being prospected in this district in 1883 and it was reported that "...old mines in the district might be reopened" (Hose and others, 1976, p. 56). Nothing further is known of this activity, however, and no production of gold is reported. In 1916, tungsten was discovered in Big Wash and Lexington Canyons and production of scheelite ore was reported from the Big Wash claims in 1916-1917 (Stager and Tingley, 1988, p. 219). A 50-ton concentrating plant was constructed by Lexington Mines Co. in 1941 at the Bonanza mine and some tungsten concentrate was produced in 1941-1942. Additional production was reported in 1968 and 1976; total tungsten production for the Lexington district is about 2,000 units of WO_3 (Stager and Tingley, 1988, p. 219-220).

Geologic Setting

The following description of regional geology of the southern Snake Range is abstracted entirely from Whitebread and others (1983, p. 1-2).

The southern Snake Range is underlain mainly by sedimentary rocks of Precambrian to Permian age which are intruded by Jurassic to Oligocene granitic rocks. Tertiary conglomerate and ash-flow tuff locally overlie the upper Paleozoic rocks, and Quaternary deposits consist of alluvial material, glacial debris, and landslides. The Snake Range is separated into two distinct structural elements by the Snake Range dé collement, a low-angle fault that emplaced younger rocks over older rocks. Relatively undeformed, weakly metamorphosed lower-plate rocks, ranging in age from Precambrian to Middle Cambrian, are intruded by granitic rocks that, in places, are truncated by the dé collement. Upper-plate rocks, ranging in age from Middle Cambrian to Permian, are broken by high-angle faults and some low-angle faults. These faults are confined to the upper plate and terminate at the dé collement.

Rocks exposed in the Lexington district are mainly lower plate rocks of the Snake Range décollement which have been intruded by porphyritic quartz monzonite porphyry that is considered to be of Cretaceous age. The lower-plate sedimentary rocks include the Prospect Mountain Quartzite, Pioche Shale, Pole Canyon Limestone, and Lincoln Peak Formation of Early to Late Cambrian age. Middle

Cambrian to Devonian formations composed largely of limestone and dolomite, with relatively minor shale and quartzite, crop out in the southern part of the district, above the dé collement surface. The favorable host rocks for mineralization are in the lower plate of the dé collement.

Ore Deposits

At the Big Wash claims, in the north part of the district, scheelite, associated with quartz, occurs as large crystals along fractures in marbleized limestone. The scheelite does not appear to be localized in any particular set of fractures or in a particular limestone bed. Disseminations of scheelite occur in the limestone in places. Trace amounts of galena, specularite, and copper-oxide staining occur in some of the workings. The scheelite-bearing fractures were found by early operators to be too thin and widely spaced for an economic high-grade mining operation, and later prospectors found that the intervening rock contains too little scheelite to allow a large-scale, low-grade operation (Stager and Tingley, 1988, p. 220).

Scheelite occurs in narrow, irregular calcite veins in limestone at both the Good Hope and Lexington Canyon (Bonanzy) mines in Lexington Canyon. Veins at the Good Hope mine are up to 3 feet thick but contain very little scheelite; some scheelite is present in colluvium overlying bedrock here. At the Lexington Canyon mine, scheelite occurs as large crystals and masses in calcite veinlets up to 14 inches wide; alluvium in the shaft area contains fragments of the veins as well as grains and nuggets of placer scheelite (Stager and Tingley, 1988, p. 220).

Other mineral occurrences in the district include a showing of sparsely disseminated sulfide minerals containing copper, lead, silver, and zinc in an adit and cuts about 1 mile south of the Lexington mine (Whitebread and others, 1983, p. 3), and trace amounts of platinum-palladium which occur in panned concentrates of stream sediment samples from Lexington Creek and the South Fork of Lexington Creek (Brown, 1983, p. 6).

Selected References

Brown, S. D., 1983, Mineral investigation of the Highland Ridge Roadless Area, White Pine County, Nevada: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 68-83, 92 p.

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

Stager, H. K., and Tingley, J. V., 1988, Tungsten deposits in Nevada: Nevada Bureau of Mines and Geology Bulletin 105, 256 p.

Whitebread, D. H., Carlson, R. R., Moss, C. K., Kluender, S. E., and Brown, S. D., 1983, Mineral resource potential map of the Wheeler Peak and Highland Ridge Further Planning Areas, White Pine County, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1343-B, scale 1:62,500, with 7 p. pamphlet.

LINCOLN DISTRICT

Location

The Lincoln district, White Pine County, covers the west slope of the Snake Range in the vicinity of Mount Washington and Lincoln Peak. It extends from Lincoln Canyon, on the south, to about Williams Canyon on the north. The district is referred to as the Mount Washington district by Hose and others (1976, p. 58), and is also sometimes known as the St. Lawrence or Mount Wheeler district. All of the district is within the Humboldt National Forest and the eastern boundary of the district could be defined as the western boundary of Great Basin National Park. However, the two main mines in the district, the St. Lawrence and the Mount Wheeler, are west of this boundary and are not within the Park.

History

Mineral showings were discovered in this area on July 10, 1869, and the Lincoln district was organized two days later, on July 12. Many claims were located in a mineral belt described as being "...four miles long, north and south, and about two miles wide." Specimens from one mine, the Washington, assayed $517 per ton in silver and carried some copper, lead, and antimony (White, 1871, p. 95). Little development resulted from this early activity, however, and no production was recorded. In 1899, interest in the area revived and a New York company acquired the St. Lawrence property (probably the original Washington mine), began development, and shipped a small amount of high-grade lead-silver ore (Keiser, 1928, p. 987). In 1911, 22 tons of lead-silver ore was shipped from the St. Lawrence mine and, in 1939 and 1948-1949, the mine produced 75 tons of lead-silver ore containing minor copper (Hose and others, 1976, p. 58). There is no record of activity at the St. Lawrence mine since that time.

Tungsten was discovered at the Mount Wheeler mine on the west flank of Mount Washington in 1950, and between 1952 and 1955 about 1,000 tons of ore containing 1.0 percent WO_3 were produced from scheelite-bearing quartz veins and greisen by Mt. Wheeler Mines, Inc. Between 1955 and 1957, Cyprus Mines Corp. extended the underground workings eastward in search of an extension of lead-silver mineralization worked previously in the St. Lawrence mine, about 1 mile to the east. During this work, small amounts of beryl were encountered, and later, in 1958, ore and tungsten concentrate from the mine were analyzed and found to contain significant amounts of beryllium. In 1959, Beryllium Resources acquired an option on the property, and performed further work underground, as well as core drilling, with Brush Beryllium Co. providing beryllium assays. Reserves of about 100,000 tons containing 0.75 percent BeO were estimated following this work (Griffiths, 1964, p. 74). In 1960, the Anaconda Company optioned the property which, by then, consisted of more than 100 claims. Following the analysis of samples from the existing core and workings, 32,402 short tons of "positive" ore and 3,168 short tons of "probable" ore with an average grade of 0.60 percent BeO were calculated (Garmoe, 1960. p. 17). Most of the beryllium was found to be present as phenacite and bertrandite (Stager, 1960, p. 71). Anaconda also examined the Jeppson claims, located mainly north of the Mt. Wheeler Mines property, and found beryllium-bearing rock. Although Anaconda purchased the Mount Wheeler Mine in 1962, there has been little activity in the mine area following initial development, in 1968, of major beryllium deposits at Spor Mountain, Utah, by Brush Wellman, Inc. The Spor Mountain deposits contain several million tons of bertrandite ore averaging about 0.7 percent BeO (Davis, 1984, p. 173). Present holdings in the Mount Wheeler mine area include 111 unpatented lode claims (mostly claims originally staked by Mt. Wheeler Mines, Inc.) held by the National Treasure Mines Co. of Salt Lake City, and 47 unpatented claims staked by a group from Ely (the Jeppson claims). Workings consist of two major east-west adits on the Mt. Wheeler Mine claims, two small adits on the Jeppson claims, and several prospect pits.

Geologic Setting

The following description of regional geology of the southern Snake Range is abstracted entirely from Whitebread and others (1983, p. 1-2).

The southern Snake Range is underlain mainly by sedimentary rocks of Precambrian to Permian age which are intruded by Jurassic to Oligocene granitic rocks. Tertiary conglomerate and ash-flow tuff locally overlie the upper Paleozoic rocks, and Quaternary deposits consist of alluvial material, glacial debris, and landslides. The Snake Range is separated into two distinct structural elements by the Snake Range dé collement, a low-angle fault that emplaced younger rocks over older rocks. Relatively undeformed, weakly metamorphosed lower-plate rocks, ranging in age from Precambrian to Middle Cambrian, are intruded by granitic rocks that, in places, are truncated by the dé collement. Upper-plate rocks, ranging in age from Middle Cambrian to Permian, are broken by high-angle faults and some low-angle faults. These faults are confined to the upper plate and terminate at the dé collement.

Rocks exposed in the Lincoln district include the Prospect Mountain Quartzite which is overlain successively by the Pioche Shale, Pole Canyon Limestone, Lincoln Peak Formation, Johns Wash Limestone, and Corset Spring Shale, all of Cambrian age. The beds strike a little south of east and dip 5° to 30° south. The Pioche Shale is 285 to 450 feet thick and contains near its base a limestone member known as the Wheeler Limestone Member which correlates with the Combined Metals Member (CM bed) at Pioche. A granodiorite-quartz monzonite stock of Tertiary age crops out on the northeast slope of Mount Washington (Hose and others, 1976, p. 58).

Three sets of faults displace the sedimentary rocks; north-striking fractures and east-striking shear zones commonly dip steeply and have small displacements, whereas bedding or low-angle faults are of large displacement.

All the mines in this district are in the lower plate of the largest low-angle fault, the Snake Range dé collement of Whitebread and others (1969, p. 1-2).

Ore Deposits

Beryllium and tungsten mineralization in the Mount Wheeler mine area is almost completely restricted to the Wheeler Limestone Member, a sequence of limestone and some limy sandstone that is 8-50 feet thick and lies 15-65 feet above the basal contact of the Pioche Shale. Bedding in the area dips about 15° south. Massive to coarsely crystalline quartz veins and veinlets cut the shale and the underlying Prospect Mountain Quartzite, but are most abundant in the Wheeler Limestone. Most are nearly vertical and strike east-northeast, although a few steep north-south veins and shallow bedding-plane veins are also present. In the Wheeler Limestone, these veins locally carry white to purple fluorite, yellowish scheelite, and stubby prisms of colorless phenacite. Beryllium mineralization extends up to 25 feet away from the veins in the lower 10 feet of the Wheeler Limestone (Garmoe, 1960, p. 7). Alteration minerals associated with the veins consist mainly of white mica and fluorite. Scheelite and white to blue beryl are locally abundant in the sericitized rock, and phenacite was reported by Garmoe. Other minerals include galena, sphalerite, and bertrandite (Stager, 1960, p. 71), but it is not clear if they occur in veins or in altered rock. Limonite pseudomorphs after pyrite are common in surface samples of both vein and altered rock. Abundant brown carbonate (possibly siderite or manganosiderite) occurs in large areas in the Wheeler limestone, but is not associated with quartz veins or beryllium-tungsten mineralization in all cases, and may represent a separate alteration episode.

The Mount Wheeler beryllium-tungsten mineralization is considered to be derived from hydrothermal fluid ascending from a large granitic intrusion about 1000 feet below the mine workings (Whitebread and Lee, 1961, p. 122) and exposed about 3 miles to the north. However, samples of this granitic rock contain only 2-7 ppm beryllium (Lee and Bastrom, 1967) which is normal for granitic rock.

Based on our field work and unpublished underground data, beryllium-tungsten mineralization occurs locally within an area of at least 0.6 mi^2 at the Mount Wheeler mine. Calculated beryllium reserves apparently only account for mineralization encountered in workings and drill holes in part of this area. Although the deposit apparently has small reserves compared with those at Spor Mountain, it contains a significant resource of high-grade beryllium ore and is likely to be the site of future exploration.

Selected References

Davis, L. J., 1984, Beryllium deposits in the Spor Mountain area, Juab County, Utah, *in* Geology of northwest Utah, southern Idaho and northeast Nevada: Utah Geological Association Publication 13, p. 173-183.

Garmoe, W. J., 1960, Report on Mount Wheeler beryllium property, White Pine County, Nevada: unpublished Anaconda Company report, American Heritage Center, University of Wyoming, 17 p.

Griffiths, W. R., 1964, Beryllium, *in* Mineral and water resources of Nevada: Nevada Bureau of Mines and Geology Bulletin 65, p. 70-75.

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

Keiser, H. D., 1928, Development of St. Lawrence property near Ely, Nevada started: Engineering and Mining Journal, v. 125, June 16, 1928, p. 987.

Kluender, S. E., 1983, Mineral investigation of the Wheeler Peak Roadless Area, White Pine County, Nevada: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 56-83, 28 p.

Lee, D. D., and Bastrom, H., 1967, Fractionation of rare earth elements in allanite and monazite as related to the geology of the Mt. Wheeler mine area, Nevada: Geochemica et Cosmochemica Acta, v. 31, p. 339-356.

Stager, H. K., 1960, A new beryllium deposit at the Mount Wheeler mine, White Pine County, Nevada: U.S. Geological Survey Professional Paper 400-B, p. 70-71.

Stager, H. K., and Tingley, J. V., 1988, Tungsten deposits in Nevada: Nevada Bureau of Mines and Geology Bulletin 105, 256 p.

White, A. F., 1871, Report of the mineralogist of the State of Nevada for the years 1869 and 1870: Carson City, Nevada, 128 p.

Whitebread, D. H., and Lee, D. D., 1961, Geology of the Mount Wheeler mine area, White Pine County, Nevada: U.S. Geological Survey Professional Paper 424-C, p. 120-122.

Whitebread, D. H., Carlson, R. R., Moss, C. K., Kluender, S. E., and Brown, S. D., 1983, Mineral resource potential map of the Wheeler Peak and Highland Ridge Further Planning Areas, White Pine County, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1343-B, scale 1:62,500, with 7 p. pamphlet.

MARBLE CANYON DISTRICT

Location

The Marble Canyon district, White Pine County, includes both sides and the bottom of Marble Canyon on the east slope near the north end of the Snake Range. The district extends generally from the Utah state line on the east to Mormon Jack Pass on the northwest and south to the limits of the Marble Canyon drainage basin. With the exception of one silver prospect in Mormon Jack Pass, the only mining area in this district is near the mouth of Marble Canyon where several marble claims were located.

History

Two claims, the Marble Monster, and the Marble Vale, were staked in Marble Canyon in 1891, but only a few samples of the surface material were quarried. Other claims were staked in 1908. There are no official records of production, but small quantities of marble are reported to have been quarried and used for headstones at Garrison, Utah (Hose and others, 1976, p. 57).

The one metallic-ore prospect in the district, the Silver Glance claim, appears to have been worked in the 1930's. Bulldozer work in this area is more recent, but there has been no activity on the property for many years.

Geologic Setting

Most of the rocks in the Marble Canyon district are intensely deformed Paleozoic carbonate rocks that lie in the lower plate of the Snake Range décollement, a subhorizontal tectonic discontinuity separating rocks of different lithology, age, and metamorphic grade. The rocks below the décollement surface consist of a massive ledge of marble beneath which occur biotite gneiss, meta-quartzite, and phyllitic siltstone. Above the marble are unmetamorphosed Cambrian limestones (Coney, 1974, p. 973; Hose and others, 1976, pl. 1).

Ore Deposits

The marble prospects at the eastern mouth of Marble Canyon were developed in marble horizons related to the Snake Range décollement. The stratum is about 150 feet thick, and extends about 2 miles up the canyon near its mouth. The near-surface marble tends to slake and weather rapidly and is therefore of poor quality for uses such as headstones. Test lots of an attractive pink-colored marble suitable for crushed stone were quarried from 1966 to 1969 but, at the present time, there is no activity in the area.

The sole metallic prospect in this district, the Silver Glance workings, explores a east-west-striking, steeply-dipping quartz vein in massive limestone. The vein contains sparse amounts of tetrahedrite.

Selected References

Coney, P. J., 1974, Structural analysis of the Snake Range "Dé collement": Geological Society of America Bulletin, v. 85, p. 973-978.

Darton, N. H., 1908, Marble of White Pine County, Nevada, near Gandy, Utah: U.S. Geological Survey Bulletin 340, p. 377-380.

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

MOUNT MORIAH AREA

Location

The Mount Moriah area, White Pine County, includes all of the northern Snake Range extending generally from the north side of Silver Creek, on the south, to the drainages of Rye Grass and Smith Canyons on the north. Mount Moriah is in the center of this area. With the exception of small prospects near the mouth of Old Mans Canyon and some of the quartzite quarries at the mouths of Hampton and Hendrys Creeks, all of the area is within the Humboldt National Forest.

History

The Lead King mine, thought to be on the northwest edge of the area, was located in 1905. The mine operated between 1905-1917 and 1949-1952, producing about 433 tons of lead-silver-zinc-copper ore (Hose and others, 1976, p.81). In 1925, lead-silver concentrate was shipped from a small mill operating at the Silver Peak mine, at the head of Smith Creek in the north part of the area (Hose and others, 1976, p. 57). This mine may be the same as the Hanna mine, which produced lead-zinc-copper-silver ore in 1945, 1949, 1952, and 1955 (Wood, 1983, p. 6). The Galena mine, near the mouth of Horse Canyon, operated for a time in 1948 and produced 33 tons of lead-zinc ore containing a little silver and copper (Hose and others, 1976, p. 57).

Quartzite has been quarried since 1955 on the east side of Mount Moriah and sold as dimension stone, flagstone, and for other uses. According to U.S. Bureau of Mines records, production through 1968 was about 3000 tons from the Star Dust (Probert) mine. The latest recorded production was in 1987, when 200 tons were mined by Mt. Moriah Stone, Inc. (Nevada Department of Minerals, 1988, p. 32).

A small quantity of garnet has been mined from placer deposits in Hampton Creek, about 2 miles above its mouth. The garnet placer was developed in the early 1960's by excavation of a pit about 150 feet in diameter and 15 feet deep, and construction of a concentration plant; this area was covered by the Danniell placer claims (1-26) in 1963. The operation was abandoned by 1965 (Hose and others, 1976, p. 57). The concentration plant, now consisting only of the superstructure along with some tanks and piping, was fairly large. A stockpile of screened feed, estimated at 3000 tons, and several thousand product bags were found at the plant site in the summer of 1990. The bags, which were designed to hold 100 pounds of garnet abrasive under the trade name "GORCO", reported General Ore Reduction Co. of San Francisco, California as processor.

In 1988, a Canadian mining company proposed drilling in the Hampton Creek area to determine the potential for garnet production from the schist; this project was abandoned because of environmental constraints.

No evidence of current mining activity was seen in the Mount Moriah area when it was examined in the summer of 1990.

Geologic Setting

The Mount Moriah area is divided into two major geologic terrains separated by the Snake Range dé collement, a slightly warped, low-angle to flat-lying fault separating rocks of different lithology, age, and metamorphic grade. Rocks below the fault consist of Precambrian and Cambrian metamorphic quartzite, schist, phyllite, and marble which have been intruded by Cretaceous or Tertiary granitic magmas. Upper-plate rocks, rocks above the Snake Range dé collement, are slightly younger than the lower-plate rocks and range in age from Cambrian to Permian. These rocks consist of unmetamorphosed limestone, dolomite, siltstone, shale, and quartzite (Hose, 1981).

The upper-plate rocks are complexly faulted by both high-angle and low-angle faults while the lower-plate rocks are almost devoid of identified high-angle faulting. The entire package of faulted upper plate rocks was thrust into position over the lower-plate rocks sometime after the Cretaceous/Tertiary granitic intrusion of the lower-plate rocks (Hose, 1981).

The lower-plate rocks crop out in an north-northwest-trending band that extends from Hampton and Hendrys Creeks on the east to Mount Moriah and on to the northwest tip of the range; this band is flanked on the northeast and southwest by faulted upper-plate rocks. Small outcrops of intrusive rocks are found along the central band of lower-plate rocks, but the largest mass occurs on the southern boundary of the area, in the upper, eastern drainages of Silver Creek.

Ore Deposits

The largest production from the Mount Moriah area has been of quartzite building stone quarried from numerous quarries in the vicinity of Hampton and Hendrys Creeks along the eastern front of the Snake Range. The quartzite quarries are scattered over an area of at least four square miles in T15 and 16N, R70E, and four sets of placer mining claims are currently listed as active: Star Dust claims (9, located in 1954), Hendry's Creek claims (2, located in 1979), Grandpa claims (30, located in 1982-1989), and Quartzite claims (2, located in 1986). These claims contain very large reserves. Richard K. Hatch, who holds the Hendry's Creek and Grandpa claims, is listed as the owner and manager of Mt. Moriah Stone, Inc.

The quarried stone is hard, gray, thin-bedded to laminated quartzite with muscovite concentrated along cleavage planes. In places it can be seen to be isoclinally folded. It splits readily into 0.5 to 6 inch thick sheets along the cleavage, and also along more widely-spaced joints that are nearly perpendicular to the cleavage. It has been utlized for flagstone and dimension stone in buildings as far away as Illinois (Hose and others, 1976, p. 58).

Garnet-bearing gravel occurs along Hampton Creek for a distance of about 1.5 miles, and is estimated to have an average width of 150 feet and thickness of 15 feet. The garnet has weathered from a garnet-staurolite schist which is exposed along the sides of Hampton Creek canyon. Total tonnage of garnet-bearing gravel present is estimated at about 1.2 million short tons, and includes gravel derived from the schist and gravel that contains appreciable amounts of other rock types. The garnet, identified as almandine (Hose and others, 1976, p. 57), appears to comprise about 5 percent of the gravel. Gravel composed exclusively of broken-down schist was collected from the pit and tested using combined hand-panning and heavy liquid separation. It was found to contain approximately 6 percent garnet by weight. Visual examination of gravel that contains quartzite and limestone fragments shows that it contains considerably less garnet. The largest garnet grains are about 4 mm in diameter, and about 90 percent by weight of the garnet is less than 2 mm in diameter based on screening of garnet concentrate collected at the plant. The garnet is reported to contain abundant magnetite inclusions which might reduce its potential for abrasive use (Carlson and others, 1984, p. 5).

The garnet-bearing schist occurs in a 1,000-foot-wide zone in the vicinity of the placer area. According to Carlson and others (1984, p. 5), the garnet resource extends about 3.5 miles along the Hampton Creek drainage and this is presumably based on the extent of source rock. Garnet is estimated to comprise less than 5 percent of this rock, although it may be more abundant locally. Hose and others (1976, p. 57) report that some layers in the schist contain up to 20 percent garnet.

Small tonnages of silver-bearing, base-metal-sulfide ores have been mined from vein and replacement deposits in several parts of the area. At the Lead King mine, on the northwest, clots and lenses of fine-grained, crystalline galena and quartz occur along bedding in silicated limestone of the Cambrian Pioche Shale. Replacement ore bodies at the Silver Peak mine, at the head of Smith Creek, occur in marble of the Cambrian Pole Canyon Limestone along a fault contact with underlying quartzite of the Pioche Shale (Hose and others, 1976, p. 57). Other small vein and replacement deposits of lead-silver ore occur in faulted Cambrian limestones at the Galena mine, near the mouth of Smith Creek (Wood, 1983, p. 7), and at prospects in Hendrys Creek and in Old Mans Canyon, along the southern part of the area.

Tungsten occurs in one small prospect about two miles south of Dry Canyon, on the west side of the Mount Moriah area. At the Grand View prospect, coarse-grained scheelite occurs in silicified limestone along a 6-inch-thick streak of quartz, calcite, and galena. The prospect occurs in Cambrian Pole Canyon Limestone, about 100 feet above the contact with the underlying Pioche Shale (Lemmon, D. W., 1943).

<u>Selected References</u>

Carlson, R. R., and Wood, R. H., 1984, Mount Moriah roadless area, Nevada, *in* Marsh, S. P., Kropschot, S. J., and Dickenson, R. G., *eds*, Wilderness mineral potential--Assessment of mineral-resource potential in U.S. Forest Service lands studied 1964-1984: U.S. Geological Survey Professional Paper 1300, v. 2, p. 777-779.

Carlson, R. R., Martin, R. A., and Wood, R. H., 1984, Mineral resources of the Mount Moriah Wilderness Area, White Pine County, Nevada: U.S. Geological Survey Map MF-1244-B, scale 1:62,500, with 7 p. pamphlet.

Hose, R. K., 1981, Geologic maps of the Mount Moriah Further Planning (RARE II) Area, eastern Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1244-A, scale 1:62,500.

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

Lemmon, D. W., 1943, Grand View tungsten claims, Black Mountain Mining Co., Snake Range, White Pine County, Nevada: U.S Geological Survey unpublished memo, 1 p.

Nevada Department of Minerals, 1988, 1987 active mines in Nevada: Nevada Department of Minerals 1987 directory of active mines in Nevada, 32 p.

Wood, R. H., II, 1983, Mineral investigation of the Mount Moriah roadless area, White Pine County, Nevada: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 50-83, 27 p.

NORTH POINT SPRING AREA

Location

This area, east of U.S. Highway 93 about 12 miles south of Majors Place, contains only one known prospect. A shallow shaft is located near some gravel pits in the foothills of low hills east of the main Schell Creek Range.

History

Nothing is known of the history of this small area; the shaft appears to have been last worked in the 1920's but may be much older. Bulldozer work in the area is at least 10 years old.

White (1871, p. 97) describes a "Fairview district", located near Bennett Spring mountain in the southern continuation of the Schell Creek Range about 30 miles north of Patterson Pass. The district, organized in April 1869, contained several claims upon which at least one shaft was sunk on lead-silver-bearing veins. Other locations were said to occur about 6 miles to the south of these. Bennett Spring is in the main Schell Creek Range, about 6 miles east of the North Point Spring area, and the solitary prospect described in this report may be within White's Fairview district. Modern topographic maps (North Point Spring 7 1/2' map, 1973) show no mine workings or prospects in the area of Bennett Spring.

Geologic Setting

The prospect area is underlain by grey, fragmental limestone of Pennsylvanian age (Hose and Blake, 1976, pl. 1).

Ore Deposits

The one small prospect visited in this area was dug on a lens of gossany jasperoid replacement ore in limestone along a northwest-trending fracture zone. Mineralization consisted of pods of galena in a matrix of silicified limestone.

Selected References

Tschanz, C. M., and Pampeyan, E. H., 1970, Geology and mineral deposits of Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 73, 188 p.

White, A. F., 1871, Report of the mineralogist of the state of Nevada for the years 1869 and 1870: Carson City, Nevada, 128 p.

OSCEOLA DISTRICT

Location

The Osceola district, White Pine County, covers both sides of the crest and the western slope of the Snake Range from Osceola summit south to Willard Creek. This district is the only predominantly placer gold district in White Pine County and includes the Dry Gulch, Grub Gulch, Weaver Creek, Hogum, and Summit placer diggings, as well as lode gold mines located mainly along Pilot Knob Ridge above Dry Gulch.

History

Gold-bearing veins were discovered on the western slope of the Snake Range, in the vicinity of Pilot Knob Ridge, in August 1872. Early locations included the Western Slope, Exchange, Pilot, and Osceola lodes (Whitehill, 1875, p. 78). The Cumberland mine was located in 1874, and the Golden Eagle and Credit ledges were also being worked in that year. Ore from these ledges and the Osceola ledge were being treated in a Mexican arastra (Whitehill, 1877, p. 170-171). Lode workings in the district are grouped in five principal areas: Gold Exchange, on Pilot Knob Ridge; Mary Ann Canyon, south of Pilot Knob Ridge; Summit, at the base of the ridge south of Osceola Summit; Whitney, south of the Summit workings and higher on the ridge; and Mulligan, at the head of Jacks Gulch, between Pilot Knob Ridge and the Summit area. The most extensive underground workings were in the Star, Crescent, Time Check, Cumberland, and Exchange mines of the Gold Exchange group (Hose and others, 1976, p. 61).

In 1878, a stamp mill was erected to replace the earlier arastras; other stamp mills were built in 1916 and 1921, and the district produced lode gold intermittently at least through 1959, the last year of recorded production. Total lode production from the district, 1872-1959 is about $1,419,000 in gold, silver, lead, zinc, and copper (Hose and others, 1976, p. 62). This figure may include some production from the Woodman and Gilded Age mines in the adjacent Sacramento district.

Placer gold was discovered in the Osceola district in 1877. The richest deposits were found in Dry Gulch and Grub (Wet) Gulch near their confluence, north of Pilot Knob Ridge. Other placer deposits were discovered below Mary Ann Canyon in the Hogum area, and at the Summit diggings, near the crest of the divide several miles above Osceola. Placer mining has been done in the district intermittently over the years to the present; the main productive period, however, was between 1877-1901 when about $1,774,600 in gold and minor silver was produced. Total placer production through 1959, the last year of recorded production, is about $1,924,000 in gold and minor silver (Hose and others, 1976, p. 62).

Tungsten was discovered at the Pea Ridge mine (possibly the Skipper mine at the head of Ohio Canyon) in 1916, and both gold and tungsten concentrates were recovered from a stamp mill constructed on the property. Tungsten was found in ores at the Black Mule mine, near the mouth of Serpent Gulch, about 1930 and at the Dirty Shirt mine, on the south end of Pilot Knob Ridge, about 1941. Between 1930-1938 and 1941-1943, the Black Mule and Dirty Shirt mines produced about 1170 units of WO_3. The Skipper mine (Pea Ridge), in Ohio Canyon, produced an additional 175 units of WO_3 between 1916-1918 and 1954-1955 (Stager and Tingley, 1988, p. 224-225).

Bat guano (phosphate rock of Lincoln, 1923, p. 253) was found to occur in Rose Cave (Bat Cave), about 3 miles north of Osceola, sometime prior to 1917. About 1926, a tunnel was driven from the hillside below the cave opening into the lowest part of the cave to extract the guano (Hose and others, 1976, p. 61); no record of any production exists, however.

Marble has been quarried from deposits in a small drainage north of Serpent Gulch. It is not known when this deposit was being mined, but considerable equipment remains on the site, and it appears to have been active within the past year or two.

None of the various deposits in the Osceola district were active when the area was visited in August, 1990. Exploration and possibly some development was reported to have taken place on the Hogum gold placer properties within the past two years, however, and equipment remains on the property.

Geologic Setting

The oldest rocks in the exposed in the district are Precambrian quartzites, conglomeratic quartzite, and argillite. These rocks are overlain conformably by the Cambrian Prospect Mountain Quartzite, Pioche Shale, and Pole Canyon Limestone and are intruded by granitic rocks of Mesozoic(?) age. The sedimentary strata are tilted westward, commonly about 35°, but locally as much as 85°, and in some localities-notably at the Osceola mine, they dip north. The sedimentary rocks are cut by steep faults that trend north or northeast and both the granite and sedimentary rocks are cut by joints and sheeted zones of small displacement (Hose and others, 1976, p. 61). All of the sedimentary rocks exposed within the Osceola district lie in lower-plate rocks, below the Snake Range dé collement (Coney, 1974, p. 1).

Ore Deposits

Lode gold deposits occur in veins 1 to 3 feet wide or in groups of veinlets and stringers along sheeted zones in quartzite. Most of the lodes are made up of discontinuous veinlets of quartz that have filled narrow, parallel fissures in sheeted zones; these zones can be up to 15 feet wide and may extend along strike for half a mile. Iron-stained clay accompanies quartz which contains sparse, very fine-grained, disseminated pyrite and many fluorite-filled vugs. Gold occurs finely disseminated in the quartz and clay, and as flakes in the quartz or lining the vugs (Weeks, 1908, p. 126).

The various workings of the Gold Exchange Group, in and along Pilot Knob Ridge, are in the upper part of the Cambrian Prospect Mountain Quartzite, near the contact with the overlying Pioche Shale; the top of Pilot Knob Ridge is capped with limestone. In the mines in this area, gold occurs in two lode systems; one striking east-west, the other northeast-southwest. The gold is concentrated within fissure zones of varying width and is also disseminated to a greater or less extent in the beds of finely shattered quartzite (Weeks, 1908, p. 128-129).

At the Summit workings, east of Osceola, gold ore was mined from fractured and brecciated zones in Prospect Mountain quartzite. Quartz veins containing limonitic gossan and fine-grained free gold follow the breccia zones.

At the Black Mule mine, west of the mouth of Serpent Gulch in the southwestern part of the district, gold, and later tungsten, ore was mined from veins that cut Cambrian shale and limestone. A small body of granite intrudes the sedimentary rocks about 600 feet south of the mine. Scheelite occurs in a narrow quartz vein along a fault cutting the sedimentary rocks and in altered limestone adjacent to the vein. The vein trends about N45°W, and dips to the southeast (Stager and Tingley, 1988, p. 224-225). Material seen on the dump of this mine is mainly replacement ore consisting of jasperoid and jasperoid-cemented breccia; scheelite occurs with the jasperoid. Tungsten was also mined from an east-west-trending quartz vein in granite at the Skipper mine in Ohio Canyon. The vein contains free gold in limonite-after-pyrite casts as well as sparse galena and some scheelite.

Marble was mined from a deposit in the next drainage north of the Black Mule mine. Two small quarries were worked, an upper quarry in massive, fine-grained, white marble; and a lower quarry showing similar material but with abundant iron-oxide staining.

The extensive placer gold deposits in the Osceola district are localized in gravel above quartzite or limestone bedrock in the canyons and above several layers of caliche-cemented alluvium, called "false bedrock", in the alluvial fans. Deposits were mined as deep as 200 feet in the fans, but most of the production came from channels 20 to 30 feet deep, 2 to 8 feet thick, as much as 60 feet wide, and a mile or more in length. The gold is generally fine; nuggets are uncommon but one weighing 24 pounds, perhaps the largest nugget ever found in Nevada, was recovered from the Osceola placers in 1878 (Whitehill, 1879, p. 158).

Selected References

Coney, P. J., 1974, Structural analysis of the Snake Range "Décollement": Geological Society of America Bulletin, v. 85, p. 973-978.

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

Kluender, S. E., 1983, Mineral investigation of the Wheeler Peak Roadless Area, White Pine County, Nevada: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 56-83, 28 p.

Lincoln, F. C., 1923, Mining districts and mineral resources of Nevada: Reno, Nevada Newsletter Publishing Co., 295 p.Stager, H. K., and Tingley, J. V., 1988, Tungsten deposits in Nevada: Nevada Bureau of Mines and Geology Bulletin 105, 256 p.

Weeks, F. B., 1908, Geology and mineral resources of the Osceola mining district, White Pine County, Nevada: U.S. Geological Survey Bulletin 340, p. 117-133.

Whitehill, H. R., 1875, Biennial report of the state mineralogist of the State of Nevada for the years 1873 and 1874: Carson City, Nevada, 191 p.

Whitehill, H. R., 1877, Biennial report of the state mineralogist of the State of Nevada for the years 1875 and 1876: Carson City, Nevada, 226 p.

Whitehill, H. R., 1879, Biennial report of the state mineralogist of the State of Nevada for the years 1877 and 1878: Carson City, Nevada, 212 p.

PAHRANAGAT DISTRICT

Location

The Pahranagat district, Lincoln County, is located in the Mount Irish Range some 50 miles west of Caliente and about 10 miles northwest of the settlement of Hiko in the White River Valley. The mines in the district are located along Silver Canyon east of Mount Irish, high in the central part of the range.

History

According to Stretch (1867, p. 64), the Pahranagat district was located in March, 1865 by a group from "Panacker City", Utah. The camp was deserted for a time later that year but, in 1866, one to two hundred men had been in the district. Locations were made on Silver, McClusky, and Sanderson Mountains; some of the early claim names were Hatch, Ely and Sanderson, Utah, Illinois, Rio Virgen, Green Monster, List, Antelope, Darius, and Silver Wave. With the exception of the Illinois and List, most of these names have passed into obscurity. Early in 1867, a 5-stamp mill was erected at Hiko, another was built at Crescent, and a 10-stamp mill was under consideration (Browne, 1868, p. 427-428). By 1868, the mill at Hiko was equipped with 10 stamps and 5 roasting furnaces, and the List mill, at Crescent (Hetfield's) Spring, had 10 stamps and 4 roasting furnaces (White, 1869, p. 84). Raymond (1870, p. 194-201) estimated that, by 1868, nearly a million dollars had been spent in the district, but only $20,000 in bullion had been shipped; for 1869, Raymond estimated bullion production did not exceed $80,000. Active operations were suspended in 1871 and, in 1881, only ten miners were at work in the district (Angel, 1881, p. 485). Couch and Carpenter (1943, p. 84-85) record small amounts of production from the district for most years between 1881 and 1899, for 1912, 1939, and 1940; total recorded production, through 1943 is, however, only $61,022--less that Raymond's estimate for 1869 alone.

In 1950, mining began of a deposit of manganese ore developed on one of the old silver properties in the north part of the district. Between 1951 and 1957, during a period of government stockpiling and resultant high metal prices, $630.300 in manganese was produced from the Pahranagat district.

Total metal production from the Pahranagat district 1867 through 1957 is estimated to be between $710,802 (Couch and Carpenter, 1943, p.85, for 1869-1940; Tschanz and Pampeyan, 1970, p. 153, for 1941-1957) and $801,400 (Tschanz and Pampeyan, 1970, p. 153, for 1867-1957).

When the government buying program ended, manganese mining ceased, and, except for occasional prospecting, the district has been quiet until the present time. In 1987, a large claim block was staked in the southern part of Silver Canyon and limited surface exploration was done in that area. In the spring of 1990, another large block of ground surrounding the old Rosario Aucurio (List) mine was staked by Utah-BHP, but exploration had not commenced in May, 1990, when the district was last visited.

Geologic Setting

Rocks exposed on Mount Irish include the lower Paleozoic Pogonip Group, the Eureka Quartzite, and the Laketown and Ely Springs Dolomites. These rocks dip gently westward, and are inferred to be part of a major prevolcanic thrust plate that has overridden complexly faulted upper Paleozoic rocks exposed on the east side of Mount Irish. A major zone of steep north-south faults complicates the thrust relationship and obscures a large overturned fold inferred to exist beneath the thrust. Nearly all of the silver veins and the manganese deposits occur in the overthrust Ordovician rocks (Tschanz and Pampeyan, 1970, p. 149).

Rugged outcrops of Eureka Quartzite form most of the steep faces of upper Sanderson and Silver Canyons. In this area, the basal part of the Eureka Quartzite consists of a locally thick, angular breccia cemented with silica and manganese- and iron-oxides. Most of the silver deposits are found in the Pogonip Group rocks, below the Eureka Quartzite; the manganese deposits occur in the Ely Springs Dolomite, above the Eureka Quartzite.

Ore Deposits

In the central part of the Pahranagat district, historic mines such as the Illinois, Indiana, and the more recent Harrison follow shear zones in silicified limestone. At the Illinois and Indiana mines, the mineralized structures strike N10°-20°E and dip steeply northwest. Jasperoid replacement horizons occur in the limestone along the main silicified structures as well as along other cross-cutting structures. Ore consisted of lenticular zones of iron- and manganese-oxide-stained quartz and calcite which contained clots of tetrahedrite, galena, and other unidentified black sulfides, cerussite, anglesite, and oxide copper minerals. These properties are located along the eastern side of Mount Irish and, along with other nearby old workings, probably constitute the "Hyko lode" of Raymond (1870, p. 197).

West of Logan Pass, in the western part of the district, workings of the Rosey (Rosario Arcuri or List) mine follow a N60°W-striking quartz vein along a fault cutting silicified limestone. The vein contains galena, tetrahedrite, and oxide copper minerals. In places, workings appear to have followed lenticular replacement bodies formed in the limestones adjacent to the main northwest-trending structures. West of the main mine workings, small, lenticular outcrops of jasperoid can be seen along bedding in thin-bedded limestone in several areas; this area was being staked in May 1990.

The most productive deposit in the district was the South Paw manganese mine. Manganese deposits at the South Paw mine are gently-dipping, pyrolusite-rich replacement lenses in brecciated

Ely Springs Dolomite. The ore bodies occurred along bedding plane faults near the contact between the dolomite and the underlying Eureka Quartzite. Jasperoid outcrops near the manganese mine also contain manganese, but they were originally prospected for silver.

Geochemical Relationships

In general, all samples collected in this district display high silver and manganese associated with high arsenic, antimony, copper, lead, and zinc. Within this broad association, however, two apparently separate groupings exist.

Samples collected from manganese-rich jasperoids in the north part of the district and samples from properties around the South Paw manganese mine show, in addition to off-scale values for manganese, relatively low silver, copper, lead, antimony and zinc. Barium values in these are higher than values in the remainder of the district.

Samples from the vein and replacement silver occurrences, on the other hand, contain silver up to and exceeding 140 ounces per ton along with very high amounts of base-metals. High bismuth in samples from two properties on the west side of the district may indicate the presence of base-metal skarns associated with a buried intrusive in that area.

Selected References

Angel, M. ed., 1881, History of Nevada, with illustrations and biographical sketches of its prominent men and pioneers: Oakland, California, Thompson and West, 680 p. (reprinted 1958 by Howell-North, Berkeley, California).

Browne, J. R., 1868, Report on the mineral resources of the States and Territories west of the Rocky Mountains: Washington, D. C., Government Printing Office.

Couch, B. F., and Carpenter, J. A., 1943, Nevada's metal and mineral production: Nevada Bureau of Mines and Geology Bulletin 38 [University of Nevada Bulletin, v. 37, no. 4], 159 p.

Raymond, R. W., 1870, Statistics of mines and mining in the States and Territories west of the Rocky Mountains (for 1869): Washington, D. C., Government Printing Office.

Stretch, R. H., 1867, Annual report of the state mineralogist of the State of Nevada for 1866: Carson City, Nevada, 151 p.

Tschanz, C. M., and Pampeyan, E. H., 1970, Geology and mineral deposits of Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 73, 188 p.

White, A. F., 1869, Report of the state mineralogist of Nevada for the years 1867 and 1868: Carson City, Nevada, 96 p.

PATTERSON DISTRICT

Location

The Patterson district, Lincoln County, is located in the southern Shell Creek Range about 50 miles south of Ely. The district is centered at Patterson Pass, north of the road crossing the range between Lake Valley and Cave Valley. Most of the mining properties in the district are located at Patterson Pass, north of the road, and along the high crest of the range north of the pass. Mines in northern Cave Valley, west of Patterson Pass are also included in the district; the Cave Valley mines, however, are within the BLM Egan Resource Area.

History

According to Raymond (1870, p. 178-179), rich silver ores were found in Patterson Pass about 1869. The activity of the camp was apparently short lived and there does not seem to have been any deep mining on any of the old claims; no producion was recorded from this early period of activity. Schrader (1931, p. 7) mentions that work was done in the Cave Valley part of the district between 1920 and 1930. In 1941, claims were staked on tungsten prospects on the east side of the range at the foot Patterson Pass. About 1,000 tons of tungsten ore was shipped during World War II but, except for intermittent prospecting, the tungsten properties have been idle since that time. The last known tungsten activity was in 1981 when Union Carbide Corp. drilled several holes in the vicinity of the old mines.

In 1956, work began on the Jerry claims, located on the range crest north of Patterson Pass. In this area, exploration of zinc-copper-rich skarn deposits extended over several years and included considerable underground exploration. This area was not active in 1981, and there has been no activity in recent years.

Geologic Setting

This part of the Schell Creek Range consists entirely of beds of Prospect Mountain Quartzite, Pioche Shale, and Pole Canyon Limestone which strike generally north and dip eastward (Tschanz and Pampeyan, 1970, p. 167). North of Patterson Pass, slices of the Cambrian section are repeated along a few north to northwest-striking faults. These faults are truncated (?) by a major, east-west-striking fault whose trace is marked by the Patterson Pass drainage. Slide blocks of Cambrian rocks rest on the lower, eastern portion of the range near the Cinch mine and form the low, eroded hills in the northern part of Cave Valley, east of Patterson Pass. Small bodies of biotite quartz monzonite intrude the Pioche Shale in the area of the Jerry claims, along the range crest north of Patterson Pass (Tschanz and Pampeyan, 1970, p. 170), and are no doubt responsible for the formation of skarn deposits there. Granitic rocks have also been intersected in drill holes on the Cinch property.

Ore Deposits

Old mine workings at Patterson Pass, north of of the road crossing the range, explore silver- and copper-bearing quartz veins and replacement deposits emplaced along generally north-striking, high-angle faults. Quartz and calcite are abundant as gangue minerals, breccia cement, and as veins in the host rock; host rock in this area is Pole Canyon Limestone which is commonly silicified near the mineral deposits. The vein material contains pyrite, limonite-after-pyrite, tetrahedrite, and copper oxide minerals.

Tungsten mineralization within the district occurs in skarns developed in carbonate rocks along faults and in quartz veins. The ridge crest workings near Schwartz Tunnel Springs explore an extensive replaced horizon in the basal limestone of the Pioche Shale. Scheelite occurs here as disseminated flakes in skarn with chalcopyrite, sphalerite, and occasionally fluorite. The horizon is capped with an iron-rich gossan which can be traced from the Schwartz Tunnel workings southwest toward the Jerry claims. The ore zone is adjacent to a major, northwest-striking fault which offsets the Cambrian section in this part of the range. The dike at the head of Schwartz canyon described by Hill (1916, p. 122) was not located, but a piece of altered intrusive rock was found at the Jerry claims. Skarn samples collected from the ridge crest workings contain anomalous beryllium, tin, and tungsten in addition to lead-zinc mineralization. The geologic setting of these deposits and their associated minerals are identical in all but grade and proven extent to the large beryllium-tungsten-fluorite deposit at Mount Wheeler in the Snake Range of White Pine County. At the Cinch and Pip mines, on the eastern range front, scheelite is present in brecciated Pole Canyon Limestone. The brecciation may occur along a low-angle fault zone which separates a slide block of limestone from underlying rocks.

In the low hills of the Cave Valley portion of the district, lead- and copper-bearing replacement deposits and quartz veins follow narrow, north-striking fractured zones in limestone beds within the basal portion of the Pioche Shale.

Selected References

Chatman, M. L., 1986, Mineral resources of a part of the Mount Grafton Wilderness Study Area (NV-040-169), Lincoln and White Pine Counties, Nevada: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 29-86, 77 p.

Hill, J. M., 1916, Notes on some mining districts in eastern Nevada: U.S. Geological Survey Bulletin 648, 214 p.

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

Schrader, F. C., 1931, Notes on ore deposits at Cave Valley, Patterson district, Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 10 [University of Nevada Bulletin, v. 25, n. 3], 16 p.

Tschanz, C. M., and Pampeyan, E. H., 1970, Geology and mineral deposits of Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 73, 188 p.

Van Loenen, R. E., Blank, H. R., Jr., Barton, H., and Chatman, M. L., 1987, Mineral resources of the Mount Grafton Wilderness Study Area, Lincoln and White Pine Counties, Nevada: U.S. Geological Survey Bulletin 1728-F, 24 p.

PIERMONT DISTRICT

Location

The Piermont district, White Pine County, is located on the eastern slope of the Schell Creek Range generally east and northeast of North Schell Peak. Historically, the district has included only those mines near the mouth of Piermont Creek. In this report, however, a number of mines and prospects extending from McCoy Creek, on the south, to Piermont Creek, on the north, are included within the limits of the district. All of the known mineral properties in the district are within the boundaries of the Humboldt National Forest.

History

The major mine in the district, the Piermont mine, was located, and the district was organized on July 5, 1869 (White, 1871, p. 84). Raymond (1872, p. 203) mentions the Elephant, Latrobe, and Spear mines as active 1 to 3 miles south-southeast of Piermont but no other information is available on these properties. A small amount of ore was mined from the Piermont mine in 1870 and, in 1871, a 10-stamp mill was built on the property (Hose and others, 1976, p. 63). The mill was shut down in 1873 and, by 1874, the district was described as described as abandoned and not worthy of mention (Whitehill, 1875, p. 89). Recorded production, 1870-1873, is $40,355 (Couch and Carpenter, 1943, p. 152), although Lincoln (1922, p. 254) mentions an unofficial production estimated at $6,000,000. The Piermont mine remained closed until 1916, when 20 tons of ore were treated in a 4-stamp mill. In 1928, a 50-ton flotation mill was constructed near the main adit and the plant operated for a time in 1929, 1930, 1935, and 1936. Minor amount of ore were produced intermittently by lessees up through 1953; the district has had no recorded production since that time.

Geologic Setting

The eastern margin of the Schell Creek Range in the general area between Taft Creek, to the south, and extending north of Piermont Creek is underlain by Precambrian quartzite and dolomite marble of the McCoy Creek Group (Hose and others, 1976, p. 63). These rocks are displaced along faults related to a large low-angle fault exposed in the Taft Creek area (Hose and others, 1976, pl. 1).

Ore Deposits

Ore at the Piermont mine was mined from a N20°-40°E-striking, southeast-dipping zone of veining and silicification that occurred along a bedding plane fault in the lower part of a brecciated stratum of thin-bedded blue limestone and marble lying between two strata of quartzite. The breccia contains fragments of sulfide-bearing vein material and, in places, is totally silicified and composed of limestone and vein fragments floating in a dark, silica matrix. Most of the ore was mined from a stope 300 feet long, 5 to 8 feet wide, and 75 feet high above the upper tunnel. The ore shoot was later mined to a depth of 1,000 feet. Ore averaged about 13 ounces of silver and 0.04 ounces of gold per ton (Hose and others, 1976, p. 64).

In the southern part of the district, prospects near the mouth of McCoy Creek expose zones of silicification and quartz veining along north-south- to northeast-trending, low-angle shears in limy phyllite and thin-bedded limestone. In one area just north of McCoy Creek, an amphibolite dike follows the zone of silicification.

Selected References

Couch, B. F., and Carpenter, J. A., 1943, Nevada's metal and mineral production: Nevada Bureau of Mines and Geology Bulletin 38 [University of Nevada Bulletin, v. 37, no. 4], 159 p.

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

Lincoln, F. C., 1923, Mining districts and mineral resources of Nevada: Reno, Nevada Newsletter Publishing Co., 295 p.

Raymond, R. W., 1872, Statistics of mines and mining in the States and Territories west of the Rocky Mountains (for 1871): Washington, D. C., Government Printing Office.

White, A. F., 1871, Report of the mineralogist of the State of Nevada for the years 1869 and 1870: Carson City, Nevada, 128 p.

Whitehill, H. R., 1875, Biennial report of the state mineralogist of the State of Nevada for the years 1873 and 1874: Carson City, Nevada, 191 p.

SACRAMENTO DISTRICT

Location

The Sacramento district, White Pine County, is on the west slope of the Snake Range west of Sacramento Pass. The district lies south of U.S. Highway 50 and includes only a few small gold-silver-tungsten mines and prospects in Sections 17 and 18, T15N, R68E.

History

Gold-silver ores were discovered here by Jack Bastian and others on April 17, 1869, and the Sacramento district was organized. Claims including the Independence, Louisville, Baystate, Armstrong, Mammoth, Timoke, Oro Fino, Gem, Old Mortality, Alpine, Rambler's Luck, Great Eastern, Boston, La Plata, Aurora, Constitution, and Sacramento were located between April and July of 1869 (White, 1871, p. 83-84). Ores from the various properties ran as high as $112 per ton in silver and $400 per ton in gold but the ores were described as "base and rebellious" (Angel, 1881, p. 657), and treatment was apparently difficult. The mines proved unprofitable, and the district was abandoned by about 1875 (Lincoln, 1923, p. 254). No production is recorded for any of the early operations. The district was idle until 1914, when tungsten was discovered at the old Gilded Age mine. A tungsten mill was erected in 1915, and the property produced about 800 units of WO_3 between 1915-1916. Another estimated 100 units of WO_3 were produced between 1941-1942 (Stager and Tingley, 1988, p. 226). The only other recorded production from this district consists of 6 ounces of gold and 1 ounce of silver produced in 1964 (Hose and others, 1976, p. 76).

Exploration, including surface mapping, sampling, and diamond drilling was done in the central part of the district in 1975, but the district has been generally quiet since then. No activity was noted in August, 1990 when properties in district were visited.

Geologic Setting

Rocks exposed in the district consist of quartzite, shale, and limestone of Precambrian and Cambrian age. A section of the Snake Range dé collement, a subhorizontal tectonic discontinuity separating rocks of differing lithology, metamorphic grade, age, and tectonic style (Coney, 1974, p. 973), passes through the range in a northeast direction along the east side of the Sacramento district. Rocks to the east of the dé collement structure are mainly metamorphosed Precambrian quartzites while rocks to the west of the dé collement consist of limestone and shale of Middle Cambrian to Ordovician age.

Ore Deposits

Ore deposits in the district occur in carbonate veins, quartz veins and in silicified breccia zones along gently-dipping faults in Middle Cambrian limestone.

At the Gilded Age and Woodman mines, lenticular carbonate and quartz-carbonate veins containing iron-oxides, copper carbonates, and, locally, crystals and thin seams of scheelite, follow silicified breccia zones along bedding or bedding-plane faults in limestone.

At a similar occurrence at the Tungsten Queen property, south of the Woodman-Gilded Age area, scheelite occurs with oxide copper and lead minerals in calcite lenses along silicified zones that follow bedding horizons in limestone.

Selected References

Angel, M. ed., 1881, History of Nevada, with illustrations and biographical sketches of its prominent men and pioneers: Oakland, California, Thompson and West, 680 p. (reprinted 1958 by Howell-North, Berkeley, California).

Coney, P. J., 1974, Structural analysis of the Snake Range "Dé collement": Geological Society of America Bulletin, v. 85, p. 973-978.

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

Lincoln, F. C., 1923, Mining districts and mineral resources of Nevada: Reno, Nevada Newsletter Publishing Co., 295 p.

Stager, H. K., and Tingley, J. V., 1988, Tungsten deposits in Nevada: Nevada Bureau of Mines and Geology Bulletin 105, 256 p.

White, A. F., 1871, Report of the mineralogist of the State of Nevada for the years 1869 and 1870: Carson City, Nevada, 128 p.

SEAMAN RANGE

Location

The Seaman Range, Lincoln and Nye Counties, lies between Coal Valley and White River Valley. The few prospects in the range are located in the area north of Timber Mountain, on the northern tip of the range. The two largest properties are north of the county line, in Nye County, but recent prospecting activity has extended south along the western border of the range into Lincoln County. Most of the high, central portion of the northern Seaman Range is within the Weepah Spring Wilderness Study Area.

History

Very little mining activity is in evidence in this area. The Red Head claims, on the west side of the range, have been held by the Davies family since 1939 and, during the 1940's and 1950's, minor amounts of mercury were produced from the property (Gese and Harris, 1985, p. 5-6). On the northeast tip of the range, workings on the FNB claims appear to date from the 1920's or 1930's, but there has been no activity there for many years.

In 1955, Lincoln Uranium Co. was working on the Lucky Srike uranium claims on the northwest flank of the range, probably in the same general area as the Red Head claims. They are reported to have drilled 11 holes, totaling 647 feet (Garside, 1973, p. 71). In the 1960,s Bear Creek Mining Co. carried out exploration work in the Timber Mountain Pass area (Gese and Harris, 1985, p. 6); the purpose and outcome of this activity is not known.

The Seaman Range attracted interest for its disseminated gold potential early in the 1980's, and several large claim blocks were staked along the western edge of the range. In 1990, many areas were still being held by mining companies, and recent sampling and drilling activity was in evidence at several of the locations examined.

Geologic Setting

The northern end of the Seaman Range is underlain by a thick section of Paleozoic rocks ranging from the Silurian Laketown Dolomite to the Mississippian Joana Limestone and Chainman Shale. These rocks are overlain on the southwest by extensive intermediate to silicic ash-flow sheets. The northernmost part of a small volcanic center crops out in the west central part of the range, south of most of the prospecting areas. Several sets of normal faults cut the Paleozoic rocks; both the carbonate rocks and the volcanic rocks generally strike northwest and dip southwest (DuBray and others, 1987, p. 6). A north-trending, prevolcanic normal fault on the west side of the range, at the county line, separates Devonian and Mississippian rocks. This fault dips westward at about 45°, and is apparently offset by several later faults; conspicuous masses of jasperoid occur along the fault (Tschanz and Pampeyan, 1970, p. 95).

Ore Deposits

Most of the prospecting activity along the west side of the Seaman Range, on the ORA, CV, and Lost Shepherd claim blocks, has been carried out on large ledges of jasperoid which have formed in carbonate rocks along fault zones.

On the Lost Shepherd claims, silicification and a wide jasperoid ledge occur along a generally east-west-trending shear zone in Mississippian Joana limestone. The rock has undergone several periods of silicification and brecciation.

Prominent outcrops of jasperoid cap small hills in the Red Head claims area, on the northwest tip of the range. Adjacent to these outcrops, trenching has exposed kaolinized shale and limy shale along a N70°E- to N70°W-striking shear zone. Cinnabar occurs along this zone as small blebs formed on surfaces of chalcedonic-quartz fracture coatings. In this same general area (the exact location is not known), iron-oxide-stained, silicified silicified breccia has been drilled for uranium; selected samples are reported to have assayed 0.445 and 0.441 percent eU_3O_8 (King and Olsen, 1955, p.1).

Workings on the FNB claims, on the northeast tip of the Seaman Range, explore a narrow jasperoid-replacement lens in limestone. Oxide copper and zinc minerals occur in the silicified lens.

Selected References

DuBray, E. A., Blank, H. R., Jr., Turner, R. L., Gese, D. D., and Harris, A. D., 1987, Mineral resources of the Weepah Spring Wilderness Study Area, Lincoln and Nye Counties, Nevada: U.S. Geological Survey Bulletin 1728-E, 11 p.

Garside, L. J., 1973, Radioactive mineral occurrences in Nevada: Nevada Bureau of Mines and Geology Bulletin 81, 121 p.

Gese, D. D., 1988, Trace element distribution near jasperoids in the Weepah Spring Wilderness Study Area, Lincoln and Nye Counties, Nevada: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 12-88, 45 p.

Gese, D. D., and Harris, A. D., 1985, Mineral resources of the Weepah Spring Wilderness Study Area (NV-040-246), Nye and Lincoln Counties, Nevada: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 40-85, 56 p.

King, E. N., and Olsen, L. L., 1955, Lucky Strike (1-9) property, Lincoln County, Nevada: U.S. Atomic Energy Commission Preliminary Reconnaissance Report 3536, 1 p.

Kleinhampl, F. J., and Ziony, J. I., 1985, Geology of northern Nye County, Nevada: Nevada Bureau of Mines and Geology Bulletin 99A, 172 p.

Tschanz, C. M., and Pampeyan, E. H., 1970, Geology and mineral deposits of Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 73, 188 p.

SHOSHONE DISTRICT

Location

The Shoshone district, White Pine County, is on the west slope of the southern Snake Range about 45 miles southeast of Ely. The mines of the district are located between Swallow Canyon and Minerva Canyon low on the western front of the range. All of the district is within the Humboldt National Forest, although most of the mines and prospects are no more than 1 mile inside the Forest boundary.

History

Rich silver chloride ore was discovered in the outcrop of the Indian vein (the eastern part of the Scheelite Chief vein) on March 13, 1869, and the Shoshone district was organized on the same day (White, 1871. p. 96). Many claims were subsequently staked, but little work was done and the district was deserted about 1876 with no production recorded. The earliest record of production from the district is for 1911, when 22 tons of lead-silver ore were produced (Hose and others, 1976, p. 76).

Scheelite was discovered in the quartz veins in the district in 1915, and mining on a small scale began in 1916. The Nevada Scheelite Co. operated in 1917 and, in 1918, the Minerva Tungsten Co. took over operations. A 150-ton mill was completed in 1918, shortly before the collapse of the tungsten market at the end of World War I. Except for a small-scale leasing operation in 1932, the property was idle until 1936 when Tungsten Metals Corp. was organized. A new mill was built in 1938, enlarged in 1940, and production was more or less continuous until 1945 (Lemmon, 1944, p. 2). In 1952, Combined Metals Reduction Co. leased the property and formed a joint venture with American Zinc Co. to operate the lease. Some production is recorded through 1957, when the U.S. Government tungsten purchasing program ceased and all operations were closed at the Minerva mine (Lee, 1971, p. 2). A small amount of production is recorded from the tungsten mines between 1977-1978, but the district has been quiet since that time.

Total recorded production for the Shoshone district, 1869-1962, is 3 ounces of gold, 1,658 ounces of silver, and 56,906 pounds of lead (Hose and others, 1976, p. 77). Tungsten production, 1916-1978, is estimated at about 130,000 units WO_3 (Stager and Tingley, 1988, p. 227).

Geologic Setting

All of the known mines and prospects in the Shoshone district occur within a part of the Middle Cambrian Pole Canyon Limestone which, in the area of the mines, has been subdivided into three informally named members: Upper Black limestone, Upper White limestone, and Lower Black limestone (Lemmon, 1944, p. 5). In this area, the Pole Canyon Limestone lies below the Snake Range dé collement, a subhorizontal tectonic discontinuity separating rocks of differing lithology, metamorphic grade, age, and tectonic style (Coney, 1974, p. 973). The dé collement structure passes along the western front of the range in northerly direction and lies along the east edge of the Shoshone district. In this area, rocks above the dé collement surface are Upper Cambrian limestones, Ordovician rocks of the Pogonip Group, and the Devonian Guilmette Formation (Hose and others, 1976, pl. 1).

Limestone units of the Pole Canyon Formation regionally dip gently southwest, but in the mine area they are variously rotated along faults or folded. Premineral faults strike eastward and dip 40°-70° north. Other faults, most of which are postmineral. strike north and dip gently to steeply east or west or strike east and dip 45°-60° north (Hose and others, 1976, p. 76).

Ore Deposits

The ore bodies in the district are scheelite (and silver)-bearing ore shoots that occur in seven roughly parallel quartz veins occupying normal faults that strike east and dip 45° to 70° north. The veins, which are spaced at intervals ranging from a few hundred feet to about half a mile, are, from north to south, Hilltop, Canary Yellow, Lone Buck, Everit, Oriole, Scheelite Chief, and Chief Extension veins (Lee, 1971, p. 5). The veins range in width from a few inches to 30 feet, in length from 1,000 to 4,000 feet; the Everit, Oriole, and Scheelite Chief are the strongest and widest veins and are the most persistent along their strike. The veins consist mainly of quartz and calcite with some scheelite and, in spots, traces of tetrahedrite, galena, silver haloids, and powellite. The scheelite commonly occurs in coarse crystalline aggregates distributed through the quartz or aligned along fractures in the quartz (Lemmon, 1944, p. 9).

Within the veins, the tungsten ore occurs in shoots of limited vertical extent but with remarkable lateral continuity. The quartz veins are nearly barren outside the shoots, which occupy only a small part of the veins. The ore shoots rake 15° to 30° down to the west about parallel to with the bedding of the Upper White and Upper Black limestones. Each of the main veins has only one principal ore shoot, the largest was in the Chief vein which was mined 1 to 10 feet wide and as much as 140 feet high for a pitch length of 600 feet in one segment and 400 feet in another (Hose and others, 1976, p. 76).

The grade of ore mined from the district ranged from 0.3 to about 2.5 percent WO_3 and may have averaged about 1.0 percent. Scheelite concentrates from some localities contained as much as 4 ounces silver per ton (Hose and others, 1976, p. 77).

Geochemical Relationships

Ore samples collected from the major mines in the district were found to contain little else but tungsten along with minor amounts of silver and lead. With the exception of lead, base metals values were very low. Manganese was anomalous in most samples.

Selected References

Brown, S. D., 1983, Mineral investigation of the Highland Ridge Roadless Area, White Pine County, Nevada: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 68-83, 92 p.

Brown, S. D., 1985, The Tungsten Queen vein, Highland Ridge Roadless Area, White Pine County, Nevada: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 30-85, 11 p.

Coney, P. J., 1974, Structural analysis of the Snake Range "Dé collement": Geological Society of America Bulletin, v. 85, p. 973-978.

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

Lee, R. G., 1971, Report on Minerva tungsten mines, White Pine County, Nevada: unpublished private report, May 28, 1971, 13 p.

Lemmon, D. M., 1944, Tungsten deposits in the Minerva district, White Pine County, Nevada: U.S. Geological Survey unpublished report, February 1944, 24 p.

Stager, H. K., and Tingley, J. V., 1988, Tungsten deposits in Nevada: Nevada Bureau of Mines and Geology Bulletin 105, 256 p.

White, A. F., 1871, Report of the mineralogist of the State of Nevada for the years 1869 and 1870: Carson City, Nevada, 128 p.

Whitebread, D. H., Carlson, R. R., Moss, C. K., Kluender, S. E., and Brown, S. D., 1983, Mineral resource potential map of the Wheeler Peak and Highland Ridge Further Planning Areas, White Pine County, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1343-B, scale 1:62,500, with 7 p. pamphlet.

SILVER KING DISTRICT

Location

The Silver King district, Lincoln County, includes a small area on the west side of the southern Schell Creek Range about 12 miles southeast of Sunnyside. The Silver King mine and other prospects in the district are near Silver King Well, about 4 miles north of Silver King Pass.

History

Ore was discovered in this district in 1874, and the district was organized the same year. In 1881, ores from the mines were being hauled to Bristol Well for milling and smelting and no town had been built at the mine site (Angel, 1881, p, 485-486. Although there are moderately extensive workings at the site, the Silver King mine is credited with production of only 8 or 10 carloads of lead-silver ore; the date of the last known production was 1939 (Tschanz and Pampeyan, 1970, p. 175). In 1981, the district was being explored by the Anaconda Minerals Company. Anaconda did considerable surface exploration and drilling at the Silver King mine in 1981 and 1982 , but ceased work soon after that. In 1990, there was no sign of activity in the district.

Geologic Setting

As shown by Tschanz and Pampeyan (1970, pl. 2), the geology of the Silver King area is complex. A major north-trending fault separates low hills of Chainman Shale, Scotty Wash Quartzite, and Pennsylvanian limestone on the west side of the district from the high ridge of the Simonson Dolomite and the Guilmette Formation on the east. The rocks to the west of the normal fault are thought to be a down-dropped remnant of the Silver King thrust plate (Tschanz and Pampeyan, 1970, p. 175). The Silver King stock, a stock of quartz diorite about two miles long and as much as one mile wide is intruded along the north-trending fault zone. K-Ar age dates obtained from intrusive rocks in the district range from about 32 ma (unmineralized porphyry dike northeast of the stock) to about 28 ma (mineralized quartz monzonite porphyry from a drill hole); the stock itself was dated at about 31 ma (Wilson, 1982, p. 4).

Ore Deposits

Ore bodies at the Silver King mine occur near the contact between Guilmette limestone and a small body of quartz diorite porphyry which crops out northeast of the main stock. Ore occurs as small replacement deposits and veins, and lead-silver-arsenic sulfides are reported to be present (Tschanz and Pampeyan, 1970, p. 175).

At the Silver King mine, old workings and prospect pits explore replacement lenses in limestone along N55° W structures, and kaolinized dike rock occurs in some workings. Other nearby prospects also follow N40° W to N80° W fractures. Dumps are rich with gossan and jasperoid, and galena pods were found on several.

Drill holes, drilled in 1981 by Anaconda Minerals Co., southeast of the Silver King mine, encountered a complex, mineralized porphyry/skarn system with indications of polymetallic potential. About 12 porphyry rock types, ranging from mafic-rich granodiorite to low-mafic (rhyolitic?) quartz eye porphyry, along with at least 3 distinct veining episodes were identified in the drill core. The veining episodes consist of: 1) an early quartz-molybdenite-pyrite-scheelite stage, cut by 2) a quartz-calcite-pyrrhotite stage, cut by 3) late, weakly mineralized (chalcopyrite-pyrite) to barren quartz veins. Skarn mineralization encountered in drilling consisted of pods and stringers of massive magnetite cut by sulfide veins and patchy areas of disseminated sulfides. Pyrrhotite is the predominant sulfide, with less but equal amounts of sphalerite and chalcopyrite and less galena. Silver is present in amounts up to 2.5 ounces per ton, and tungsten, molybdenum, and tin are locally present.

Selected References

Angel, M. ed., 1881, History of Nevada, with illustrations and biographical sketches of its prominent men and pioneers: Oakland, California, Thompson and West, 680 p. (reprinted 1958 by Howell-North, Berkeley, California).

Tschanz, C. M., and Pampeyan, E. H., 1970, Geology and mineral deposits of Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 73, 188 p.

Wilson, G. E., 1982, Silver King project 1981 summary report: The Anaconda Minerals Company unpublished report, 4 p.

SILVERHORN DISTRICT

Location

The Silverhorn district, Lincoln County, is located in the southern Fairview Range about 25 miles northwest of Pioche. The mines and prospects in the district are northwest of Bristol Pass in the area generally between Fairview and Silverhorn Washes and Fairview Peak. The eastern part of this district, on the southeast side of the range, is sometimes referred to separately as the Fairview district. The entire area is also sometimes included in the Bristol/Jackrabbit district which lies south of Bristol Pass.

History

The Fairview, or National Lead mine, in the southeast part of the district, is reported to have been discovered about 1882 but, until 1922, nothing but assessment was done on the property (Westgate and Knopf, 1932, p. 67). The mine was active in 1926, but there is no production recorded. According to Paher (1970, p. 305), a silver strike was made in 1906 at the site of Silverhorn, on the western slope of the Fairview Range. Other accounts credit the discovery to J. L. Whipple who, while chasing a stray horse, found croppings of horn silver at the Silver Horn and Silver Dale deposits (Lincoln, 1922, p. 128) in the fall of 1920. A boom took place in early 1921 which subsided later in the year. No production is recorded from this activity. At some time prior to 1984, an open pit was developed on the site of the original Silverhorn mines. Ore was mined and hauled elsewhere, possibly to the mill at Atlanta, for treatment. No record of this production is known.

The Fairview perlite deposit was explored and mined sometime prior to 1951, and about 5000 tons of perlite was shipped to a grinding plant at Caselton. Operations were suspended when the Hollinger deposit, in the Wilson Creek Range, was developed (Cochran, 1951, p. 13).

There was no activity in this district in the summer of 1990, but many claim posts were in evidence, and recent drilling and trenching was noted near both the Silverhorn and Fairview properties.

Geologic Setting

The southern Fairview Range, in the vicinity of the mining properties, is underlain by complexly-faulted Devonian, Mississippian, and Pennsylvanian rocks which crop out as windows and fault-bounded blocks through overlying Tertiary volcanic rocks. The Paleozoic rocks crop out along a west-northwest-trending band that is skirted to the northeast and southwest by a thick section of andesite and dacite flows. Both pre- and postvolcanic faults cut the Paleozoic rocks. Coarse-grained, pink granite is exposed in contact with Devonian carbonate rocks in an area east of Fairview Wash (Tschanz and Pampeyan, 1970, p. 89).

Immense outcrops of jasperoid occur near the old camp of Silverhorn. The largest of these are hundreds of yards long and hundreds of feet wide, forming conspicuous dull-brown masses the make the ridge tops. The jasperoid has formed along faults which cut Mississippian limestone (Westgate and Knopf, 1932, p. 51).

Ore Deposits

The Fairview (Nevada Lead or Robison) mine was developed on a north-striking, east-dipping quartzose zone cutting Devonian limestone (Westgate and Knopf, 1932, p. 67). Silicified limestone and jasperoid crops out near the main Fairview shaft, and nearby rock is bleached, marbleized, and displays silica webbing along fractures. Unoxidized vein material found on the shaft dump contained clots and disseminations of galena.

At the Silverhorn mine, open pit mining has followed a wide N70°E-striking breccia zone that has been silicified into a rubbly jasperoid mass. Numerous northwest- and north-south-striking fractures also cut the jasperoid. The present pit is at the location of, and may include, the original silver workings. According to Westgate and Knopf (1932, p. 51), seams that traverse the jasperoid are splotched with horn silver, and the high assays that were obtained from sampling these films led to the short-lived boom in 1921. Other prospects in the Silverhorn area explore similar jasperoid outcrops; none, however, have been developed to the extent of the large Silverhorn jasperoid.

The Fairview perlite deposit, located about two miles north of the metallic occurrences in the district consists, of a 150-foot-wide mass of relatively pure gray to black perlitic vitrophyre at least 1300 feet long that dips at a moderate angle beneath mixed glassy and devitrified gray rhyolite. The perlite may be a feeder dike for partially devitrified flow rock. Reddish-brown glassy to devitrified ash-flow tuff caps the partly devitrified gray unit.

According to Cochran (1951, p. 13), the Fairview deposit contains more than one million short tons of commercial perlite. Cochran estimates total reserves for the deposit at about 6 million short tons, which probably includes a considerable amount of devitrified material.

Approximately 5,000 short tons of perlite were mined by the Combined Metals Production Co. from the Fairview deposit prior to development of the Hollinger perlite mine which yielded better quality material at lower cost (Cochran, 1951, p. 13). Most of this material was crushed at Castleton and sent to an expansion plant in Utah.

Selected References

Cochran, K. L., 1951, Union Pacific Railroad Company perlite resources, Meadow Valley Wash Area, Clark and Lincoln Counties, Nevada and Beaver and Millard Counties, Utah: Union Pacific Railroad Company unpublished report, 23 p.

Lincoln, F. C., 1923, Mining districts and mineral resources of Nevada: Reno, Nevada Newsletter Publishing Co., 295 p.

Paher, S. W., 1970, Nevada ghost towns and mining camps: Berkeley, California, Howell-North Books, 492 p.

Tschanz, C. M., and Pampeyan, E. H., 1970, Geology and mineral deposits of Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 73, 188 p.

Westgate, L. G., and Knopf, A., 1932, Geology and ore deposits of the Pioche district, Nevada: U.S. Geological Survey Professional Paper 171, 79 p.

SNAKE DISTRICT

Location

The Snake district includes the drainage areas of Snake and Baker Creeks on the east slope of the Snake Range south of Lehman Caves. The district extends generally from the crest of the range between Wheeler Peak and Baker Peak, east to the eastern base of the Snake Range. Most of the district is within the Humboldt National Forest, and all but the eastern border area is now within Great Basin National Park.

History

Specimens of ore were found in this area, and the Snake district was organized in February, 1869; according to the description in White (1871, p. 84), there was not sufficient encouragement to justify the expenditure of much capital or labor in the district. In November, 1873, the Snake Valley district was organized, covering the "...foothills on the eastern slope of Jeff. Davis Mountain [Wheeler Peak], the eastern boundary of the district being the State line" (Hose and others, 1976, p. 77).. Little work was apparently done at this time, however, and there is no record of production.

Scheelite-bearing veins along Snake Creek were discovered in 1913, and a shipment of tungsten concentrate was made the same year from the Tilford (Bonita) mine at Camp Bonita; additional production was reported from the same property in 1915 and 1916. Placer deposits of scheelite in the floor of Snake Creek Canyon below the Bonita mine were explored in the early 1940's, but only a few units of WO_3 were recovered. The Johnson mine located on the crest of the Snake Range south of Baker Peak, produced small amounts of tungsten ore in 1918 and 1934. Total tungsten production for the district is estimated to be about 500 units of WO_3 (Stager and Tingley, 1988, p. 230-231).

Lead ore was shipped from the Poljack claim in Young Canyon in 1929; seven tons of ore containing lead, copper, and silver are reported to have yielded about $450 (Hose and others, 1976, p. 77).

Geologic Setting

The following description of regional geology of the southern Snake Range is abstracted entirely from Whitebread and others (1983, p. 1-2).

The southern Snake Range is underlain mainly by sedimentary rocks of Precambrian to Permian age which are intruded by Jurassic to Oligocene granitic rocks. Tertiary conglomerate and ash-flow tuff locally overlie the upper Paleozoic rocks, and Quaternary deposits consist of alluvial material, glacial debris, and landslides. The Snake Range is separated into two distinct structural elements by the Snake Range dé collement, a low-angle fault that emplaced younger rocks over older rocks. Relatively undeformed, weakly metamorphosed lower-plate rocks, ranging in age from Precambrian to Middle Cambrian, are intruded by granitic rocks that, in places, are truncated by the dé collement. Upper-plate rocks, ranging in age from Middle Cambrian to Permian, are broken by high-angle faults and some low-angle faults. These faults are confined to the upper plate and terminate at the dé collement.

Rocks exposed in the Snake district are mainly clastic and carbonate rocks of Lower to Middle Cambrian age, the Prospect Mountain Quartzite, Pioche Shale, and Pole Canyon Limestone, which lie in the lower plate of the Snake Range dé collement. These rocks have been intruded by granitic rocks of Jurassic to Tertiary age. In the southeastern part of the district, sections of the dé collement structure are exposed; rocks in the upper plate of the structure include all formations from the Cambrian Lincoln Peak Formation to the Devonian Guilmette Formation. The upper-plate section is highly attenuated by normal faults and a few low-angle faults.

Ore Deposits

At the Bonita mine, scheelite, and locally galena and pyrite, occur in narrow, lenticular quartz veins that cut a thin marble bed. The veins strike about N15°E, and are vertical or dip steeply southeast. The placer deposit in the floor of Snake Creek Canyon, below the Bonita mine, is about 1,200 feet long, 200 feet wide at the upstream end, and 400 feet wide at the downstream end. Scheelite recovered from the placer deposit ranged in size from fine fragments up to nuggets weighing as much as 10 pounds. The average tungsten content of the placer deposit was about 1 pound of WO_3 per yard (Stager and Tingley, 1988, p. 231).

Mine workings at the Johnson mine consist of about 1,400 feet of drifts which follow thin quartz veins cutting a coarse-grained granite. The pegmatitic veins are 1 to 4 inches wide and consist of glassy quartz, mica, feldspar, scheelite, beryl, topaz, and pyrite (Stager and Tingley, 1988, p. 231).

According to Whitebread and others (1983, p. 2), tungsten and silver were mined from a zone of highly brecciated limestone of the Pole Canyon and Lincoln Peak Formations near the dé collement at the Poljack mine in Young Canyon. Nothing more is known of this occurrence. It is, however, the only property in the district to lie outside of Great Basin National Park.

Selected References

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.
Kluender, S. E., 1983, Mineral investigation of the Wheeler Peak Roadless Area, White Pine County, Nevada: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 56-83, 28 p.

Stager, H. K., and Tingley, J. V., 1988, Tungsten deposits in Nevada: Nevada Bureau of Mines and Geology Bulletin 105, 256 p.

White, A. F., 1871, Report of the mineralogist of the State of Nevada for the years 1869 and 1870: Carson City, Nevada, 128 p.

Whitebread, D. H., Carlson, R. R., Moss, C. K., Kluender, S. E., and Brown, S. D., 1983, Mineral resource potential map of the Wheeler Peak and Highland Ridge Further Planning Areas, White Pine County, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1343-B, scale 1:62,500, with 7 p. pamphlet.

TUNGSTEN DISTRICT

Location

The Tungsten district (also known as the Hub district), White Pine County, is at the base of Wheeler Peak on the west slope of the Snake Range. As described by Hose and others (1976, p. 79), the district is centered around Hub Mine Basin in T13N, R68E, and includes both Wheeler Peak and Baker Peak to the south. All of the district is within the Humboldt National Forest, and the western boundary of Great Basin National Park is only about one half mile east of the mines in Hub Mine Basin.

History

In 1889, a black mineral noted in quartz veins in this area was identified as huebnerite. The first mining claims covering outcrops of what became the Hub mine were located in 1899, and a small shipment of hand-sorted ore was made from the property that year. The Tungsten mining district was organized in 1900 and about 10 tons of concentrate containing 65 to 70 percent WO_3 was produced during the year. Several operators, including J. H. Marriott, Tungsten Mining and Milling Co., Huebnerite Tungsten Co., and U.S. Tungsten Corp. worked the Hub mine between 1900 and 1917. The district was idle from 1917 to about 1941 when a little placer concentrate was produced. During 1950-1955, the old dumps were reworked and about 170 units of WO_3 were recovered (Stager and Tingley, 1988, p. 231). The district has been inactive since 1955.

Total production from the Tungsten district, 1899-1955, is about 11,000 units of WO_3 (Stager and Tingley, 1988, p. 231).

Geologic Setting

The Hub Mine Basin is underlain by quartz monzonite of Jurassic age that is intrusive into, and rudely layered parallel with, Precambrian quartzite. Five prominent quartz veins and several smaller ones cut across the layering of the granite but do not persist into the quartzite (Hose and others, 1976, p. 79).

Ore Deposits

The veins in the district strike northeast and dip southeast, except for the main Hub vein which dips 60°NW to vertical. The main Hub vein is 3 inches to 5 feet wide and is stoped intermittently for about 1,000 feet along its strike. Nearly all of the Hub vein is mineralized but the best ore was found in shoots 15 to 25 feet long separated by lower-grade portions of the vein of about the same length. Huebnerite is the main ore mineral, although scheelite is disseminated sparsely in some parts of the vein. Huebnerite occurs as fine grains and crystals as much as 3 inches long disseminated in the quartz and as veinlets and lenses as much as 3 inches thick along fractures in the quartz. The principal gangue mineral is dense, white quartz accompanied locally by small amounts of fluorite and pyrite.

Average grade of the ore mined from the Hub deposit was about 1.4 percent WO_3, but a 1-ton shipment of cobbed and sorted ore contained nearly 20 percent WO_3 (Hose and others, 1976, p. 79).

Selected References

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

Kluender, S. E., 1983, Mineral investigation of the Wheeler Peak Roadless Area, White Pine County, Nevada: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 56-83, 28 p.

Stager, H. K., and Tingley, J. V., 1988, Tungsten deposits in Nevada: Nevada Bureau of Mines and Geology Bulletin 105, 256 p.

Weeks, F. B., 1908, Tungsten deposits in the Snake Range, White Pine County, eastern Nevada: U.S. Geological Survey Bulletin 340, p. 263-369.

Whitebread, D. H., Carlson, R. R., Moss, C. K., Kluender, S. E., and Brown, S. D., 1983, Mineral resource potential map of the Wheeler Peak and Highland Ridge Further Planning Areas, White Pine County, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1343-B, scale 1:62,500, with 7 p. pamphlet.

WHITE CLOUD DISTRICT

Location

The White Cloud district, White Pine county, lies north of White Cloud Mountain on the northern tip of the Snake Range. The only known mines and prospects in this area are found in the drainage of White Cloud Canyon and to the east, along the south margin of White Cloud Basin.

History

According to Hose and others (1976, p. 81), the White Cloud district was never organized officially, but was named prior to 1905 for a prospector's mule that died while crossing White Cloud Point. They also state that the only mine in the district, the Lead King, thought to be located somewhere near the summit of White Cloud Mountain, produced some 443 tons of lead-silver-copper-zinc ore between 1905-1917, and 1949-1952. Hose and others (1976,p. 81), go on to express doubt that the recorded production actually originated at the mine in the White Cloud district but instead, came from a mine of the same name in the Duck Creek district, south of Mcgill.

The mine production is not questioned here, but the location of the Lead King mine is questioned. There is no mine shown on maps detailed maps of White Cloud Mountain (Third Butte East 7 1/2' quadrangle, 1986); a mine fitting the description of the Lead King mine, however, is located in the Mount Moriah district further south in the Snake Range.

The two small prospects found in White Cloud Basin appear to have been first prospected in the 1920's or 1930's, and have been inactive for many years. New mining claims, however, were in evidence near the prospect in White Cloud Canyon.

Geologic Setting

Rocks exposed along the southern margin of White Cloud Basin are metamorphosed carbonate rocks of Middle Cambrian age that have been intruded by small bodies of granitic rock.

Ore Deposits

Only two small mineral occurrences were found in this district. At the Cedar Ridge #1 claim, in White Cloud Canyon, a 4-foot-wide iron- and manganese-oxide-stained quartz vein cuts marble and altered granitic rock. At the second area, about 1 mile to the southeast, a calcite-cemented marble breccia containing clots and streaks of galena follows a northeast-striking, steeply-dipping fault zone in marble. These prospects produced little, if any ore.

Selected References

Hose, R. K., Blake, M. C., and Smith, R. M., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

WILLOW CREEK DISTRICT

Location

Historically, the Willow Creek district, Nye County, included only mines south of Nyala, in the drainage of Willow Creek on the west slope of the Quinn Canyon Range (Hill, 1916, p. 144). Kral (1951, p. 216) expanded the district to include properties in the vicinity of Adaven near the mouth of Cherry Creek on the east side of the range. This area, also known as the Sharp area, extends north of Cherry Creek into the northern Grant Range. Kleinhampl and Ziony (1985, p. 227) follow the usage of Kral, but note that the name Quinn Canyon district is sometimes applied to the expanded district. In this report, Willow Creek district refers to all of the southern Quinn Canyon Range extending from the general area of Willow Creek, on the west side of the range, and Cherry Creek, on the east side of the range, south to the Lincoln County line. Most of this area is within the Humboldt National Forest and only a small part, the area on the east slope of the range, east of the Forest boundary, is within the BLM Schell Resource Area.

History

Hill (1916, p. 147-148) credits the first discoveries in the district to Charles Sampson and David Jenkins who located the Rustler claim east of Nyala on an arsenical gold-silver deposit. Other small deposits containing gold and silver were discovered nearby, and shipments were made from some during the periods 1917-1926, 1938-1939, and 1948. Total recorded production from the district, through 1961, is $115,700 (Kleinhampl and Ziony, 1985, p. 227).

Fluorite was discovered west of Cherry Creek, in the central part of the district, in 1934 and other deposits were discovered to the west, near Quinn Canyon, in 1941 (Papke, 1979, p. 48). Fluorite deposits also occur in the southern Quinn Canyon Range, south of the Lincoln County line; the Lincoln County part of the district, however, was not staked until 1952-1953. While only about 29,500 tons of fluorspar have been produced from what is known as the Quinn Canyon fluorite district, it contains the largest concentration of fluorspar deposits in Nevada (Papke, 1979, p. 48).

There has been no fluorspar production in the Quinn Canyon district for many years. In 1984, however, there was considerable activity related to precious metal exploration taking place and several major mining companies, including Superior Oil, Cominco American, and Amoco Minerals, controlled large claim blocks within the district. This activity was generally in the area of Adaven, north and south of Cherry Creek along the Humboldt National Forest boundary. BLM records do not indicate any activity in the district at the present time (BLM mineplan notices data base, 5-1-90).

Geologic Setting

The southern part of the Quinn Canyon Range consists mainly of Tertiary volcanic rocks through which several isolated blocks of Paleozoic carbonate rocks are exposed. A rhyolite plug cuts the volcanic rocks in Cottonwood Creek, southeast of Adaven. The carbonate rocks range in age from Cambrian (Windfall Formation) through Devonian (Guilmette Formation). These rocks are complexly faulted. The volcanic rocks consist mainly of thick sections of welded ash flow tuff. Both Paleozoic carbonate rocks and the tuffs have been cut by rhyolite plugs and east-northeast trending rhyolite dikes. The occurrence of thick ash flows in the domed central part of the Quinn Canyon Range and the occurrence of numerous rhyolite plugs and flows on the southwest and south flanks all strongly suggest that a major volcanic center may be present. Propylitic and silicic alteration, as well as broad zones of brecciation in the volcanic rocks near the Lincoln County line, indicate loci of structural weakness, but these features have not yet been related to a definite volcanic center (Kleinhampl and Ziony, 1985, p. 147).

Ore Deposits

Mineral deposits in this district can be separated into three groups which are generally localized in three distinct areas: gold-silver deposits near Nyala (the original Willow Creek district); fluorspar deposits in the area of Cottonwood and Quinn canyons, south of Cherry Creek Canyon; and base-metal deposits in the Sharp area, at the mouth of Cherry Creek Canyon southeast of Adaven. Only the deposits at Sharp are within the BLM Schell Resource area.

In the Sharp area, base-metal replacement deposits at the Roadside mine have formed in contorted, brecciated, and bleached limestone of the Pogonip Group. The ore is an oxidized sideritic (?) ferromanganese mixture with silver probably occurring in argentiferous galena. The deposits have formed along north-striking, west-dipping fracture zones that cut the carbonate section (Kleinhampl and Ziony, 1984, p. 228-229). At the Red Bird group, about 1 mile northeast of the Roadside mine, lead-silver ore occurs in a narrow quartz vein in limestone near a north-striking rhyolite dike. This dike is believed to extend north to the Combined Metals Reduction Co. mine where a 2-foot vein containing pyrite, arsenopyrite, galena, and sphalerite occurs at the contact between the dike and limestone (Kral, 1951, p. 217).

Geochemical Relationships

Samples taken from the three properties in the Sharp area all showed high silver values associated with very high arsenic, antimony, cadmium, lead, zinc, and manganese. Tin values were very anomalous, in excess of 1000 ppm in one sample from the old shaft in Cherry Creek Canyon. Trace amounts of gold were also reported in samples from the same property.

Selected References

Hill, J. M., 1916, Notes on some mining districts in eastern Nevada: U.S. Geological Survey Bulletin 648, 214 p.

Kleinhampl, F. J., and Ziony, J. I., 1984, Mineral resources of northern Nye County, Nevada: Nevada Bureau of Mines and Geology Bulletin 99B, 243 p.

Kleinhampl, F. J., and Ziony, J. I., 1985, Geology of northern Nye County, Nevada: Nevada Bureau of Mines and Geology Bulletin 99A, 172 p.

Kral, V. E., 1951, Mineral resources of Nye County, Nevada: Nevada Bureau of Mines and Geology Bulletin 50, 223 p.

Papke, K. G., 1979, Fluorspar in Nevada: Nevada Bureau of Mines and Geology Bulletin 93, 77 p.

Sainsbury, C. L., and Kleinhampl, F. J., 1963, Fluorite deposits of the Quinn Canyon Range, Nevada: U.S. Geological Survey Bulletin 1272-C, 22 p.

WILSON CREEK RANGE

Location

This area covers a portion of the western slope of the Wilson Creek Range, Lincoln County, lying generally southwest of Parsnip Peak. The area is along the western boundary of the Parsnip Peak Wilderness Study Area.

History

Perlite was produced from the Hollinger mine in the north part of this area from the late 1940's until the early 1970's by Combined Metals Reduction Co. There has been no perlite production since that time, but the deposit has recently been restaked by Wilkin Mining and Trucking Co. of Panaca. To the southeast, south of Tower Springs, the Gold Tower lode claims were staked as a gold prospect in 1981. Sampling was done in the area, but no gold or silver resources were identified (Gese, 1985, p. 11).

Geologic Setting

This portion of the Wilson Creek Range is composed predominantly of Oligocene and Miocene rhyolitic welded ash-flow tuffs, and Miocene rhyolite lavas related to the Parsnip Peak volcanic center. There is little evidence of hydrothermal alteration in these volcanic rocks, but the vitric parts of the lava flows and breccias which envelope them have been extensively mined for perlite (Ekren and others, 1977). The volcanic rocks unconformably overlie thrust-faulted, warped, and folded Paleozoic rocks. These older rocks are seen only in a small outcrop of Cambrian limestones and dolomites exposed along a fault in a small area south of Tower Springs (Gese, 1985, p. 2). Much of the rock is brecciated, and contains jasperoid and iron-oxide minerals (Toth and others, 1987, p. 7).

Ore Deposits

Perlite is known to occur in at least four separate areas in this part of the western Wilson Creek Range. Deposits are known in the area of Blue Rock Spring, on the northwest; at the Hollinger mine, about 2 miles south of Blue Rock Spring; in an area about 2 miles south of Lower Tower Spring; and at the Free deposit, about 1 mile west of Pierson Summit.

More perlite has been mined from the Hollinger mine than from any other Nevada perlite deposit. Total production is estimated at 350,000 short tons. Mining was begun in 1949 by the Combined Metals Production Co. and continued until 1971. Subsequently, the deposit was held by Kerr-McGee, Inc., which dropped its claims in 1983. The deposit was relocated in 1985 as a single 8-member placer claim that is controlled by Wilkin Mining and Trucking Co., which operates a small perlite expansion plant in Caliente.

The Hollinger deposit consists of flat-lying to shallowly dipping mass of nearly pure, grey to black, granular perlite 2,500 feet long and at least 150 feet thick. The average exposed perlite width is 550 feet, and minable reserves are about 4.5 million short tons assuming the exposed perlite can be mined from an open pit with 45° walls. Past production has come from two pits: the west pit, which is about 650 feet long and 200 feet wide with a maximum wall height of about 150 feet; and the smaller east pit which is about 150 feet in diameter, and 15 feet deep.

Glassy to devitrified pumiceous rhyolite breccia appears to underlie and overlie perlite at the Hollinger Mine, but the perlite does not show any indications of brecciation. Devitrified rhyolitic flow rock or ash-flow tuff lies above perlite at the west end of the deposit. Minor amounts of spherulitic devitrification occurs within the perlite and appears to be more abundant near the west end of the deposit. The perlite contains less than 5 percent of small quartz and feldspar phenocrysts which are most easily seen in devitrified material. According to Gese (1985, p. 10) the density of expanded Hollinger perlite ranges between 2.55 and 4.56 lbs/ft^3, which indicates that it would be suitable for filter aids and cryogenics, as well as for construction material.

The Wilson Creek Range contains several other perlite occurrences that form a northwesterly zone about 8 miles long that includes the Hollinger mine (Toth and others, 1987, p. 5). No production has been reported from these occurrences, and they contain perlite that is considered suitable only for plaster and concrete aggregate (Gese, 1985, p. 7-9). The Free perlite deposit, which is about 6 miles southeast of the Hollinger mine, consists of 1.45 million short tons of relatively pure light grey "onion-skin" type perlite that is underlain and overlain by dacitic flow rock according to Cochran (1951, p. 15). Gese (1985, p. 8) reports a more conservative estimate of 0.25 million short tons and an average expanded density of 4.7 lbs/ft^3 for perlite in the Free deposit. Three unnamed perlite deposits that lie 2.5 to 4 miles southeast of the Hollinger mine together contain about 3.1 million short tons of perlite with relatively high expanded densities (Gese, 1985, p. 8). On the Blue Rock claims about 2 miles north of the Hollinger mine, relatively pure perlite has yielded expanded densities of 2.5 to 5.4 lbs/ft^3 (Gese, 1985, p. 9).

The only known metallic prospects in this area are the Gold Tower claims, south of Lower Tower Springs. Claims in this area cover outcrops of brecciated jasperoid veins in altered carbonate rocks. The largest vein is exposed for about 400 feet along strike, is about 10-feet-wide, and contains limonite, hematite, cinnabar, orpiment, and realgar; one of six samples taken in this area by the U.S. Bureau of Mines contained silver, none contained gold (Gese, 1985, p. 11).

Selected References

Ekren, E. B., Orkild, P. P., and Dixon, G. L., 1977, Geologic map of Tertiary rocks, Lincoln County, Nevada: U.S. Geological Survey Map I-1041.

Cochran, K. L., 1951, Union Pacific Railroad Company perlite resources, Meadow Valley Wash Area, Clark and Lincoln Counties, Nevada and Beaver and Millard Counties, Utah: Union Pacific Railroad Company unpublished report, 23 p.

Gese, D. D., 1985, Mineral resources of the Parsnip Peak Wilderness Study Area (NV-040-206), Lincoln County, Nevada: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 42-85, 23 p.

Toth, M. I., Stoneman, R. G., Blank, H. R., Jr., and Gese, D. D., 1987, Mineral resources of the Parsnip Peak Wilderness Study Area, Lincoln County, Nevada: U.S. Geological Survey Bulletin 1728-D, 13 p.

Tschanz, C. M., and Pampeyan, E. H., 1970, Geology and mineral deposits of Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 73, 188 p.

TABLE 1. DEFINITION OF LEVELS OF MINERAL RESOURCE POTENTIAL AND CERTAINTY OF ASSESSMENT

Definitions of Mineral Resource Potential

LOW mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics define a geologic environment in which the existence of resources is unlikely. This broad category embraces areas with dispersed but insignificantly mineralized rock as well as areas with few or no indications of having been mineralized.

MODERATE mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resource occurrence, where interpretations of data indicate a reasonable likelihood of resource accumulation, and (or) where an application of mineral-deposit models indicates favorable ground for the specified type(s) of deposits.

HIGH mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resource occurrence, where interpretations of data indicate a high degree of likelihood for resource accumulation, where data support mineral-deposit models indicating presence of resources, and where evidence indicates that mineral concentration has taken place. Assignment of high resource potential to an area requires some positive knowledge that mineral-forming processes have been active in at least part of the area.

UNKNOWN mineral resource potential is assigned to areas where information is inadequate to assign low, moderate, or high levels of resource potential.

NO mineral resource potential is a category reserved for a specific type of resource in a well-defined area.

Levels of Certainty

LEVEL OF RESOURCE POTENTIAL ↑

<table>
<tr><td rowspan="4">U/A
UNKNOWN POTENTIAL</td><td>H/B
HIGH POTENTIAL</td><td>H/C
HIGH POTENTIAL</td><td>H/D
HIGH POTENTIAL</td></tr>
<tr><td>M/B
MODERATE POTENTIAL</td><td>M/C
MODERATE POTENTIAL</td><td>M/D
MODERATE POTENTIAL</td></tr>
<tr><td rowspan="2">L/B
LOW POTENTIAL</td><td rowspan="2">L/C
LOW POTENTIAL</td><td>L/D
LOW POTENTIAL</td></tr>
<tr><td>N/D
NO POTENTIAL</td></tr>
<tr><td>A</td><td>B</td><td>C</td><td>D</td></tr>
</table>

LEVEL OF CERTAINTY →

A. Available information is not adequate for determination of the level of mineral resource potential.
B. Available information suggests the level of mineral resource potential.
C. Available information gives a good indication of the level of mineral resource potential.
D. Available information clearly defines the level of mineral resource potential.

Abstracted with minor modifications from:

Taylor, R.B., and Steven, T. A., 1983, Definition of mineral resource potential: Economic Geology, v. 78, no. 6, p. 1268-1270.

Taylor, R. B., Stoneman, R. J., and Marsh, S. P., 1984, An assessment of the mineral resource potential of the San Isabel National Forest, south-central Colorado: U.S. Geological Survey Bulletin 1638, p. 40-42.

Goudarzi, G. H., compiler, 1984, Guide to preparation of mineral survey reports on public lands: U.S. Geological Survey Open-File Report 84-0787, p. 7, 8.

POTENTIAL FOR THE OCCURRENCE OF MINERAL RESOURCES, DISCUSSION BY COMMODITY

The following comments regarding mineral resources potential are organized by commodity. The areas discussed in general are shown on the mineral assessment map set (Appendix D). The general assessment category that each area is assigned applies only to the specific marked areas on the mineral assessment maps; no assessment is implied for lands outside the marked areas. The definition of levels of mineral resource potential and levels of certainty of assessments generally followed in this section is patterned after that used by the U.S. Geological Survey in their wilderness study program. A chart showing the levels of potential and certainty, including definitions, is shown in Table 1.

SALINES AND BRINES

Playas and playa deposits are common in Nevada and they have been and are important sources of industrial minerals in the form of salines and brines (including sodium and potassium minerals). Detailed exploration of Nevada playas has been rather limited and, with few exceptions, very little is known about their subsurface features. In the Schell Resource Area, production of saline minerals is reported from only one playa deposit, Yelland Dry Lake in Spring Valley, where salt is reported to have been recovered in the 1880's. Based on its limited past production and location, this area is given a low potential for salt production. Other playas occur in Lake Valley and Cave Valley, but nothing is known of their potential. Potential for the occurrence of salines and brines within the Schell Resource Area is shown in Table 2.

TABLE 2. POTENTIAL FOR THE OCCURRENCE OF SALINES AND BRINES
BLM Schell Resource Area

Mineral commodity(ies)	Mining district/area	Deposit type	Level of potential	Level of confidence
salines, brines	Mount Moriah	evaporite	low	B
	North Point Spring	evaporite	unknown	A
	Silver King	evaporite	unknown	A

METALLIC MINERALS

Based on past production, information in the literature, and known mineral occurrences, there is potential for the discovery and/or future exploitation of deposits of at least ten metallic mineral commodities within the BLM Schell Resource Area. Table 3 lists the inferred potential for the occurrence of these metallic mineral resources within the BLM Schell Resource Area.

TABLE 3. POTENTIAL FOR THE OCCURRENCE OF METALLIC MINERAL RESOURCES
BLM Schell Resource Area

Mineral commodity(ies)	Mining district/area	Deposit type	Level of potential	Level of confidence
beryllium, tungsten	Lincoln	skarn (beryllium-fluorine)	high	C
copper	Kinsley	polymetallic replacement	low to moderate	B
copper, lead, zinc, silver	Aurum-Muncy Creek	polymetallic replacement	low to moderate	B
copper, silver	Aurum-Muncy Creek	skarn (copper)	low to moderate	B
gold	Osceola	alluvial	moderate	C
gold, silver	Atlanta	hot-spring gold-silver	moderate to high	C
	Eagle Valley	quartz adularia vein	low to moderate	B
	Piermont	polymetallic vein	low	B
	Seaman Range	hot-spring gold-silver	low to moderate	B
gold, silver, tungsten	Black Horse	polymetallic vein	low to moderate	B
	Sacramento	polymetallic vein	low to moderate	B
gold, tungsten	Osceola	polymetallic replacement	moderate to high	B
		polymetallic vein	moderate to high	B
lead, silver	Silver King	polymetallic replacement	moderate to high	C
lead, silver, copper	Eagle	polymetallic replacement	low to moderate	B
lead, silver, copper, gold	Bristol/Jackrabbit	polymetallic vein	moderate to high	B
	Highland	polymetallic vein	low to moderate	B
lead, silver, zinc, copper	Lincoln	polymetallic vein	low	B
	Willow Creek	polymetallic vein	low to moderate	B
lead, zinc, copper, silver	Highland	polymetallic replacement	low to moderate	B
manganese, lead, silver	Bristol/Jackrabbit	replacement manganese	moderate to high	B
manganese, silver	Pahranagat	replacement manganese	moderate to high	C
mercury	Seaman Range	hot-spring mercury	low	B
silver	Cooper	polymetallic vein	low to moderate	B
	Silverhorn	distal disseminated silver-gold	moderate to high	B
	White Cloud	polymetallic vein	low	B
silver, copper, manganese	Aurum-Siegel	polymetallic replacement	low to moderate	B
silver, gold	Eagle Valley	distal disseminated silver-gold	low	B
	Wilson Creek Range	distal disseminated silver-gold	low	B
silver, lead	Mount Moriah	polymetallic replacement	low to moderate	B
	Pahranagat	polymetallic vein	moderate to high	B
	Silverhorn	polymetallic replacement	moderate to high	B
	Willow Creek	polymetallic replacement	low to moderate	B
silver, lead, gold	Aurum-Siegel	polymetallic vein	unknown	A
	Cleve Creek	polymetallic vein	low	B
silver, lead, gold, tungsten(?)	Cleve Creek	polymetallic replacement	low	B
silver, lead, manganese	Pahranagat	polymetallic replacement	moderate to high	B
silver, lead, zinc, copper, gold	Freiberg	polymetallic replacement	moderate to high	C
silver, lead, zinc, copper, manganese	Bristol/Jackrabbit	polymetallic replacement	moderate to high	B
silver, tungsten	Aurum-Schellbourne	polymetallic vein	low	B
	Eagle	polymetallic vein	low	B
tungsten	Aurum-Schellbourne	vein tungsten	low	B
	Cleve Creek	vein tungsten	low to moderate	B
	Freiberg	skarn (tungsten)	low to moderate	B
	Patterson	vein tungsten	moderate	C
	Sacramento	vein tungsten	low to moderate	B
	Shoshone	vein tungsten	medium to high	C
	Tungsten	vein tungsten	low	B
tungsten, silver	Eagle	vein tungsten	low to moderate	C
	Geyser Ranch	vein tungsten	low to moderate	B
uranium, silver, gold	Atlanta	volcanogenic uranium	low	B
zinc, copper, lead, silver	Silver King	skarn (zinc-copper, lead)	medium to high	C
zinc, copper, tungsten	Patterson	skarn (zinc, copper, tungsten)	moderate to high	C
zinc, lead	Freiberg	skarn (zinc-lead)	moderate to high	C
zinc, lead, copper, silver	Highland	skarn (zinc-lead)	low to moderate	B

BERYLLIUM

A major beryllium resource is known to exist at the Mount Wheeler mine, Lincoln district, and high potential exists for development of additional resources in this district. Similar geologic conditions, along with anomalous beryllium concentrations, are found in the Patterson district of the southern Schell Creek Range, near Mount Grafton, and this area may have potential, although presently unmeasurable, for discovery of beryllium deposits.

COPPER

Copper occurs, as a principal commodity, in only two districts within the resource area but is also present as a potential coproduct in many other districts.

Copper has been mined from polymetallic replacement and skarn deposits in the Aurum-Muncy Creek district, and from polymetallic replacement deposits in the Kinsley district. Copper occurs as a coproduct in the Freiberg, Bristol/Jackrabbit, Willow Creek, and Patterson districts

GOLD

Seven mining districts within the BLM Schell Resource Area have potential, ranging from low to high, for the discovery and development of gold resources. Additional reserves of gold in hot-spring deposits may be present in the Atlanta district and there may be potential for discovery of this type of deposit in the Seaman Range. Although we have not assigned a potential rating to the area, there may be some potential for gold discovery on the west side of the Pahranagat Range where rock formations favorable for sediment-hosted gold deposits crop out. There is also potential, again not assigned a rating, for discovery of gold associated with scarn deposits in the Freiberg, Kinsley, and Aurum-Muncy Creek districts.

LEAD

Lead occurs in polymetallic vein and replacement deposits in seven mining districts within the resource area. It has been a major product in one of these, the Bristol/Jackrabbit district, and there is potential for developing additional resources in this district. Several other districts have potential for producing lead as a byproduct of silver mining.

MANGANESE

Manganese ore has been mined from the Pahranagat and Bristol/Jackrabbit districts, and both districts have potential for additional production.

MERCURY

Only one mercury occurrence (in the Seaman Range) is reported in the resource area. Although it may have had a small production, its potential is rated as low.

SILVER

Silver is widespread throughout the Schell Resource Area; it is reported to occur, in a variety of deposit types, within at least 13 mining districts within the area. Most of the deposits are polymetallic vein or replacement deposits, but important hot-spring and disseminated deposits also occur. Several silver occurrences in the area fall into the "distal disseminated silver-gold" model of Cox (written communication, 1988), and potential exists in several districts for discovery of this type of occurrence.

TUNGSTEN

Important resources of tungsten are known to be present in at least two districts within the BLM Schell Resource Area and low to moderate potential is inferred to exist for the discovery and development of tungsten resources in at least 8 additional districts. With only two exceptions, all of these areas are inferred to have potential for development of resources in vein deposits. Additional tungsten resources may be present in skarn deposits in the Freiberg district and in the Lincoln district; in the Lincoln district, however, tungsten is inferred to be an important coproduct, not the major commodity.

ZINC

Zinc is a potentially valuable coproduct in polymetallic vein, polymetallic replacement, and skarn deposits in many occurrences within the Schell Resource Area but, in most of these, silver, lead, copper, or sometimes tungsten would be the potential primary metal recovered.

URANIUM

Low to moderate potential for the discovery and development of small-sized, low-grade uranium resources may exist in one deposit within the Atlanta mining district.

NONMETALLIC MINERALS/INDUSTRIAL MINERAL RESOURCES

Occurrences of nine industrial mineral commodities are known in the Schell Resource Area. Four industrial mineral commodities are known to have been produced from the district, but recent production has been restricted to two - aggregate and building stone. It is possible that the production of perlite, which was an important commodity from the district in the past, will be resumed in the future.

Table 4 lists inferred resource potential for the known types of nonmetallic/industrial mineral resources (excluding sand and gravel) within the BLM Schell Resource Area.

TABLE 4. POTENTIAL FOR THE OCCURRENCE OF INDUSTRIAL MINERAL RESOURCES
BLM Schell Resource Area

Mineral commodity(ies)	Mining district/area	Deposit type	Level of potential	Level of confidence
barite	Eagle Valley	vein barite	low	B
clay	Bristol/Jackrabbit	bedded	low	B
fluorite	Cooper	replacement fluorite	low	B
garnet	Mount Moriah	alluvial	low	C
marble	Bristol/Jackrabbit	bedded	unknown	A
	Kinsley	bedded	unknown	A
	Marble Canyon	bedded	unknown	A
	Osceola	bedded	unknown	A
optical quartz	Freiberg	quartz crystal	unknown	A
perlite	Silverhorn	bedded	low	C
	Wilson Creek Range	bedded	moderate to high	C
quartzite building stone	Mount Moriah	bedded	high	C

AGGREGATE

Aggregate was mined from two Nevada Department of Transportation sand and gravel pits in the Schell District in 1989 according to the Nevada Division of Mine Inspection. Both pits are in White Pine County, one is just north of Baker and the other is along Highway 93 near the northern border of the county. It is likely that production will continue from these pits or similar deposits in the district to meet local road construction and maintenance needs. Commercial aggregate requirements in the area are relatively minor and are presently met by small operations outside the district at Ely and Caliente. No potential ratings have been assigned to aggregate deposits, and aggregate occurrences are not shown on maps included with this report.

BARITE

Barite, in vein deposits, is reported in only one location within the Schell Resource Area. Little is known about this occurrence, but it appears to have limited surface extent. The potential of the deposit for barite production is very low.

CRUSHED STONE AND DIMENSION STONE

Moderate amounts of thin-bedded quartzite have been quarried in the Mount Moriah mining district and sold as dimension stone, flagstone, and for other uses. The quartzite quarries are scattered over an area of at least four square miles, and reserves of similar rock are very large. Because of recent increases in building stone usage, particularly in paving applications for which Mount Moriah quartzite is well-suited, potential for future production of this commodity is considered to be high. Idaho Quartzite Corp., which mines similar rock and distributes it internationally, has recently staked claims southwest of the existing quarries.

Marble in three areas, the Kinsley, Marble Canyon, and Bristol/Jackrabbit districts, was quarried for dimension stone. In addition, crushed stone for an unknown market was apparently produced from marble in the Osceola mining district. No production figures are available for any of these deposits, and there has been no reported commercial production in recent years. The potential for future marble production in the Schell district is not known.

CLAY

Clay that occurs in underground workings near Bristol Well has not been found in significant quantities near the surface. Based on descriptions in Papke (1970) it is not likely to qualify as a high value specialty clay. It is unlikely that either occurrence can be mined economically, and clay potential based on known occurrences in the Schell District is low.

FLUORSPAR

The only fluorspar deposit in the Schell District is relatively low-grade and small. Because U.S. fluorspar markets are satisfied by large high-grade deposits in the eastern U.S. and overseas, and because of the worldwide trend away from chlorinated fluorocarbons in refrigerants and aerosols, it is unlikely that small western U.S. deposits can be competitive. The only operating western U.S. fluorspar mine (located near Beatty in western Nevada) shut down in 1989. Potential for fluorspar mining in the Schell District is considered very low.

GARNET

The Hampton Creek garnet placer is probably too small and low-grade for economic production, even though the garnet abrasive market is strong because of health concerns about quartz abrasive products. Although a considerable reserve of garnet schist occurs adjacent to the placer deposit at Hampton Creek, the cost of mining and beneficiating this remote resource would probably be prohibitive.

PERLITE

In the past the Schell district has been an important source of perlite, mostly from the Hollinger mine in the Wilson Creek Range, and potential for future perlite production is high.

At present, about 4000 tons of perlite are mined annually from the Mackie Mine in Lincoln County just south of the Schell Resource Area. Part of this production is expanded at a plant in Caliente and part is shipped to California for processing. Because of the geometry of the Mackie deposit, most of the perlite is mined underground (although this method also helps to keep the perlite dry which facilitates processing during the winter). In 1985 the Wilkin Mining and Trucking Co., operator at the Mackie Mine, acquired the Hollinger deposit. According to Joseph Wilkin, Hollinger mine perlite may be utilized in the future, although this would require modifications to the processing plant.

The Wilson Creek Range contains several other perlite deposits, but because of lower expandibility (Gese, 1985), development of these deposits is not as likely as at the Hollinger mine. The Fairview perlite deposit in the Silverhorn mining district also has relatively low potential because of its remote location and lower quality compared with the Hollinger deposit.

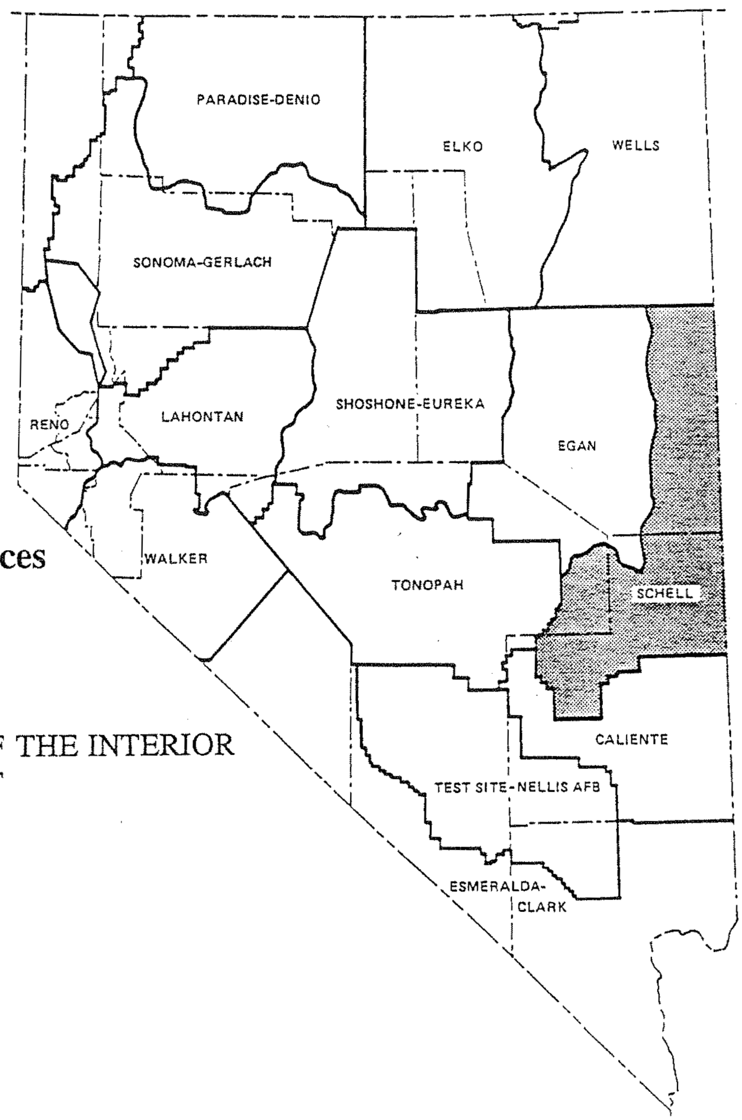
PHOSPHATE

Small amounts of phosphate (bat guano) were mined from a cave in the Osceola mining district. Potential for significant future development is low. Bat guano deposits are very small and guano from all sources (mainly marine bird guano) accounts for less than 1 percent of the world's phosphate production. Due to the limited extent of the one reported deposit, no potential has been assigned to this commodity, and it is not shown on the mineral potential maps.

QUARTZ CRYSTAL

Quartz crystal, as a unique commodity, is reported in only one area within the BLM Schell Resource Area. The area, in the southern Quinn Canyon Range, Nye County, has had no production, and it is inferred to have low potential for the development of minable resources of quartz crystal.

Mineral Resources Inventory
Bureau of Land Management,
Schell Resource Area, Ely District, Nevada



Appendix A
Mines, Prospects, and Occurrences

Prepared for:
UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Ely Office
Ely, Nevada

Under Cooperative Agreement 14-08-0001-A-0586
with the
U.S. GEOLOGICAL SURVEY

NEVADA BUREAU OF MINES AND GEOLOGY
UNIVERSITY OF NEVADA, RENO
October 1991

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(Filed into files)

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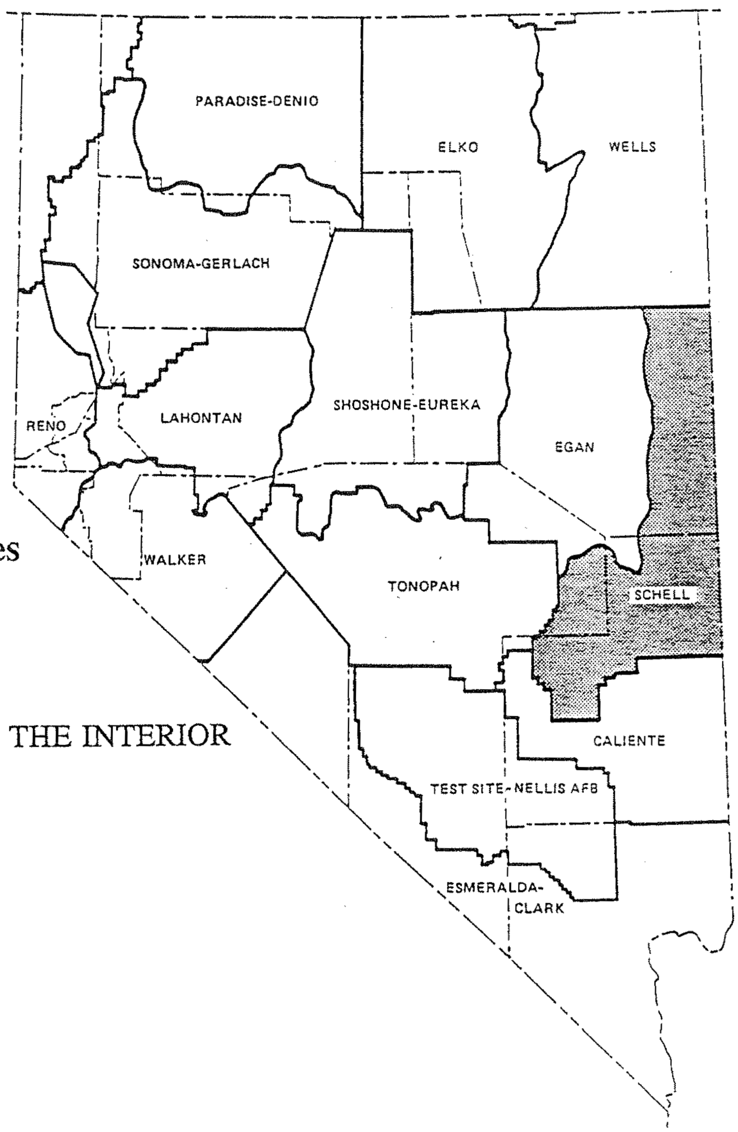
Bureau of Land Management,
Schell Resource Area, Ely District, Nevada



Appendix B
Sample Descriptions and Analyses

Prepared for:
UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Ely Office
Ely, Nevada

Under Cooperative Agreement 14-08-0001-A-0586
with the
U.S. GEOLOGICAL SURVEY

NEVADA BUREAU OF MINES AND GEOLOGY
UNIVERSITY OF NEVADA, RENO
October 1991

Sample Descriptions, Schell Resource Area

DISTRICT	SAMPLE	DEPOSIT NAME	UTM N	UTM E	DESCRIPTION
Atlanta	4098	Hulse mine	4259510	732730	Silicified breccia of white quartzite and silic. limestone; fragments cemented with vuggy, white quartz; matrix contains clots and disseminations of fine-grained pyrite and a sooty, black mineral (uraninite?); amber jarosite on fracture surfaces
Atlanta	4099	Silver Park mines, west area	4260013	730897	Sicified jasperoid breccia, quartzite and silicified limestone fragments in silica matrix; some points of blue-green copper oxide minerals; sooty black mineral as disseminations and streaks; vugs lined with quartz and white barite crystals
Atlanta	4100	Silver Park pit	4260135	731101	Vuggy, silicified limestone and jasperoid breccia; red-brown and cinnamon-brown iron oxides; some copper oxides, barite, calcite, and quartz crystals in vugs.
Atlanta	4387	Silver Park pit	4260133	731101	White, greenish cast, kaolinized rhyolitic welded tuff with clear quartz phenocrysts; fracture surfaces flooded with cinnamon-brown limonite and coated with euhadral, amber jarosite crystals; jarosite crystals also disseminated throughout altered rock.
Atlanta	4388	Hulse deposit, east adit	4259490	733180	Silicified jasperoid breccia, hematitic gossan in breccia matrix.
Atlanta	4389	Atlanta mine	4260704	733669	Silicified hydrothermal breccia, clast-supported; clasts of kaolinized, silicified rhyolitic welded tuff in matrix of quartz; some quartz is smoky black, crystalline; some clots marcasite on fracture surfaces; some jarosite in oxidized segments.
Atlanta	4390	Atlanta mine	4260704	733669	Brick-red hematitic gossan lenses in dense, flinty, jasperoid; vugs in jasperoid contain quartz and calcite crystals, some manganese-oxide crusts, rock brecciated; some of the boulders contain both rhyolite and jasperoid clasts.
Aurum-Muncy Creek	2105	Kansas mine	4387545	709364	Replacement ore; granular magnetite, possibly some specular hematite with streaks and clots of chalcopyrite, pyrite, bornite; some malachite; minor pale amber garnet
Aurum-Muncy Creek	2106		4387765	709670	massive magnetite, some specular hematite, trace green copper-oxide staining
Aurum-Muncy Creek	2107	Defiance mine	4387786	709628	Reddish-brown, massive jasperoid, vuggy, with vugs filled with crystals of hemimorphite, possible smithsonite, some hemimorhite stained sea-green
Aurum-Muncy Creek	2108	Grand Deposit mine	4388057	710205	Cellular gossan and jasperoid; smithsonite, aurichalcite, malachite, hemimorhpite occur in vugs in gossan; minor magnetite
Aurum-Muncy Creek	2109		4387976	710507	Cellular, limonite-hematite gossan with clots calcite crystals; hemimorphite crystals line vugs; no copper-oxide staining
Aurum-Muncy Creek	2110	Mun #1 claim	4386839	710156	Massive hematite gossan, clots and coatings of crystalline malachite, some chalcopyrite and pyrite in centers of gossan clots, minor hemimorphite
Aurum-Schellbourne	869	White Horse claim	4412560	700620	Dark grey silicified limestone and limestone breccia with coarse calcite and quartz veins. Scheelite occurs as small flecks in the vein material. Copper oxides and tetrahedrite are present along with drusy quartz vug fillings.
Aurum-Schellbourne	870	Durand lode mining claim	4412280	700080	Grey-brown, limy siltstone breccia with iron oxide, calcite pods and cement; some brown calcite and gossan included in the sample.
Aurum-Schellbourne	871	Mack Claim #3 and #1	4412080	700160	Calcite vein and limestone breccia with calcite and quartz cement; no obvious metallic mineralization. Shows no scheelite when lamped.
Aurum-Schellbourne	2142	Georgia claims	4416997	703583	Red jasperoid fragments in silicified breccia, some vuggy, white quartz, minor iron-oxide staining
Aurum-Schellbourne	2144	Georgia claims	4417000	703580	White, crystalline calcite veinlets containing fine- to medium-grained, blue-white-fluorescing scheelite
Aurum-Siegel	2111	Lucky Deposit mine	4396859	706989	Hematite-limonite gossan, clear calcite crystals in vugs
Aurum-Siegel	2112		4396920	707107	Hematite-limonite gossan, clots calcite, some clear crystals in vugs

Sample Descriptions, Schell Resource Area

DISTRICT	SAMPLE	DEPOSIT NAME	UTM N	UTM E	DESCRIPTION
Aurum-Siegel	2113	Copper Queen mine	4397525	705574	Gossan, mainly hematite, limonite, silicate minerals, clots malachite and other copper-oxide minerals
Aurum-Siegel	2114	Copper Queen mine	4397491	705642	Sulfide replacement ore, consisting of pyrrhotite, pyrite, chalcopyrite, chlorite, in silicated limy shale
Aurum-Siegel	2129	Siegel mine	4400509	705030	White vein quartz with galena kernels, iron-oxides and sooty manganese-oxides in boxworks in vein material
Aurum-Siegel	2130	Siegel mines	4400785	705014	Massive, black manganese oxide with white quartz; manganese oxides fill spaces in vuggy, replacement ore; lots of chlorite in rock
Aurum-Siegel	2143	May Queen group	4404518	702191	Silicified quartzite breccia, laced and cemented with vuggy, white quartz; clear quartz crystals in vugs, some fine-grained pyrite, trace ruby silver
Black Horse	5000		4336992	732733	Carbonate veins in limestone with scheelite or powellite
Black Horse	5001		4336855	732962	Limonite, quartz veins in quartzite breccia
Black Horse	5002		4336936	733092	Quartz-carbonate veins with malachite, hematite
Black Horse	5003		4336477	733007	Brecciated quartzite with limonite and hematite
Black Horse	5004		4336590	732266	Bleached limestone and quartzite with pyrite; argillic alteration
Black Horse	5005	Black Horse mine	4337505	734198	Quartz vein with native gold, pyrite, malachite, hematite-limonite
Black Horse	5006	Black Horse mine	4337883	734639	Vein quartz or quartzite breccia, limonite
Black Horse	5007	Woodman mine	4338106	726768	Spongy silica-carbonate stockwork; limonite-after-pyrite
Black Horse	5008	Sacramento mine	4338196	726812	Quartz vein with malachite, limonite, manganese oxide, possibly powellite
Black Horse	5009	Sacramento mine	4338194	726815	carbonate vein, possible tungsten
Black Horse	5010	Gilded Age #2 mine	4337543	726923	Carbonate veins
Black Horse	5011	Gilded Age #2 mine	4337543	726923	Quartz-carbonate vein with malachite, limonite-after-sulfides
Black Horse	5012	Gilded Age #1 mine	4337504	726490	Quartz vein with malachite, limonite, scheelite
Black Horse	5013		4337003	733963	Quartz vein with limonite
Black Horse	5014		4337178	733649	Carbonate veins, minor limonite
Black Horse	5015		4339323	735257	Quartzite with limonite, very minor quartz veining
Black Horse	5016	Tilford mine	4342965	736452	Carbonate veins in limestone
Black Horse	5017	Tilford mine	4342980	737077	Gossan
Black Horse	5018	Tilford mine	4342980	737077	Carbonate vein, minor limonite
Bristol/Jackrabbit	4083	Ida May mine	4219237	709129	Oxidized replacement ore, mainly jasperoid/manganese- and iron-oxide gossan with specular hematite, resinous, pale yellow-brown sphalerite, some cerussite, malachite, chrysacolla, chalcocite and cuprite (?); botryoidal greenish-white smithsonite in vugs
Bristol/Jackrabbit	4084	Lucky Star mine	4220200	708516	Massive black pyrolusite, sooty, with some clear calcite veining, material varies from sugary-textured breccia of clear calcite crystals and steely pyrolusite to massive, sooty pyrolusite.
Bristol/Jackrabbit	4085	Lode claim	4217853	700816	Dense hematite and manganese-oxide-stained crystalline marble, some siliceous gossan, brick-red hematite staining, some manganese-oxide films.
Bristol/Jackrabbit	4086	Wood Butcher mine	4211890	707990	Silicified quartz vein breccia, yellow and yellow-green oxide coatings, some quartzite fragments in breccia; points of limonite in quartz, some blue-black metallic mineral disseminated in quartz (galena?), hematite-after-pyrite casts in vein quartz.
Bristol/Jackrabbit	4087	Wood Butcher mine, south	4211583	708091	White vein quartz, fine veinlets and disseminations of pyrite, rock yellow-green from limonite staining, rare points of gren and blue copper-oxide minerals, points of dark sulfide mineral in vein, some vuggy sections with clear quartz crystals and pyrite

Sample Descriptions, Schell Resource Area

DISTRICT	SAMPLE	DEPOSIT NAME	UTM N	UTM E	DESCRIPTION
Bristol/Jackrabbit	4088	Last Dollar #5 lode	4218693	707272	Scoraceous mass of black, crystalline pyrolusite and clear calcite crystals, very sintery texture, probably due to quartz cement, some earthy pyrolusite.
Bristol/Jackrabbit	4089	Silver Pick mine	4209074	713211	Dull, red-brown hematitic jasperoid, minor calcite veining; some clots hematitic gossan; minor manganese oxide; jasperoid very flinty
Bristol/Jackrabbit	4090	Longlegs adit	4211091	712039	Dense gossan, brick-red hematitic- and orange-brown liimonitic-stained jasperoid with clear quartz crystals in veins and small vugs.
Bristol/Jackrabbit	4091	Monarch mine	4214175	710948	Sugary white cockscomb vein quartz,bands of dense silicified iron- and manganese-oxide mixture along walls; vuggy with gossan filling vugs; clots galena filling space between quartz crystals; some calcite clots; some cerussite in vugs
Bristol/Jackrabbit	4092	Bristol mine, Snyder shaft	4217218	709125	Massive hematite/limonite/manganese oxide gossan; pale yellow oxides in cavities, minor copper oxide minerals on fracture surfaces.
Bristol/Jackrabbit	4093	Home Run mine	4216239	708745	White crystalline calcite matrix of silicified limestone breccia; calcite also brecciated; surfaces coated with crusts of copper oxide minerals; veinlets of copper oxides also cut calcite; copper minerals include malachite, chyrsacolla, possibly cuprite;
Bristol/Jackrabbit	4094	Home Run mine	4216239	708745	Dense iron-oxide-rich jasperoid; clots pale yellow and red-brown gossan, copper-oxide crusts.
Bristol/Jackrabbit	4095		4220984	708094	Siliceous replacement ore; red-brown jasperoid with clots and lenses of fine-grained galena; some anglesite replacing galena.
Bristol/Jackrabbit	4096	Black Metals shaft	4218997	710878	Dense, black, manganese ore; black pyrolusite, white and black calcite; some iron-rich jasperoid, minor copper-oxide staining.
Bristol/Jackrabbit	4097	Pioche-Bristol mine	4219697	710167	Small pods and blebs of fine-grained galena in silicified limestone; some copper-oxide minerals; clear quartz crystals, calcite, black manganese oxide crystals, minor iron-rich jasperoid.
Cleve Creek	4396	Kolchek mine	4346288	704808	White, crystallne calcite with spots grey, metallic mineral (possibly tetrahedrite); some copper-oxide staining; possibly some scheelite
Cleve Creek	4397	Old Kolchek adit	4346442	704633	Massive, hematite-stained jasperoid with gossan clots; some gossan clots have silvery, crystalline galena in centers; spots of chalcopyrite
Cleve Creek	4398	Cleve Creek prospects	4344740	708670	Massive, white vein quartz (bull quartz), sparse tetrahedrite, some spots of hematite-after-pyrite, copper-oxide staining near tetrahedrite
Cleve Creek	4399	Cleve Creek prospects	4344932	708620	Massive, white vein quartz (bull quartz), sparse tetrahedrite, some spots of hematite-after-pyrite, copper-oxide staining near tetrahedrite; some spots fresh chalcopyrite and pyrite
Cooper	2131	Capital Hill claims	4324769	708347	White vein quartz and silicified shale; sparse clots tetrahedrite with associated azurite and malachite staining; hematite staining in shale
Cooper	2132		4323979	708243	White vein quartz, hematite and limonite crusts and staining
Cooper	2138	Rattlesnake Heaven prospects	4324212	715070	Lithic-rich welded tuff, brecciated, with thick coatings, veinlets, and breccia cement of green and clear fluorite
Eagle	2115	Oxide claim shaft	4397546	747798	White vein quartz with disseminated tetrahedrite clots, yellow-green oxide stains
Eagle	2116	Yellow Jacket claims	4395030	745875	Greenish mass of chlorite, muscovite, silicated limestone, with intergrowths of quartz, fluorite, white calcite, possible scheelite
Eagle	2117	Antelope mine	4404337	733437	White vein quartz with clots tetrahedrite, some azurite and malachite
Eagle	2118	Rees mine	4403460	732939	Buff-colored, fine-grained silicated limestone with quartz veining and clots; minor pale iron-oxide staining; possible scheelite

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Eagle	2119		4399874	732811	Quartz-actinolite greissen with clots of sphalerite, some galena, minor green and blue copper minerals
Eagle	2120	Glenco mine	4393864	739704	Massive, white vein quartz with clots of tetrahedrite, some galena
Eagle	2121	Tungstonia mine	4394430	743701	White and clear vein quartz with clots crystalline huebnerite and pyrite, some purple and green fluorite
Eagle	2122	Tungstonia mine, first vein east of shaft	4394609	743875	White vein quartz with crystals huebnerite, some crystalline galena, possibly tetrahedrite, lots of pale yellow pyrite
Eagle	2123		4391082	728147	Massive, siliceous, hematite gossan; some manganese oxide,; gossan is in limestone breccia, possibly some cerussite
Eagle	2124	Whisky Bottle adit	4391360	727988	Siliceous gossan; hematite with some manganese oxide; possible cerussite; pale-green, crystalline fluorite in veins and clots cutting gossan; white and black calcite; green copper oxide staining as well as thin crusts of crystalline malachite
Eagle	2125	Dancy 7 mine	4392248	727695	Cellular, silicified gossan/jasperoid; mostly hematite, wome manganese oxide; also some pale yellow oxides; clear acicular quartz crystals in matrix and vugs in breccia.
Eagle Valley	1498	Reeds Cabin Summit prospect	4223940	758080	Dump. Vein quartz, minor limonite and hematite staining.
Eagle Valley	1499	Confidence mine	4222530	758390	Dump. Vein quartz, brecciated possible jarosite crystals in vugs, calcite crystals.
Eagle Valley	1563	Tempa mine	4203930	756780	Dump. Quartz carbonate vein, streaks black sulfide.
Eagle Valley	1564	Horsethief Spring prospect	4211110	741640	Dump. Silicified limestone, jasperoid, clots MnO & Feox.
Eagle Valley	1565	Horsethief Spring prospect	4211250	741530	Barite from vein, some white calcite, minor Feox stain.
Freiberg	1761	Smelter shaft	4197970	624410	Calcite-cemented limestone breccia and dense, siliceous, hematitic gossan. Rocks are dense and contain vug fillings of soft, bright green crystals; cerussite occurs with calcite vein material; gossany vugs contain abundant iron- and copper-oxide minerals.
Freiberg	1762	Smelter shaft	4197970	624410	Iron-stained jasperoid and silicified limestone. Original rock is bleached to tan color, and coated by hematite, limonite, and manganese-oxides.
Freiberg	1763	Section 20/21 adit	4199600	624400	Dense, light green, banded calc-silicate with earthy, hematitic gossan contaning cerussite and cores of galena. Calc-silicate contains minor fine- grained scheelite, is coated by iron and manganese oxides and minor copper oxides.
Freiberg	1764	Freiberg mine	4200620	623000	Green garnet-epidote-calcite skarn with abundant fine to coarse "plates" of dark brown (yellow) to black sphalerite. Also contains disseminated, fine crystals of chalcopyrite and pyrite.
Freiberg	1765	New Freiberg mine	4200600	624290	Dense, pink)-brown, marly, recrystallized dolomite and dolomitic limestone; rock coated, replaced, veined by iron oxides (mainly hematite); contains veins and pods of galena , chalcopyrite, and pyrite; minor surface coatings of cerussiteand copper oxides
Freiberg	1766	New Freiberg mine	4200600	624290	Altered, earthy to marly yellow-brown limestone cut by veinlets of calcite with hematitic gossan and boxworks; minor copper-oxides and clots of oxidized pyrite are present. Rock is heavy, possibly due to disseminated galena
Freiberg	1767	Freiberg tungsten prospect	4201950	622060	Light green, epidote-calcite skarn and white marble; skarn contains coarse crystals of scheelite and powellite.
Freiberg	3287	Felsite shaft	4199520	623140	Weak skarn; pale garnet with massive pyrite and sphalerite, hemimorphite(?) crystals on fracture surfaces, some manganese oxide staining.
Freiberg	3288	Smelter shaft	4197790	624410	Siliceous gossan, pale brown limonite and reddish hematite clots, botryoidal pale green mineral (arsenic mineral ?) on fracture surfaces.

DISTRICT	SAMPLE	DEPOSIT NAME	UTM N	UTM E	DESCRIPTION
Freiberg	3469	Crystal contact prospect	4204540	613720	Rubbly, black manganese-oxide-rich gossan, may be in weathered skarn zone; gossan contains some jasperoid fragments, but is mostly limonite laced with silica.
Geyser Ranch	801	Deer Trail mine	4284930	698480	Massive, milky white quartz vein with few vugs, coarse (1cm) to fin e, subhedral crystals of heubnerite - some in discontinuous lenses and irregular pods, some manganese-oxide staining.
Geyser Ranch	802	Geyser mine	4282600	699730	Sheared, milky-white quartz vein with clots huebnerite; coarse, bluish-white fluorite present in clots and along fractures; yellow oxide coatings.
Geyser Ranch	803		4282650	699860	Sheared, massive, grey-white quartz vein with sericitic coatings on fracture surfaces.
Golden Gate Range	3200	Golden Gate Range prospect	4190870	640740	Jasperoid with gossan lenses, brecciated and cemented with silica, red-brown and cinnamon-brown hematite in vugs, sparse sprays of hemimorphite crystals on fractures and vugs, abundant jarosite crystals in cavities and on fracture surfaces.
Highland	1389	Blue Bell mine	4204270	713800	Fe-Mn- oxide- stained siliceous gossan; pods and stringers fresh, fine grained galena; greenish alteration suggests anglesite, pyrite ghosts, fracture surfaces coated with opaline silica and very fine-grained calcite; jarosite coatings
Highland	1390		4203550	711225	Silicified gossan, Fe-Mn oxide stained, some surfaces coated with malachite ;powdery, gossan carries stringers and pods vitreous quartz , chalcopyrite ghosts, hematite pseudomorphs after pyrite; grey zones suggest disseminated sulfides
Highland	1391		4203650	711200	Gossan, quartz vein breccia, manganosiderite vein, all highly Fe-Mn oxidized, earthy, silicious, heavy.
Highland	1392	West Manhattan Vein prospect	4203670	711180	Quartz vein/breccia cementing gossan, silicified, quartz granular, heavily manganese - and iron-oxide stained; surfaces coated with caliche, irides cent oxides.
Highland	1393	Death-trap shaft	4204560	711480	Quartz vein, fractured ,carrying barite laths, oxidized pyrite and chalcopyrite crystals; fractures and vein wall lined with fresh galena; surfaces coated with malachite, chrysocolla, cerussite, Fe-oxides, dendritic pyrolusite, yellow-green crusty mineral
Highland	1394	Manhattan tunnel	4203900	711500	Vitreous, white quartz vein, clots of heubnerite-ferberite(?), intergrown pyrite-molybdenite, possibly minor galena, tetragonal pink soft crystals line vugs, patches and veins of iron-stained sericite, oxidized grains pyrite, vein pegmatitic
Highland	1395	Manhattan tunnel (upper workings)	4203900	711500	Gossan in andradite(?) garnet, brecciated quartz vein pods, heavily oxidized, oxidized pyrite grains in quartz.
Highland	1396		4203520	712450	Hydrothermally altered quartz vein/silicious gossan, abundant Fe-Mn oxide staining, quartz granular/vein, granular calcite/crystalline calcite, minor MnO2, secondary copper coats a lone piece of quartzite.
Highland	1397	X-Ray tunnel	4202620	712050	Crystalline, medium grey limestone with abundant clots, pods, stringers, white calcite, very fine pyrite grains, oxidized, minor FeOx stains. Breccia zones cemented with crystalline calcite with abundant open spacing.
Highland	1435		4202920	716725	Quartz vein/brecciated dolomite, massive white to grey quartz vein, highly fractured, with abundant Fe-Mn oxide stains, rocks locally silicified. Hydrothermal, abundant open spaces, quartz euhedral pyrite grains intergrown with quartz crystals.
Highland	1566	Florence mine	4206300	711200	Dump. Clots galena, Feox gossan in white quartz, some Cuox stain.
Kinsley	68	Morning Star mine	4443044	725600	Gossan material, siliceous, with Cuox, Feox.
Kinsley	70	Kinsley mine	4443920	725240	Gossan material, jasper, vein quartz with Cuox.

DISTRICT	SAMPLE	DEPOSIT NAME	UTM N	UTM E	DESCRIPTION
Kinsley	2139		4442996	726168	Hematite-limonite gossan, vuggy, jasperoid with open boxworks, some filled with gossan material
Kinsley	2140	Morning Star mine	4443044	725600	Massive hematite gossan with crusts and coatings of malachite, clots melaconite, some chalcopyrite kernels remain in centers of gossan clots, some chalcocite, sparse azurite staining
Kinsley	2141		4443575	726492	Massive, brown hematite gossan, vuggy in areas, veins of jasperiod and melaconite, malachite staining and crusts
Lincoln	3281	Mount Wheeler mine (Pole adit)	4309000	731100	Vuggy replacement ore, clots muscovite, hematite-after-pyrite, manganese oxide, clots crystalline scheelite, fluorite, calcite, quartz and siderite, phenacite and bertrandite reported to be present.
Lincoln	4393	North Mount Wheeler adit	4310265	731222	Gossany, replacement ore (beryllium skarn) consisting of white, sugary quartz, muscovite, lenses and points of black sphalerite, hematite-after-magnetite cubes, sparse calcite and pale purple fluorite, considerable coarse-grained scheelite
Lincoln	5033	Mount Wheeler mine	4309004	731066	Quartz vein with phenacite (?)
Lincoln	5034		4310221	731236	Altered limestone, silicified, with limonite, scheelite; taken from wallrock 1-foot south of vein, in footwall (from same area as sample 4393)
Lincoln	5035		4310221	731236	Altered limestone, silicified, with limonite, scheelite, beryl, fluorite; collected from 6-feet of vein face, in footwall (taken from same area as sample 4393)
Marble Canyon	2128	Silver Glance workings	4375059	738910	Massive, white vein quartz with clots and lenses of tetrahedrite, some masses up to 1/4-in. thick; some blue and green copper-oxide staining
Mount Moriah	2133	4-mile claim	4355462	731418	Massive hematite-limonite gossan; some quartz, possibly some cerussite; mainly cellular hematite with some manganese-oxide coatings
Mount Moriah	2134	Lead King mine	4362386	732697	Galena in white vein quartz; minor manganese-oxide staining
Mount Moriah	5020	Hendry's Creek prospects	4343870	753540	Hematite vein
Mount Moriah	5021	Hendry's Creek prospects	4343885	753330	Limonitic breccia vein
Mount Moriah	5028	Big Red claims	4338419	748261	Gossan, or iron replacement of limestone; hematite, limonite, gypsum
Mount Moriah	5029	Big Red claims	4338419	748261	Carbonate breccia
Mount Moriah	5030		4337120	748540	Gossan, or iron oxide replacement of fanglomerate; hematite, limonite, gypsum
Mount Moriah	5031	Bellander mine	4332781	743342	Hematite vein
Mount Moriah	5032	Bellander mine	4332781	743342	Manganese-oxide stringers with limonite staining
North Point Spring	4070	Ponderosa No. 1 claim	4306099	713955	Clots and kernels of massive galena in jasperoid; gossan clots in oxidized rock; some manganese oxide coatings
Osceola	2135	Gold Exchange group	4329309	724788	White vein quartz, brecciated, stained with red hematite, some limonite and manganese oxides
Osceola	2136	Summit group	4330214	728289	Brecciated, white vein quartz, gossan clots in vein, vuggy, vugs leached, specks of shiny, native gold in white quartz (not in vugs)
Osceola	2137	Cumberland mine	4327899	725757	White and clear vein quartz with gossan, boxworks, some fine-grained, black mineral(?) associated with the clear quartz
Osceola	4394	Skipper mine	4324996	727585	Massive, milk-white vein quartz with sparse galena, pyrite; limonite-after-pyrite cubes, with possible fine-grained free gold in limonite; trace coarse-grainedscheelite (on fracture surfaces only)

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Osceola	4395	Black Mule mine	4324472	723348	Silicified limestone, jasperoid-cemented breccia, clots of fine-grained, cellular gossan, some MnO points, clear and dark, quartz fills voids, calcite; also milk-white vein quartz with limonite-after-pyrite cubes; medium- to fine-grained scheelite
Pahranagat	3261	Long Horne Silver mine	4167740	644580	Silicified limestone, gossan along shear zones with clots and lenses of sooty manganese oxides; possible silver sulfides present
Pahranagat	3262	Harrison mine	4168380	642710	Manganese- and iron-oxide gossan in silicified limestone, copper-oxide staining, some black calcite, cerrusite in vugs
Pahranagat	3263	John T. lode	4168170	642870	Manganese- and iron-oxide gossan in silicified limestone, some jasperiod
Pahranagat	3264	Black Prince lode	4168640	642950	Jasperoid with manganese-oxide rich gossan, pyrolusite crystals, clear silica coating vugs and fracture surfaces
Pahranagat	3265	Lone Pine prospect	4169740	642580	Jasperoid lense, massive replacement by manganese oxides, silica boxworks, minor iron oxides, some pyrite in pyrolusite clots, clear crystals coating vugs, possibly cerrusite
Pahranagat	3266	Gentry prospect	4170240	642860	Manganese-oxide replacement lense in limestone, jasperoid with minor iron-oxide stain, white botryoidal silica coating fracture surfaces
Pahranagat	3267	South Paw mine	4170680	642240	Massive, soft pyrolusite; some silica; open spaces coated with sooty, botryoidal pyrolusite
Pahranagat	3268	South Paw mine (east)	4170640	642300	Silicified limestone, jasperoid with clots and lenses of pyrolusite, some iron oxides, vuts lined with clear quartz crystals and massive pyrolusite
Pahranagat	3269	Rosey mine	4165760	639700	Silicified limestone with white vein quartz containing clots of galena, sphalerite, possibly tetrahedrite, malachite and azurite clots, minor manganese-oxide staining
Pahranagat	3270	Queen of the Hill lode	4164670	641930	White vein quartz containing spots black lead/silver sulfides, some malachite and azurite staining, cerrusite and anglesite in vugs and coating sulfide clots
Pahranagat	3271	Gilman/Webster property	4165760	642900	Calcite-quartz vein with manganese oxides, black sulfides, minor copper- and iron-oxide stainings and coatings, some cerrusite
Pahranagat	3272	Illinois mine	4166620	642480	Silicified limestone and white vein quartz, clots black sulfides, vugs contain cerrusite, some spots manganese- and iron-oxides, possibly some anglesite
Pahranagat	3273	Fifth of July property	4166220	642420	White vein quartz, siliceous, iron-stained gossan, blue and green copper-oxide staining
Pahranagat	3274	Sanderson Canyon shaft	4166270	642080	Siliceous gossan, iron- and manganese-oxides in vugs, trace copper-oxide staining
Pahranagat	3285	Arab shaft	4167770	642680	White, vuggy vein quartz with clots copper-oxide formed from oxidizing tetrahedrite; contains dark manganese-oxide clots; a soft, grey mineral coats fractures and fills cavities in the vein.
Pahranagat	3286	Indiana ledge	4167680	642620	White vein quartz with minor copper-oxide staining; dendrites of manganese oxides coat fracture surfaces; chyrsacolla cements brecciated vein material.
Pahranagat	4383	Tom Blunder shaft	4168000	642620	Silicated limestone, gossan with minor copper oxide minerals; white vein quartz, vuggy, with clear quartz crystals coating vugs; clots galena, sphalerite; galena is rimmed by anglesite, cerussite crystals occur in some vugs, coating quartz
Pahranagat	4384	Rosey #3 lode claim	4165680	639470	Silicified replacement ore; clots of galena and massive tetrahedrite, some sooty manganese oxides in cellular gossan; azurite and green copper oxide minerals along with yellow and pale cinnamon-brown iron oxides; cerussite crystals in vugs
Pahranagat	4385	Castle property	4169330	642210	Clots of manganese oxides, films and coatings of iron oxides in silicified quartzite-jasperoid lens

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Pahranagat	4386	Edna lode	4164760	642080	Replacement ore, some white vein quartz with clots of galena rimmed with anglesite, some cerussite in vugs; cellular boxworks in quartz, vugs filled with cinnamon- and seal-brown gossan , some pale-green copper-oxide staining, manganese dendrites
Patterson	98	Jerry claims	4276040	697050	Garnet skarn with quartz, calcite, clots pyrite, sphalerite, fine-grained, disseminated sulfides, manganese-and iron-oxide films, disseminated scheelite; dump sample
Patterson	99	Jerry claims	4276420	697080	Siliceous gossan, CuOx, FeOx and Mn clots, fluorite.
Patterson	804	Cinch mine	4274660	700980	Sheared and brecciated quartz vein, iron-oxide boxworks.
Patterson	805	Cinch mine	4274750	699430	Limestone breccia with grey limestone fragments in crystalline, red calcite matrix.
Patterson	806	Cinch mine	4274780	699440	Limestone breccia with calcite pods and veinlets, copper- and iron- oxide gossan clots.
Patterson	810	Ad prospect	4277370	697740	Limonitic and manganese-oxide gossan in skarn; minor scheelite present.
Patterson	810.1	Ad prospect	4277370	697740	Dense, fine-grained, greenish tactite with possible diopside, garnet, tremollite chlorite composition. Contains vugs of calcite, coarse flakes of scheelite and clots of pyrite and chalcopyrite. Slightly vuggy with prismatic quart crystals.
Patterson	811	Silver Lode claims	4274210	698390	Sugary, vuggy quartz vein and quartz (vein) cemented breccia with silic, lithic fragments. Some gossan and FeOx inclusions. Small amount CuOxs (azurite + malachite), some associated with black clots of tetrhedrite.
Patterson	812		4274010	697670	Massive milky white quartz vein with calcite pods and veinlets, some grey silic limestone fragments(?) Also rocks have azurite and malachite. Oxide occur in clumps, and as coatings small amount sulfides and rock breccia.
Patterson	813	unnamed silver prospect	4274390	697610	Grey to white massive quartz vein with few scattered vugs filled with calcite. Cu oxides coat fracture surfaces and occur in clots (oxidized tetrhedrite?) Unidentified yellow oxide, probably Fe, in vugs and fractures.
Piermont	2101	Steel lode claims	4361321	712714	Silicified limestone breccia; clear, euhedral quartz crystals in vugs; iron-oxide staining on fractures; no obvious metallic mineralization
Piermont	2102	Piermont mine	4373080	710620	Silicified breccia; open boxworks in outcrop; breccia contains fragments of vein quartz containing clots of pyrite; breccia of silcified fragments is cemented with dark silica; possibly some arsenopyrite with pyrite.
Piermont	2103	Piermont mine, west stope	4372987	710599	Siliceous gossan in footwall of NE-striking, southeast-dipping fault zone; silicified limestone with limonite gossan clots; barite crystals in vugs and on fracture surfaces.
Piermont	2104	Piermont mine, mill ore	4373228	710759	Selected ore from lower adit; iron-sulfide-stained silicified limestone
Piermont	4400	McCoy Creek prospects	4361056	712671	White "bull" quartz with clots of cellular limonite-hematite gossan, deformed, rounded, cockscomb-like quartz crystals
Pioche	1434	Pioche Metals mine	4203390	718710	Quartz/calcite/siderite vein material, carrying fresh and oxidized pods, stringers and grains galena, sphalerite, pyrite, abundant Fe-Mn oxides, malachite and other secondary copper minerals, clots manganosiderite
Quinn Canyon Range	3123	Combined Metals Reduction Co. mine	4219670	626500	Quartz vein and replacement ore in limestone; ore contains galena, tetrahedrite, and copper sulfides.
Quinn Canyon Range	3124	Combined Metals Reduction Co. mine	4219680	626270	Silicified, gossany vein material; iron-oxide-stained, contains lead oxides
Quinn Canyon Range	3125	Red Bird mine	4217720	626900	Selected from dump; strong iron oxides in silicified vein, somewhat gossan-like; vein contains galena and copper oxides.
Quinn Canyon Range	3126	Iron Cap mine	4217300	626285	Selected from dump; gossan-like vein system containing manganese oxides and possible lead minerals(?)

DISTRICT	SAMPLE	DEPOSIT NAME	UTM N	UTM E	DESCRIPTION
Sacramento	5036		4338290	726980	Carbonate vein with scheelite
Seaman Range	3470	Lost Shepherd claims	4206340	662780	Massive jasperoid breccia laced with chalcedonic silica stringers and veinlets; some lenses of iron-oxide gossan along fractures.
Seaman Range	4071	FNB claims	4214186	670414	Dense iron-oxide-rich jasperoid with gossan-filled voids; some green copper-oxide minerals coating fractures and forming boytroidal clots in vugs; stubby hemimorphite crystals in vugs.
Seaman Range	4072	FNB claims	4214453	670295	Vuggy, siliceous gossan in jasperoid; earthy iron oxides, sugary quartz, green copper-oxide coatings; botryoidal white mineral lining vugs, some has green coloration (possibly smithsonite).
Seaman Range	4073	Red Head claims	4215607	663895	Siliceous gossan in pale-colored jasperiod; punky, kaolinized rock, cinnabar occurs as blebs and disseminations in spongy rock and as coatings on chalcedonic fracture coatings.
Seaman Range	4074	ORA and CV claims area	4208080	664948	Punky kaolinized shale and shaly limestone; flooding and banding of hematitic and limonitic iron oxides.
Shoshone	3277	Scheelite Chief mine	4297100	729080	White vein quartz, clots massive calcite, vuggy, vugs filled with quartz, scheelite present.
Shoshone	3278	Everit mines	4296750	730650	Quartz-calcite vein with clots massive, pale-tan scheelite, minor points of iron-oxide and blue-green copper-oxide minerals.
Shoshone	3279	Everit mines	4298600	730550	White vein quartz, some calcite, trace scheelite.
Shoshone	3280	Oriole mine	4297800	729850	White vein quartz and calcite, vuggy, quartz crystals line vugs, clots of crystalline scheelite.
Shoshone	4391	Tungsten Queen mine	4299334	730866	White and tan, crystalline calcite along with sugary white calcite, crystals of iron-oxide stained scheelite; scheelite fluoresces blue-white, some is encapsulated in quartz.
Shoshone	4392	Hill Top mine	4300085	729864	White to cream colored crystalline calcite, iron-oxide-staining on walls, sugary texture in spots; possibly scheelite present; considerable amount of faint red- and orange-fluorescence--calcite, trace of scheelite with blue-white fluorecsence
Silver King	100	Silver King Well prospect	4238030	683250	Dump, grab brown jasperiod, hematite gossan.
Silver King	267	Silver King claims	4239220	686000	Dump, grab, gossan with spots galena quartz, calcite CuOx, Cinn-br limonite in vugs.
Silver King	268	Silver King claims	4239290	686040	Outcrop, random chip; bleached, mod. kaolinized quartz porphyry, limonite points and flooding (weak) along fractures.
Silver King	269	Silver King claims	4239650	686000	Dump, grab; limonite-hematite gossan; clots galena; vugs with cerrusite.
Silver King	4075	Silver King mine	4240069	685681	Siliceous gossan, some jasperiod lenses; red-brown and yellow-brown iron oxides filling vugs, pale green crystalline mineral in vugs along with quartz crystals.
Silverhorn	2601	Silverhorn mine	4225250	701880	Jasperoid breccia, quartz cement, quartz crystals coat vugs, minor coatings of cerargyrite on fractures some calcite, MnO.
Silverhorn	4076	Silverhorn mine	4225420	702140	Silicified jasperiod breccia; clasts are silicified limestone, minor shale; fracture surfaces and vugs are coated with clear microcrystalline quartz; surfaces and some clasts are flooded with hematite, points of manganese oxides, and some surfaces are coa
Silverhorn	4077	Coin claims shaft	4224588	704715	Silicified limestone, jasperoid, brecciated, with coatings and films pale green-blue oxide mineral; pale green crystalline mineral, possibly dussertite; some hematite flooding, manganese points on fracture surfaces.
Silverhorn	4078	Section 3 prospect	4223833	704346	Silicified limestone with gossan-filled vugs; cerussite crystals in some vugs; rock flooded with brick-red hematite staining; some yellow-brown and cinnamon-brown staining, minor copper-oxide staining, points of manganese oxides.

DISTRICT	SAMPLE	DEPOSIT NAME	UTM N	UTM E	DESCRIPTION
Silverhorn	4079	Fairview mine	4225793	707014	Scoraceous, gossany jasperoid, clots red-brown and yellow-ochre limonite; spots and clots of manganese-oxides as well as fracture coatings; minor amounts of fine-grained galena (?) in shaly, gossany rock.
Silverhorn	4080	Fairview mine, south	4225387	706668	Sugary vein quartz, vuggy, with medium to fine-grained points of galena in quartz; cerussite, along with points of manganese-oxides, in oxidized rock.
Silverhorn	4081	Louie claims, east adit	4222600	708210	Siliceous, gossany replacement ore in jasperoid; some vuggy, cockscomb white vein quartz, brick-red and pale yellow-green oxide coatings; clots and coatings of a pale, green-blue mineral (?)
Silverhorn	4082	Louie claims, west shaft	4222481	707736	Siliceous gossan in jasperoid; dense iron-and manganese-oxide-stained rock; some manganese oxide fracture coatngs; dull, cinnamon-brown limonite.
Tungsten	3275	Hub Basin mine	4315600	729650	White vein quartz containing clots and lenses of huebnerite and wolframite, some fluorite, muscovite, minor pyrite.
Tungsten	3276	Unknown	4315900	729050	White vein quartz containing clots and lenses of huebnerite and wolframite, muscovite, possibly sphalerite.
White Cloud	2126	Cedar Ridge #1 claim	4378756	731958	White vein quartz, clots galena, some cerussite rims; oxidized rock composed of hematite gossan
White Cloud	2127		4377556	733164	Sugary, white, crystalline calcite stringers and breccia-cement; clots, kernels, and fracture coatings of crystalline galena; galena rimmed with red-brown oxide minerals

SPECTROGRAPHIC ANALYSES, DETERMINATION LIMITS

ELEMENT	LOWER DETERMINATION LIMIT	UPPER DETERMINATION LIMIT
Ca	0.05 %	20%
Fe	0.05 %	20%
Mg	0.02 %	10%
Na	0.2 %	5%
P	10 ppm	5%
Ti	0.002%	1%
Ag	0.5 ppm	5,000 ppm
As	200 ppm	10,000 ppm
Au	10 ppm	500 ppm
B	10 ppm	2,000 ppm
Ba	20 ppm	5,000 ppm
Be	1 ppm	1,000 ppm
Bi	10 ppm	1,000 ppm
Cd	20 ppm	500 ppm
Co	10 ppm	2,000 ppm
Cr	10 ppm	5,000 ppm
Cu	5 ppm	20,000 ppm
Ga	5 ppm	500 ppm
Ge	10 ppm	100 ppm
La	50 ppm	1,000 ppm
Mn	10 ppm	5,000 ppm
Mo	5 ppm	2,000 ppm
Nb	20 ppm	2,000 ppm
Ni	5 ppm	5,000 ppm
Pb	10 ppm	20,000 ppm
Sb	100 ppm	10,000 ppm
Sc	5 ppm	100 ppm
Sn	10 ppm	1,000 ppm
Sr	100 ppm	5,000 ppm
V	10 ppm	10,000 ppm
W	20 ppm	10,000 ppm
Y	10 ppm	2,000 ppm
Zn	200 ppm	10,000 ppm
Zr	10 ppm	1,000 ppm

ATOMIC ABSORPTION ANALYSES, DETERMINATION LIMITS

ELEMENT	LOWER DETERMINATION LIMIT		
Au	0.05	ppm	(or as shown, such as N0.5ppm)
As	1.0	ppm	(or as shown, such as N2ppm)
Sb	1.0	ppm	(or as shown, such as N2ppm)
Zn	1.0	ppm	(or as shown, such as N20ppm)

NOTE:

Throughout the data set, the letter **N** signifies the element was not detected at the stated lower limit of detection; **G** (or >) signifies that the element is present in an amount in excess of the stated upper limit of detection; **B** or **no entry** in a single element column signifies that the element was not analyzed; **L** (or <) signifies that the element is present, but is slightly below the detection limit and cannot be given a value. For gold, the atomic absorption analysis is accurate and should be used instead of the value shown under spectrographic analysis. For arsenic, antimony, and zinc, the spectrographic values should be used in the higher ranges (generally above 200ppm) and the atomic absorption values should be used in the lower ranges.

A number of the samples collected during this study are still in the laboratory waiting to be analyzed; these data will be added to the data set when results are obtained.

MINING DISTRICTS, SCHELL RESOURCE AREA--SPECTROGRAPHIC ANALYSES

SAMPLE NO	Ca%	Fe%	Mg%	Na%	P%	Ti%	Ag	As	Au	B	Ba	Be	Bi	Cd	Co	Cr	Cu	Ga	Ge	La	Mn	Mo	Nb	Ni	Pb	Sb	Sc	Sn	Sr	Th	V	W	Y	Zn	Zr
Atlanta Mining District																																			
4098	0.07	1.5	0.02	N0.2	N0.2	0.07	3.	700.	N10.	<10.	150.	<1.	N10.	N20.	N10.	N10.	30.	N5.	N10.	<50.	200.	300.	N20.	7.	150.	100.	5.	N10.	N100.	N100.	100.	N20.	200.	700.	70.
4099	1.	3.	0.5	N0.2	N0.2	0.015	500.	1000.	N10.	<10.	>5000.	1.	N10.	N20.	N10.	N10.	5000.	<5.	N10.	<50.	500.	200.	N20.	7.	500.	2000.	N5.	N10.	300.	N100.	30.	N20.	10.	300.	15.
4100	1.5	15.	0.7	N0.2	N0.2	0.01	300.	5000.	N10.	<10.	>5000.	<1.	N10.	N20.	N10.	N10.	700.	10.	N10.	N50.	300.	300.	N20.	10.	150.	1500.	N5.	N10.	300.	N100.	20.	N20.	N10.	200.	N10.
4387	0.07	2.	0.3	N0.2	<0.2	0.2	10.	<200.	N10.	15.	1000.	1.	<10.	N20.	N10.	10.	300.	50.	N10.	70.	200.	5.	<20.	<5.	1000.	150.	<5.	N10.	N100.	N100.	30.	N20.	15.	300.	200.
4388	0.15	7.	0.1	N0.2	N0.2	0.1	3.	300.	N10.	20.	1000.	1.5	N10.	N20.	<10.	30.	50.	20.	N10.	<50.	200.	100.	<20.	100.	70.	300.	7.	N10.	200.	N100.	200.	150.	200.	300.	100.
4389	0.07	3.	0.05	0.2	<0.2	0.3	30.	1000.	N10.	15.	1000.	<1.	N10.	N20.	N10.	30.	100.	50.	N10.	70.	50.	50.	<20.	5.	200.	500.	5.	N10.	700.	N100.	200.	N20.	10.	N200.	200.
4390	7.	15.	1.5	<0.2	N0.2	0.03	70.	1500.	N10.	N10.	>5000.	1.	N10.	N20.	10.	30.	100.	30.	N10.	N50.	200.	100.	N20.	70.	70.	1000.	5.	N10.	500.	N100.	100.	N20.	30.	500.	<10.
Aurum-Muncy Creek Mining District																																			
2105	0.3	>20.	0.07	N0.2	N0.2	0.002	50.	N200.	N10.	N10.	200.	1.	50.	N20.	30.	<10.	15000.	70.	<10.	N50.	500.	N5.	N20.	N5.	15.	N100.	N5.	30.	N100.	N100.	<10.	N20.	<10.	1500.	N10.
2106	7.	20.	0.15	N0.2	N0.2	0.002	30.	N200.	N10.	N10.	150.	3.	30.	200.	50.	<10.	3000.	70.	<10.	N50.	2000.	N5.	N20.	N5.	2000.	N100.	N5.	50.	N100.	N100.	30.	N20.	<10.	5000.	150.
2107	1.5	10.	0.2	H	N0.2	0.015	15.	N200.	20.	300.	3.	N10.	N10.	>500.	300.	<10.	>20000.	20.	N10.	N50.	5000.	7.	N20.	15.	500.	N100.	<5.	N10.	N100.	N100.	20.	N20.	<10.	>10000.	N10.
2108	3.	7.	0.07	H	N0.2	0.03	150.	200.	N10.	<10.	50.	1.	20.	500.	30.	15.	>20000.	15.	N10.	N50.	1000.	<5.	N20.	<5.	5000.	N100.	<5.	20.	N100.	N100.	20.	N20.	<10.	>10000.	15.
2109	0.3	15.	0.07	N0.2	N0.2	0.03	70.	3000.	N10.	<10.	150.	<1.	N10.	70.	<10.	15.	1500.	30.	N10.	N50.	300.	200.	N20.	5.	>20000.	200.	N5.	50.	N100.	N100.	50.	N20.	<10.	7000.	10.
2110	0.15	20.	0.15	<0.2	N0.2	<0.002	150.	500.	N10.	70.	1500.	3.	N10.	100.	100.	15.	>20000.	50.	N10.	N40.	150.	7.	N20.	15.	700.	150.	N5.	20.	300.	N100.	70.	N20.	<10.	>10000.	N10.
Aurum-Schellbourne Mining District																																			
869	3.	.1	.07			.02	1000.	500.	N	20.	70.	L	N	N	N	15.	200.			L	100.	N	N	L	150.	500.	N	N	N	N	15.	N	L	N	10.
870	20.	15.	3.			.015	70.	1500.	N	L	100.	1.5	N	N	7.	10.	30.			N	700.	70.	N	20.	150.	L	5.	N	L	N	150.	N	15.	L	L
871	20.	.7	10.			.03	7.	N	N	15.	50.	1.	N	N	N	20.	15.			N	700.	7.	N	5.	50.	N	L	N	L	N	30.	N	10.	N	20.
2142	0.3	0.3	0.05	N0.2	<0.2	0.015	7.	<200.	N10.	N10.	100.	3.	<10.	N20.	N10.	15.	700.	<5.	N10.	N50.	50.	50.	N20.	5.	30.	N100.	N5.	N10.	N100.	N100.	30.	<20.	N10.	N200.	<10.
2144	20.	0.5	0.5	N0.2	N0.2	0.015	15.	N200.	N10.	N10.	150.	<1.	<10.	N20.	N10.	20.	150.	5.	N10.	N50.	300.	7.	N20.	5.	50.	N100.	<5.	N10.	500.	N100.	20.	100.	10.	N200.	10.
Aurum-Siegel Mining District																																			
2111	15.	7.	0.7	N0.2	N0.2	0.03	300.	300.	N10.	N10.	200.	2.	N10.	20.	<10.	30.	3000.	30.	N10.	N50.	1500.	7.	N20.	7.	15000.	N100.	<5.	200.	N100.	N100.	150.	N20.	20.	2000.	15.
2112	3.	15.	0.15	N0.2	<0.2	0.03	700.	1500.	N10.	N10.	150.	<1.	N10.	30.	N10.	15.	1500.	50.	N10.	N50.	1000.	15.	N20.	<5.	10000.	<100.	<5.	500.	N100.	N100.	150.	N20.	10.	7000.	20.
2113	1.	15.	0.7	N0.2	<0.2	0.1	70.	N200.	N10.	N10.	200.	3.	15.	N20.	70.	50.	>20000.	70.	N10.	70.	1500.	<5.	N20.	15.	150.	N100.	5.	150.	300.	N100.	50.	N20.	30.	3000.	30.
2114	3.	15.	0.7	N0.2	<0.2	0.1	70.	N200.	N10.	N10.	50.	5.	<10.	20.	100.	30.	20000.	70.	N10.	50.	1500.	N5.	N20.	20.	100.	N100.	5.	100.	200.	N100.	15.	70.	20.	3000.	100.
2129	0.3	0.7	0.3	N0.2	<0.2	0.1	20.	N200.	N10.	<10.	70.	1.	70.	<20.	N10.	15.	200.	<5.	N10.	<50.	1500.	70.	<20.	<5.	15000.	N100.	<5.	N10.	N100.	N100.	150.	30.	<10.	300.	30.
2130	1.5	3.	0.5	N0.2	<0.2	0.03	30.	N200.	N10.	N10.	200.	70.	15.	20.	<10.	<10.	700.	7.	N10.	<50.	>5000.	150.	N20.	<5.	5000.	N100.	<5.	150.	300.	N100.	70.	1000.	10.	1500.	15.
2143	0.15	0.7	0.15	N0.2	<0.2	0.03	700.	200.	N10.	<10.	100.	2.	<10.	N20.	N10.	20.	500.	10.	N10.	<50.	150.	50.	N20.	5.	70.	700.	N5.	N10.	N100.	N100.	30.	N20.	<10.	N200.	50.
BLack Horse Mining District																																			
5000	20.	0.5	1.	<0.2	N0.2	0.02	1.5	N200.	N10.	10.	700.	<1.	N10.	N20.	N10.	20.	20.	N5.	N10.	N50.	1000.	N5.	N20.	<5.	300.	N100.	N5.	N10.	500.	N100.	30.	N20.	10.	N200.	15.
5001	3.	1.5	0.07	N0.2	N0.2	0.03	3.	N200.	N10.	<10.	700.	<1.	N10.	N20.	<10.	15.	30.	<5.	N10.	<50.	1000.	<5.	N20.	7.	70.	N100.	N5.	N10.	N100.	N100.	30.	N20.	10.	N200.	70.
5002	1.5	0.7	0.02	N0.2	0.3	0.02	7.	200.	N10.	10.	200.	1.	N10.	N20.	N10.	15.	3000.	N5.	20.	N50.	150.	50.	<20.	10.	2000.	200.	N5.	N10.	200.	N100.	30.	300.	<10.	<200.	10.
5003	0.05	3.	0.07	N0.2	N0.2	0.05	<0.5	200.	N10.	15.	200.	15.	N10.	N20.	N10.	15.	50.	10.	N10.	<50.	50.	5.	<20.	5.	70.	N100.	N5.	N10.	N100.	N100.	20.	50.	15.	N200.	150.
5004	0.15	2.	0.1	N0.2	<0.2	0.1	2.	300.	N10.	15.	700.	<1.	N10.	N20.	N10.	20.	10.	10.	N10.	<50.	30.	N5.	<20.	5.	30.	N100.	N5.	N10.	N100.	N100.	30.	N20.	30.	N200.	200.
5005	<0.05	1.	0.02	N0.2	<0.2	0.03	7.	200.	10.	10.	3000.	<1.	N10.	N20.	N10.	15.	50.	5.	N10.	N50.	30.	15.	N20.	<5.	700.	N100.	N5.	N10.	N100.	N100.	30.	N20.	<10.	N200.	70.
5006	0.15	1.5	0.07	N0.2	<0.2	0.03	N0.5	<200.	N10.	10.	700.	<1.	N10.	N20.	N10.	15.	5.	5.	N10.	<50.	700.	N5.	N20.	<5.	20.	N100.	N5.	N10.	N100.	N100.	100.	N20.	10.	N200.	30.
5007	7.	0.3	0.7	N0.2	N0.2	0.01	100.	N200.	N10.	10.	>5000.	<1.	N10.	N20.	N10.	15.	30.	N5.	<10.	N50.	150.	N5.	N20.	5.	1000.	<100.	N5.	N10.	700.	N100.	15.	20.	<10.	300.	<10.
5008	3.	1.	0.7	N0.2	N0.2	0.007	150.	500.	N10.	15.	700.	1.	N10.	20.	N10.	15.	2000.	<5.	20.	N50.	30.	N5.	N20.	7.	2000.	3000.	N5.	N10.	N100.	N100.	10.	N20.	<10.	1000.	<10.
5009	20.	0.3	1.	N0.2	N0.2	0.01	5.	N200.	N10.	N10.	50.	<1.	N10.	N20.	N10.	15.	30.	N5.	N10.	N50.	150.	N5.	N20.	<5.	100.	N100.	N5.	N10.	500.	N100.	15.	N20.	<10.	N200.	<10.
5010	20.	0.2	1.5	N0.2	N0.2	N0.002	3.	N200.	N10.	N10.	20.	<1.	N10.	N20.	N10.	10.	20.	N5.	N10.	N50.	50.	N5.	N20.	N5.	100.	N100.	N5.	N10.	300.	N100.	<10.	N20.	N10.	N200.	N10.
5011	7.	0.5	1.5	N0.2	N0.2	0.005	700.	300.	<10.	10.	30.	1.	N10.	70.	N10.	10.	2000.	<5.	20.	N50.	30.	<5.	<20.	5.	3000.	1500.	N5.	N10.	200.	N100.	30.	1000.	<10.	3000.	<10.
5012	10.	0.1	0.3	N0.2	N0.2	<0.002	100.	N200.	N10.	N10.	30.	<1.	N10.	N20.	N10.	10.	500.	N5.	15.	N50.	30.	10.	N20.	<5.	700.	200.	N5.	N10.	200.	N100.	15.	1000.	N10.	N200.	<10.
5013	0.15	1.5	0.03	N0.2	<0.2	0.02	1.	<200.	N10.	10.	100.	<1.	N10.	N20.	N10.	15.	15.	5.	N10.	<50.	30.	<5.	N20.	7.	20.	N100.	N5.	N10.	N100.	N100.	15.	20.	10.	N200.	50.
5014	>20.	0.7	0.7	N0.2	N0.2	0.03	0.7	N200.	N10.	10.	100.	<1.	N10.	N20.	N10.	20.	7.	N5.	N10.	N50.	200.	N5	N20.	5.	50.	N100.	<5.	N10.	1000.	N100.	10.	N20.	10.	N200.	15.
5015	0.3	1.5	0.1	N0.2	<0.2	0.2	0.7	<200.	N10.	10.	200.	1.	N10.	N20.	N10.	20.	5.	5.	N10.	<50.	20.	N5.	<20.	5.	20.	N100.	<5.	N10.	N100.	N100.	70.	N20.	10.	N200.	200.
5016	>20.	0.7	1.5	N0.2	N0.2	0.07	2.	N200.	N10.	N10.	100.	<1.	N10.	N20.	N10.	30.	15.	<5.	N10.	<50.	1000.	N5.	N20.	<5.	50.	N100.	<5.	N10.	500.	N100.	15.	N20.	30.	N200.	50.
5017	0.3	>20.	0.05	N0.2	N0.2	0.007	1.5	1500.	N10.	N10.	50.	<1.	N10.	50.	N10.	20.	1500.	50.	20.	N50.	70.	<5.	N20.	<5.	2000.	300.	N5.	N10.	N100.	N100.	20.	N20.	<10.	>10000.	N10.
5018	>20.	0.5	0.3	N0.2	N0.2	N0.002	<0.5	N200.	N10.	N10.	N20.	N1.	N10.	70.	N10.	10.	30.	N5.	N10.	N50.	700.	<5.	N20.	N5.	5000.	N100.	N5.	N10.	300.	N100.	<10.	N20.	N10.	1000.	<10.

MINING DISTRICTS, SCHELL RESOURCE AREA--SPECTROGRAPHIC ANALYSES

SAMPLE NO	Ca%	Fe%	Mg%	Na%	P%	Ti%	Ag	As	Au	B	Ba	Be	Bi	Cd	Co	Cr	Cu	Ga	Ge	La	Mn	Mo	Nb	Ni	Pb	Sb	Sc	Sn	Sr	Th	V	W	Y	Zn	Zr
Bristol/Jackrabbit Mining District																																			
4083	5.	10.	0.3	N0.2	N0.2	0.05	70.	7000.	N10.	N10.	200.	<1.	200.	50.	N10.	<10.	20000.	20.	N10.	N50.	5000.	N5.	N20.	<5.	10000.	2000.	<5.	150.	200.	N100.	30.	N20.	15.	3000.	70.
4084	15.	1.5	0.7	N0.2	N0.2	0.003	150.	N200.	N10.	N10.	50.	N1.	N10.	N20.	N10.	<10.	50.	N5.	N10.	100.	>5000.	15.	N20.	N5.	10000.	N100.	7.	N10.	700.	N100.	100.	N20.	<10.	3000.	N10.
4085	15.	15.	3.	N0.2	N0.2	0.02	N0.5	N200.	N10.	20.	200.	3.	N10.	N20.	N10.	10.	20.	5.	N10.	N50.	1500.	N5.	N20.	N5.	100.	100.	N5.	N10.	N100	N100.	150.	30.	10.	<200.	15.
4086	0.1	1.5	0.03	N0.2	N0.2	0.07	200.	5000.	N10.	10.	70.	<1.	N10.	N20.	N10.	N10.	50.	N5.	N10.	<50.	300.	7.	N20.	<5.	5000.	2000.	N5.	N10.	<100.	N100.	15.	N20.	<10.	N200.	150.
4087	0.3	3.	0.15	N0.2	N0.2	0.15	10.	700.	N10.	10.	700.	<1.	N10.	N20.	N10.	<10.	200.	<5.	N10.	<50.	700.	7.	N20.	7.	500.	<100.	7.	N10.	300.	N100.	30.	N20.	20.	500.	300.
4088	7.	1.	1.	N0.2	N0.2	<0.002	150.	N200.	N10.	N10.	5000.	N1.	N10.	300.	N10.	N10.	1000.	<5.	N10.	N50.	>5000.	5.	N20.	N5.	>20000.	700.	<5.	N10.	200.	N100.	70.	N20.	N10.	>10000.	N10.
4089	15.	15.	0.5	N0.2	0.2	0.07	N0.5	700.	N10.	N10.	500.	<1.	70.	N20.	30.	20.	500.	7.	N10.	200.	1000.	20.	30.	10.	150.	N100.	N5.	N10.	700.	N100.	100.	N20.	100.	200.	70.
4090	3.	7.	1.5	N0.2	N0.2	<0.002	70.	300.	N10.	<10.	100.	1.	N10.	N20.	10.	<10.	500.	<5.	N10.	N50.	1500.	30.	N20.	<5.	50.	<100.	N5.	N10.	N100.	N100.	100.	N20.	N10.	500.	N10.
4091	1.5	7.	0.05	N0.2	N0.2	<0.002	150.	700.	N10.	10.	N20.	N1.	30.	N20.	N10.	<10.	1000.	15.	N10.	N50.	300.	N5.	N20.	<5.	>20000.	300.	N5.	200.	N100.	N100.	<10.	N20.	N10.	1500.	N10.
4092	2.	20.	0.07	N0.2	N0.2	0.05	70.	10000.	N10.	N10.	50.	N1.	300.	150.	N10.	N10.	1500.	70.	20.	N50.	1500.	N5.	N20.	<5.	15000.	1000.	<5.	150.	N100.	N100.	30.	N20.	<10.	3000.	30.
4093	15.	5.	0.7	N0.2	N0.2	0.003	150.	10000.	N10.	30.	70.	<1.	1000.	20.	N10.	N10.	>20000.	<5.	N10.	N50.	5000.	20.	N20.	<5.	3000.	2000.	N5.	100.	150.	N100.	15.	N20.	15.	1500.	N10.
4094	2.	15.	0.07	N0.2	N0.2	0.01	70.	7000.	N10.	<10.	30.	N1.	300.	N20.	N10.	<10.	1000.	15.	N10.	N50.	2000.	30.	N20.	<5.	1500.	3000.	N5.	150.	N100.	N100.	150.	N20.	15.	1500.	N10.
4095	7.	3.	2.	N0.2	N0.2	0.005	150.	700.	N10.	<10.	20.	1.	15.	<20.	N10.	<10.	300.	<5.	N10.	N50.	1500.	N5.	N20.	5.	>20000.	200.	N5.	N10.	200.	N100.	100.	<20.	N10.	3000.	N10.
4096	15.	3.	0.7	N0.2	N0.2	0.002	100.	200.	N10.	N10.	<20.	<1.	150.	150.	N10.	N10.	1500.	<5.	N10.	N50.	>5000.	N5.	N20.	<5.	7000.	700.	N5.	30.	300.	N100.	70.	N20.	<10.	5000.	N10.
4097	15.	1.5	3.	N0.2	N0.2	N0.002	700.	1000.	N10.	30.	N20.	<1.	N10.	500.	N10.	N10.	3000.	30.	N10.	N50.	>5000.	N5.	N20.	<5.	>20000.	5000.	N5.	150.	500.	N100.	10.	N20.	N10.	7000.	N10.
Cleve Creek Mining District																																			
4396	15.	0.3	0.15	N0.2	<0.2	0.005	200.	200.	N10.	N10.	150.	2.	N10.	N20.	N10.	<10.	700.	<5.	20.	N50.	150.	10.	N20.	<5.	5000.	500.	N5.	N10.	500.	N100.	15.	100.	N10.	N200.	N10.
4397	0.1	7.	0.03	N0.2	N0.2	0.02	500.	1500.	N10.	<10.	700.	2.	N10.	20.	<10.	10.	2000.	20.	15.	N50.	150.	20.	N20.	7.	>20000.	2000.	N5.	N10.	500.	N100.	20.	N20.	N10.	3000.	<10.
4398	<0.05	0.7	<0.02	N0.2	<0.2	0.015	5.	N200.	<10.	10.	100.	1.5	N10.	N20.	N10.	<10.	700.	<5.	20.	N50.	20.	N5.	N20.	<5.	700.	N100.	N5.	N10.	N100.	N100.	20.	N20.	<10.	N200.	50.
4399	<0.05	0.5	<0.02	N0.2	<0.2	0.02	5.	<200.	10.	<10.	150.	<1.	N10.	N20.	N10.	10.	500.	<5.	20.	N50.	15.	N5.	N20.	N5.	150.	N100.	N5.	N10.	N100.	N100.	15.	N20.	N10.	N200.	50.
Cooper Mining District																																			
2131	1.5	0.3	0.15	N0.2	N0.2	0.15	700.	700.	N10.	10.	1000.	5.	10.	20.	N10.	30.	10000.	<5.	N10.	N50.	500.	<5.	<20.	10.	700.	2000.	<5.	N10.	<100.	N100.	150.	N20.	10.	300.	50.
2132	10.	0.7	0.5	N0.2	N0.2	0.1	10.	N200.	N10.	<10.	200.	3.	N10.	N20.	<10.	30.	150.	<5.	N10.	N50.	300.	N5.	N20.	15.	300.	N100.	<5.	N10.	150.	N100.	150.	N20.	<10.	<200.	30.
2138	20.	1.	0.3	<0.2	<0.2	0.15	3.	<200.	N10.	<10.	1000.	5.	N10.	N20.	N10.	20.	150.	15.	N10.	<50.	700.	N5.	N20.	5.	150.	N100.	5.	N10.	200.	N100.	70.	N20.	20.	N200.	50.
Eagle Mining District																																			
2115	5.	0.3	2.	N0.2	<0.21	0.005	200.	N200.	N10.	N10.	150.	N1.	150.	70.	N10.	10.	3000.	N5.	N10.	N50.	150.	N5.	N20.	5.	7000.	700.	N5.	1000.	N100.	N100.	100.	N20.	N10.	3000.	<10.
2116	15.	3.	3.	0.2	N0.2	0.015	15.	N200.	N10.	N10.	200.	50.	<10.	500.	<10.	<10.	200.	70.	20.	N50.	>5000.	20.	<20.	7.	150.	N100.	<5.	150.	N100.	N100.	50.	700.	20.	5000.	15.
2117	0.5	0.15	0.3	N0.2	<0.2	<0.002	500.	2000.	N10.	N10.	100.	3.	20.	150.	N10.	15.	7000.	<5.	N10.	N50.	300.	N5.	N20.	<5.	2000.	2000.	N5.	20.	N100.	N100.	15.	150.	N10.	1500.	<10.
2118	15.	0.3	7.	<0.2	N0.2	0.03	15.	N200.	N10.	N10.	70.	<1.	N10.	<20.	N10.	30.	200.	5.	N10.	N50.	150.	N5.	N20.	7.	200.	N100.	N5.	N10.	300.	N100.	15.	300.	<10.	N200.	15.
2119	15.	0.2	2.	N0.2	N0.2	0.002	200.	3000.	N10.	N10.	200.	<1.	N10.	150.	N10.	10.	10000.	15.	N10.	N50.	150.	20.	N20.	7.	15000.	1500.	N5.	30.	150.	N100.	<10.	N20.	N10.	3000.	<10.
2120	0.3	0.3	0.7	N0.2	<0.2	0.002	200.	N200.	N10.	N10.	50.	<1.	1000.	70.	N10.	15.	150.	N5.	N10.	N50.	200.	7.	N20.	7.	7000.	N100.	N5.	70.	N100.	N100.	15.	N20.	N10.	3000.	50.
2121	0.3	3.	0.15	N0.2	<0.2	0.05	10.	N200.	N10.	<10.	70.	3.	300.	N20.	<10.	50.	300.	10.	15.	<50.	5000.	N5.	<20.	15.	500.	N100.	<5.	20.	N100.	N100.	10.	1500.	<10.	200.	20.
2122	0.3	1.5	0.07	N0.2	0.5	0.02	70.	N200.	N10.	<10.	100.	1.5	200.	50.	N10.	10.	1000.	<5.	N10.	N50.	>5000.	N5.	<20.	5.	3000.	N100.	<5.	100.	200.	N100.	15.	1500.	<10.	2000.	15.
2123	0.05	>20.	0.03	N0.2	N0.2	0.02	300.	3000.	N10.	N10.	30.	1.	150.	30.	<10.	20.	700.	70.	10.	N50.	200.	70.	N20.	<5.	>20000.	3000.	N5.	30.	N100.	N100.	50.	N20.	<10.	5000.	30.
2124	2.	20.	0.1	N0.2	N0.2	0.03	700.	5000.	N10.	N10.	70.	<1.	100.	150.	<10.	20.	10000.	70.	N10.	N50.	500.	N5.	N20.	10.	>20000.	700.	5.	N10.	200.	N100.	15.	N20.	15.	>10000.	50.
2125	0.07	15.	0.07	N0.2	N0.2	0.05	500.	2000.	N10.	10.	500.	<1.	700.	30.	<10.	15.	1500.	20.	N10.	<50.	150.	50.	N20.	10.	>20000.	1500.	<5.	N10.	N100.	N100.	10.	700.	<10.	3000.	70.
Eagle Valley Mining District																																			
1498	1.	3.	.7			.5	10.	N	N	20.	700.	3.	N	N	10.	L	50.			100.	300.	N	N	10.	70.	N	10.	N	500.	N	50.	N	30.	N	200.
1499	.7	2.	.5			.3	15.	N	N	10.	150.	3.	N	N	15.	10.	20.			50.	200.	N	N	15.	30.	N	5.	N	L	N	50.	N	15.	N	100.
1563	20.	.2	.07			.02	2000.	N	N	L	100.	2.	N	N	L	N	30.			N	1000.	L	N	5.	150.	N	N	N	500.	N	10.	N	10.	N	20.
1564	>20	2.	1.5			.03	2.	N	N	10.	300.	1.	N	N	N	N	5.			L	>5000	N	N	L	30.	N	N	N	200.	N	30.	N	L	300.	15.
1565	20.	.3	2.			.005	L	N	N	N	>5000.	1.	N	N	N	N	L			L	200.	N	N	L	70.	N	N	N	3000.	N	10.	N	N	N	L
Freiberg Mining District																																			
1761	2.	10.	.1			.05	100.	>10000.	N	20.	100.	L	50.	200.	N	L	>20000.			50.	500.	50.	L	L	>20000.	1500.	L	20.	100.	N	10.	N	L	>10000.	50.
1762	1.	3.	.2			.15	1.	500.	N	50.	300.	1.	N	N	N	L	200.			50.	20.	50.	L	L	150.	L	N	N	100.	N	20.	N	L	500.	200.
1763	20.	10.	5.			.02	150.	N	N	200.	50.	L	200.	200.	L	N	7000.			50.	2000.	N	L	L	>20000.	150.	N	20.	100.	N	10.	N	N	>10000.	L
1764	20.	10.	.7			.05	20.	N	N	10.	L	2.	300.	>500.	100.	N	150.			50.	>5000.	N	L	L	1000.	N	L	20.	L	N	10.	N	L	>10000.	100.
1765	20.	10.	10.			.005	100.	L	N	10.	L	N	10.	300.	N	N	1500.			50.	2000.	N	L	L	>20000.	200.	N	500.	L	N	50.	N	N	>10000.	N
1766	10.	10.	1.			.05	30.	5000.	N	20.	500.	L	10.	200.	N	20.	>20000.			50.	2000.	L	L	L	20000.	1000.	L	100.	100.	N	20.	N	N	10000.	50.
1767	20.	10.	5.			.5	2.	200.	N	500.	700.	L	70.	20.	10.	30.	150.			50.	3000.	150.	20.	10.	200.	100.	15.	L	500.	N	50.	5000.	N	1000.	200.
3287	3.	20.	.2	L	L	.03	3.	N	N	50.	70.	1.	N	N	300.	L	2000.	70.	N	50.	700.	7.	N	100.	30.	N	L	30.	L	N	20.	N	10.	1000.	50.
3288	3.	10.	.07	L	.2	.03	200.	>10000.	N	15.	100.	1.	100.	>500.	N	L	>20000.	20.	N	N	500.	50.	N	L	>50000.	1000	L	30.	100.	N	10.	N	15.	>10000.	50.
3469	10.	5.	0.5	0.7	N0.2	0.007	N.05	300.	N10.	10.	3000.	70.	N10.	N20.	N10.	N10.	7.	5.	N10.	<50.	>5000.	200.	N20.	N5.	100.	N100.	N5.	N10.	700.	N100.	50.	N20.	100.	N200.	20.

MINING DISTRICTS, SCHELL RESOURCE AREA--SPECTROGRAPHIC ANALYSES

SAMPLE NO	Ca%	Fe%	Mg%	Na%	P%	Ti%	Ag	As	Au	B	Ba	Be	Bi	Cd	Co	Cr	Cu	Ga	Ge	La	Mn	Mo	Nb	Ni	Pb	Sb	Sc	Sn	Sr	Th	V	W	Y	Zn	Zr
Geyser Ranch Area																																			
801	.05	1.5	.1			.07	20.	200.	N	20.	1000.	10.	N	N	10.	20.	300.			50.	>5000	N	L	20.	150.	L	7.	N	500.	N	15.	10000.	15.	200.	50.
802	.7	.3	.15			.05	500.	N	N	50.	2000.	10.	N	N	L	10.	300.			N	>5000	N	N	5.	1500.	700.	7.	N	5000.	N	10.	10000.	L	N	20.
803	.3	.2	.7			.1	500.	N	N	100.	100.	15.	N	N	N	30.	10.			L	200.	N	N	5.	30.	L	L	N	150.	N	20.	N	10.	N	70.
Golden Gate Range Area																																			
3200	2.	15.	.15	L	L	.05	N	500.	N	70.	100.	L	N	N	L	2000.	50.	50.	N	L	70.	7.	N	70.	15.	N	L	20.	150.	N	1500.	N	20.	300.	20.
Highland Mining District																																			
1389	3.	>20.	.5			.01	50.	2000.	N	50.	20.	1.	10.	20.	N	N	1000.			50.	3000.	N	L	5.	>20000.	100.	L	200.	N	N	30.	N	L	5000.	20.
1390	1.	>20.	.1			.02	1.5	300.	N	20.	200.	7.	N	N	10.	L	>20000.			50.	1000.	100.	20.	5.	100.	N	L	N	N	N	100.	500.	100.	500.	50.
1391	1.5	>20.	.05			.1	1.5	200.	N	20.	50.	7.	10.	N	N	L	L			L	300.	70.	20.	N	50.	N	5.	50.	N	N	200.	100.	50.	700.	200.
1392	.5	>20.	.05			.02	2.	N	N	20.	50.	5.	10.	N	N	N	L			L	200.	50.	20.	N	50.	N	N	N	N	N	50.	1000.	N	L	L
1393	1.5	1.	.05			.05	500.	2000.	N	50.	G5000	2.	N	100.	N	N	1000.			50.	500.	70.	L	N	20000.	5000.	N	N	1000.	N	10.	N	N	>10000	50.
1394	L	2.	.2			.07	5.	N	N	20.	1000.	5.	N	N	N	N	7.			50.	500.	100.	20.	N	150.	L	N	20.	N	N	30.	N	N	500.	100.
1395	1.	>20.	.1			.02	20.	N	N	50.	500.	7.	L	L	10.	N	200.			L	3000.	70.	20.	L	1000.	N	N	70.	N	N	100.	50.	L	1000.	L
1396	10.	>20.	.5			.02	5.	1000.	N	50.	150.	L	10.	N	10.	N	500.			L	300.	100.	20.	N	50.	N	N	N	N	N	50.	100.	N	L	L
1397	G20	1.	2.			.02	1.5	N	N	N	20.	L	N	N	N	N	20.			50.	150.	N	L	L	50.	N	N	N	200.	N	10.	N	N	L	N
1435	1.	15.	.5			.002	5.	1000.	N	20.	200.	10.	500.	L	N	N	300.			50.	5000.	N	L	L	100.	100.	N	100.	N	N	100.	50.	L	2000.	N
1566	.5	3.	.05			N	700.	500.	N	15.	500.	L	10.	N	7.	N	3000.			20.	200.	50.	N	7.	>20000.	1000.	N	50.	L	N	L	L	N	10000.	15.
Kinsley Mining District																																			
68	.7	15.	.15			.51	200.	1000.	N	10.	300.	1.5	>1000.	150.	70.	N	>20000.			N	700.	50.	N	10.	10000.	1000.	N	15.	N	N	10.	N	15.	10000.	20.
70	1.5	10.	.07			.02	100.	10000.	N	15.	70.	7.	100.	20.	70.	N	20000.			N	1000.	30.	N	20.	200.	500.	N	15.	N	N	20.	300.	10.	2000.	10.
2139	0.3	7.	0.03	1.	1.	0.07	50.	2000.	N10.	10.	100.	N1.	500.	N20.	N10.	<10.	30.	20.	N10.	N50.	30.	7.	N20.	<5.	1500.	N100.	15.	N10.	200.	N100.	30.	N20.	<10.	N200.	20.
2140	0.15	15.	0.1	N0.2	N0.2	0.002	70.	1000.	N10.	N10.	150.	<1.	>1000.	N20.	50.	<10.	>20000.	20.	N10.	<50.	50.	100.	N20.	10.	300.	300.	N5.	30.	N100.	N100.	<10.	N20.	<10.	1000.	10.
2141	3.	10.	0.5	N0.2	N0.2	0.01	5.	300.	N10.	50.	50.	2.	15.	N20.	20.	10.	>20000.	20.	<10.	N50.	100.	100.	N20.	7.	70.	N100.	<5.	N10.	N100.	N100.	200.	20.	<10.	500.	<10.
Lincoln Mining District																																			
3281	3.	5.	2.			.05	3.	N	N	50.	1500.	>1000.	N	N	L	20.	7.			L	5000.	L	N	L	700.	N	5.	N	700.	N	20.	50.	30.	200.	70.
4393	15.	2.	2.	<0.2	<0.2	0.03	1.5	N200.	N10.	30.	2000.	>1000.	N10.	N20.	<10.	10.	15.	30.	<10.	<50.	700.	N5.	N20.	5.	100.	N100.	5.	N10.	500.	N100.	20.	300.	20.	N200.	20.
5033	0.3	1.5	0.3	N0.2	0.2	0.02	5.	<200.	N10.	10.	2000.	500.	N10.	N20.	N10.	15.	30.	10.	N10.	N50.	700.	N5.	N20.	7.	1500.	N100.	N5.	N10.	100.	N100.	15.	<20.	10.	<200.	15.
5034	20.	1.5	2.	N0.2	<0.2	0.003	N0.5	N200.	N10.	20.	1500.	700.	N10.	N20.	N10.	10.	<5.	5.	N10.	<50.	5000.	N5.	N20.	N5.	500.	N100.	<5.	N10.	1000.	N100.	<10.	1000.	30.	N200.	<10.
5035	10.	2.	3.	<0.2	<0.2	0.02	N0.5	N200.	N10.	30.	5000.	>1000.	N10.	N20.	<10.	10.	<5.	15.	15.	<50.	1500.	N5.	N20.	N5.	70.	N100.	5.	N10.	1000.	N100.	15.	1000.	50.	N200.	15.
Marble Canyon Mining District																																			
2128	7.	0.15	5.	N0.2	N0.2	N0.002	150.	500.	N10.	N10.	N20.	<1.	<10.	30.	N10.	15.	7000.	N5.	N10.	N50.	150.	N5.	N20.	<5.	>20000.	7000.	N5.	70.	N100.	N100.	<10.	N20.	<10.	700.	10.
Mount Moriah Area																																			
2133	0.7	15.	0.5	<0.2	N0.2	0.015	50.	<200.	N10.	30.	700.	150.	N10.	N20.	N10.	<10.	150.	30.	N10.	N50.	>5000.	N5.	N20.	<5.	1500.	N100.	<5.	15.	300.	N100.	150.	50.	20.	700.	<10.
2134	7.	1.5	0.5	1.	<0.2	0.1	150.	N200.	N10.	<10.	200.	2.	300.	N20.	<10.	30.	150.	10.	N10.	<50.	3000.	N5.	N20.	7.	>20000.	150.	5.	<10.	700.	N100.	30.	N20.	15.	N200.	100.
5020	15.	3.	5.	1.5	N0.2	0.01	N0.5	N200.	N10.	30.	>5000.	1.5	N10.	30.	<10.	<10.	10.	7.	N10.	N50.	>5000.	<5.	N20.	10.	10000.	N100.	N5.	N10.	300.	N100.	15.	N20.	<10.	1500.	N10.
5021	7.	1.5	0.15	N0.2	<0.2	0.015	N0.5	N200.	N10.	10.	700.	1.	N10.	N20.	N10.	15.	100.	<5.	N10.	<50.	2000.	10.	N20.	7.	150.	N100.	N5.	N10.	150.	N100.	30.	N20.	20.	300.	50.
5028	20.	7.	0.5	1.	N0.2	0.02	N0.5	500.	N10.	30.	>5000.	20.	N10.	N20.	<10.	20.	10.	15.	70.	N50.	>5000.	20.	N20.	15.	100.	<100.	<5.	N10.	300.	N100.	20.	N20.	15.	200.	20.
5029	>20.	0.7	5.	<0.2	N0.2	0.03	<0.5	N200.	N10.	20.	150.	3.	N10.	N20.	N10.	30.	5.	N5.	N10.	<50.	1500.	N5.	N20.	N5.	200.	N100.	<5.	N10.	200.	N100.	15.	N20.	<10.	N200.	15.
5030	15.	10.	0.5	0.7	N0.2	0.03	N0.5	500.	N10.	30.	3000.	10.	N10.	N20.	N10.	30.	7.	50.	50.	N50.	1500.	N5.	N20.	<5.	30.	<100.	<5.	N10.	300.	N100.	30.	150.	20.	<200.	20.
5031	>20.	3.	1.	0.2	N0.2	0.02	7.	N200.	N10.	30.	700.	7.	N10.	N20.	N10.	20.	7.	7.	<10.	<50.	1500.	7.	N20.	<5.	2000.	N100.	10.	N10.	300.	N100.	30.	N20.	300.	<200.	20.
5032	7.	2.	3.	0.7	N0.2	0.1	700.	N200.	N10.	50.	>5000.	5.	N10.	50.	N10.	30.	100.	20.	N10.	70.	3000.	5.	N20.	5.	>20000.	N100.	5.	N10.	5000.	N100.	30.	N20.	20.	1500.	50.
North Point Spring Area																																			
4070	3.	5.	0.3	N0.2	N0.2	0.07	100.	200.	N10.	10.	100.	1.5	N10.	N20.	N10.	<10.	700.	<5.	N10.	N50.	150.	50.	N20.	<5.	>20000.	150.	N5.	N10.	>5000.	N100.	30.	N20.	N10.	1500.	30.
Osceola Mining District																																			
2135	5.	3.	0.15	N0.2	<0.2	0.1	5.	1000.	N10.	20.	200.	3.	10.	N20.	<10.	30.	30.	15.	<10.	<50.	150.	N5.	<20.	7.	5000.	N100.	5.	N10.	700.	N100.	50.	30.	20.	<200.	300.
2136	0.07	0.7	0.03	N0.2	<0.2	0.03	3.	<200.	15.	<10.	70.	<1.	N10.	N20.	N10.	15.	10.	<5.	<10.	N50.	100.	N5.	N20.	<5.	200.	N100.	N5.	N10.	N100.	N100.	10.	N20.	<10.	N200.	70.
2137	0.15	2.	0.02	N0.02	<0.2	0.05	50.	1500.	N10.	10.	300.	1.	N10.	N20.	<10.	15.	30.	5.	N10.	N50.	150.	N5.	N20.	5.	200.	150.	<5.	N10.	150.	N100.	15.	N20.	<10.	N200.	30.
4394	0.2	1.5	0.1	N0.2	<0.2	0.1	3.	300.	N10.	20.	700.	30.	N10.	N20.	<10.	15.	20.	15.	N10.	N50.	20.	<5.	<20.	5.	1000.	N100.	<5.	N10.	N100.	N100.	30.	1000.	15.	200.	70.
4395	7.	7.	0.1	N0.2	<0.2	0.05	30.	1500.	N10.	15.	300.	5.	N10.	N20.	10.	100.	30.	15.	<10.	<50.	1500.	10.	<20.	50.	150.	150.	7.	N10.	150.	N100.	50.	700.	30.	700.	150.

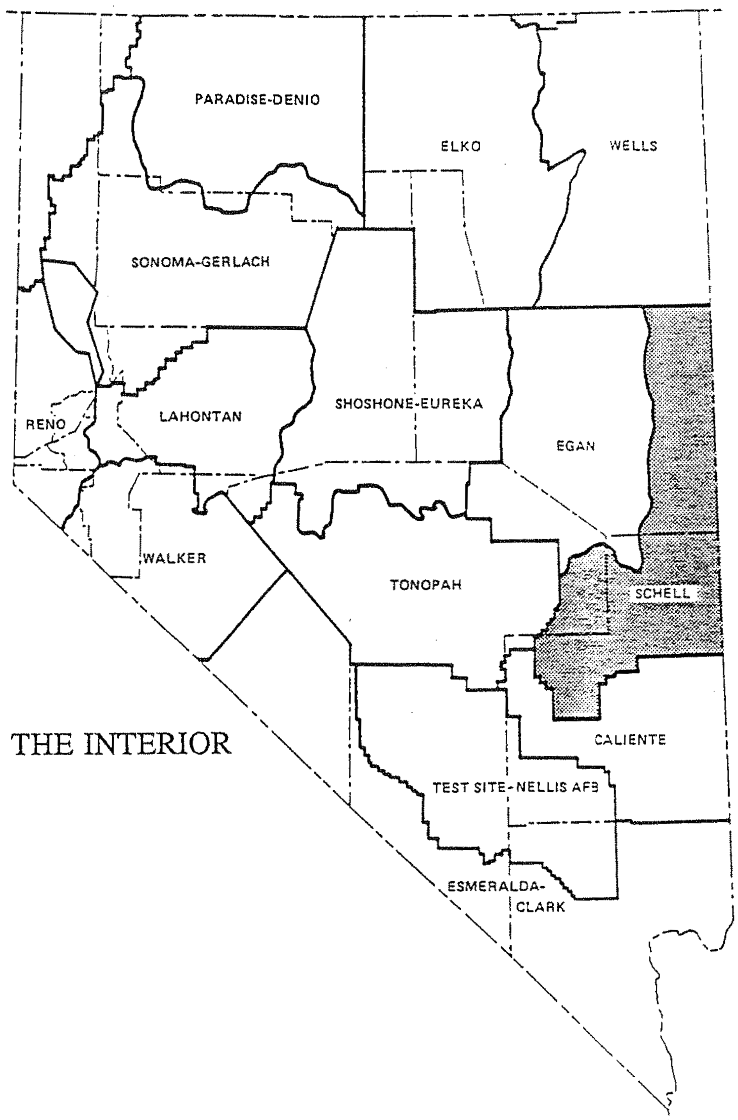
MINING DISTRICTS, SCHELL RESOURCE AREA--SPECTROGRAPHIC ANALYSES

SAMPLE NO	Ca%	Fe%	Mg%	Na%	P%	Ti%	Ag	As	Au	B	Ba	Be	Bi	Cd	Co	Cr	Cu	Ga	Ge	La	Mn	Mo	Nb	Ni	Pb	Sb	Sc	Sn	Sr	Th	V	W	Y	Zn	Zr
Pahranagat Mining District																																			
3261	2.	.15	.07	L	L	.03	500.	N	N	L	300.	1.	N	N	N	50.	300.	50.	N	50.	>5000.	15.	N	L	>20000.	1000.	5.	N	N	N	20.	L	L	200.	20.
3262	5.	10.	3.	G5	L	.002	150.	700.	N	150.	30.	L	100.	100.	N	L	1500.	15.	N	N	>5000.	7.	N	7.	>20000.	500.	5.	10.	L	N	100.	L	N	>10000.	N
3263	.15	5.	.03	L	N	.005	150.	1500.	N	50.	200.	3.	700.	N	N	20.	1000.	L	N	N	>5000.	5.	N	L	>20000.	200.	N	N	L	N	500.	L	L	10000.	L
3264	20.	.15	.7	L	N	.05	5.	N	N	L	1000.	L	N	N	N	50.	10.	N	N	N	>5000.	5.	N	10.	30.	100.	L	N	3000.	N	100.	N	10.	200.	100.
3265	3.	.7	1.	L	.2	.03	500.	300.	N	N	1000.	N	N	N	N	100.	500.	N	N	N	>5000.	5.	N	L	2000.	500.	N	N	300.	N	100.	N	N	7000.	L
3266	7.	.5	1.	L	L	.003	100.	300.	N	N	5000.	L	N	N	N	100.	50.	N	N	N	>5000.	10.	N	L	300.	200.	N	N	1000.	N	200.	N	N	L	N
3267	5.	.2	.7	.2	.2	.005	150.	N	N	N	150.	N	N	N	N	100.	20.	N	N	N	>5000.	L	N	L	200.	200.	L	N	3000.	N	200.	N	N	300.	L
3268	2.	1.5	.7	L	L	.02	30.	N	N	L	500.	L	N	N	N	150.	15.	N	N	N	>5000.	5.	N	L	100.	N	L	N	200.	N	100.	N	N	L	L
3269	2.	1.	.03	L	N	.01	700.	5000.	N	10.	100.	N	200.	N	N	15.	20000.	20.	N	N	3000.	200.	N	L	>20000.	10000.	N	N	L	N	L	20.	N	>10000.	N
3270	7.	.07	2.	L	N	.015	700.	3000.	N	N	30.	N	1000.	N	N	10.	5000.	50.	N	N	>5000.	10.	N	7.	>20000.	7000.	N	N	L	N	L	L	N	>10000.	L
3271	.15	5.	.03	L	N	L	700.	3000.	N	20.	150.	N	N	N	N	50.	15000.	30.	N	L	5000.	150.	N	7.	>20000.	700.	N	N	200.	N	15.	L	N	>10000.	L
3272	3.	1.	.1	L	N	.07	2000.	700.	N	10.	100.	N	20.	N	N	20.	15000.	50	N	L	>5000.	L	N	L	>20000.	5000.	N	N	L	N	L	L	N	>10000.	20.
3273	5.	.7	.7	L	N	.05	2000.	300.	N	10.	100.	N	10.	N	N	30.	7000.	20.	N	N	>5000.	L	N	L	>20000.	1000.	N	N	N	N	10.	L	N	>10000.	30.
3274	.3	10.	.07	L	N	.05	1000.	5000.	N	50.	100.	N	100.	N	N	20.	2000.	10.	N	L	>5000.	L	N	5.	20000.	5000.	N	N	N	N	15.	L	10.	>10000.	70.
3285	5.	2.	1.5	L	.2	.015	>5000.	1500.	N	L	N	1.	10.	20.	L	10.	20000.	10.	N	N	2000.	L	N	L	>20000.	5000.	L	20.	100.	N	L	N	N	1000.	15.
3286	.07	.1	.07	L	L	.03	5000.	700.	N	10.	70.	1.	N	N	L	L	3000.	5.	N	N	500.	L	N	5.	10000.	1500.	L	L	L	N	150.	L	N	3000.	70.
4383	<0.05	7.	0.05	N0.2	N0.2	0.015	2000.	5000.	N10.	N10.	2000.	<1.	200.	100.	N10.	15.	10000.	30.	N10.	N50.	150.	N5.	N20.	<5.	>20000.	7000.	N5.	30.	N100.	N100.	<10.	N20.	<10.	5000.	15.
4384	0.3	2.	0.05	N0.2	<0.2	0.05	500.	3000.	N10.	10.	1000.	1.5	15.	70.	N10.	20.	5000.	20.	N10.	N50.	700.	7.	N20.	5.	>20000.	5000.	<5.	N10.	150.	N100.	15.	N20.	<10.	5000.	30.
4385	0.7	3.	0.15	N0.2	<0.2	0.015	150.	2000.	N10.	10.	1500.	1.	N10.	<20.	N10.	<10.	700.	<5.	N10.	N50.	>5000.	5.	N20.	15.	2000.	300.	N5.	N10	200.	N100.	100.	N20.	<10.	2000.	N10.
4386	5.	2.	1.5	N0.2	0.2	0.02	1500.	10000.	N10.	<10.	150.	<1.	1000.	150.	N10.	15.	>20000.	30.	N10.	N50.	3000.	N5.	N20.	<5.	>20000.	10000.	N5.	30.	100.	N100.	10.	N20.	<10.	>10000.	10.
Patterson Mining District																																			
98	15.	>20	2.			.015	N	N	N	L	1500.	200.	L	200.	10.	L	1000.			N	>5000	N	N	5.	70.	N	N	30.	N	N	L	500.	15.	>10000	15.
99	1.5	>20	.5			.03	500.	10000.	N	30.	700.	7.	50.	100.	50.	20.	>20000			L	1500.	L	N	100.	150.	>10000	5.	70.	N	N	15.	100.	20.	>10000	20.
804	10.	.7	3.			.002	7.	N	N	20.	100.	1.5	N	N	N	L	20.			N	2000.	N	N	L	50.	L	L	N	L	N	30.	100.	L	200.	L
805	>20	2.	1.			.007	20.	700.	N	N	700.	10.	N	N	50.	10.	70.			N	2000.	5.	N	70.	500.	200.	N	N	300.	N	200.	100.	10.	300.	10.
806	10.	.3	.7			.015	1000.	N	N	30.	70.	1.5	N	200.	N	15.	3000.			N	200.	30.	N	7.	5000.	3000.	N	N	L	N	70.	50.	L	2000.	10.
810	1.	15.	.7			.07	10.	500.	N	10.	700.	150.	300.	200.	50.	20.	1000.			50.	>5000	N	N	20.	70.	L	5.	70.	N	N	50.	150.	50.	>10000	20.
810.1	10.	15.	2.			.1	N	N	N	L	30.	150.	50.	500.	20.	20.	300.			L	>5000	N	N	7.	100.	N	5.	150.	L	N	20.	100.	20.	>10000	70.
811	1.5	1.	.7			.007	1500.	300.	N	20.	20.	3.	N	70.	N	10.	1000.			L	300.	5.	N	5.	5000.	1000.	N	N	500.	N	70.	N	N	2000.	L
812	3.	.5	.5			.02	700.	L	N	50.	200.	10.	N	100.	L	10.	5000.			50.	300.	5.	L	10.	3000.	2000.	N	N	300.	N	20.	N	L	10000.	10.
813	.15	.05	.02			L	300.	700.	N	50.	50.	1.	N	70.	N	15.	3000.			N	20.	L	N	5.	7000.	3000.	N	N	N	N	10.	N	L	2000.	L
Piermont Mining District																																			
2101	3.	3.	0.2	<0.2	N0.2	0.1	200.	300.	N10.	20.	150.	1.5	20.	N20.	30.	20.	50.	10.	15.	N50.	150.	N5.	<20.	20.	200.	100.	5.	N10.	N100.	N100.	70.	N20.	<10.	<200.	20.
2102	0.07	0.7	0.07	N0.2	N0.2	0.07	200.	200.	N10.	<10.	500.	2.	N10.	N20.	<10.	15.	30.	<5.	<10.	<50.	20.	N5.	<20.	<5.	700.	N100.	N5.	N10.	N100.	N100.	30.	N20.	<10.	N200.	30.
2103	0.05	3.	0.1	N0.2	N0.2	0.2	10.	<200.	N10.	20.	>5000.	1.5	N10.	N20.	N10.	50.	700.	15.	N10.	<50.	70.	N5.	<20.	5.	150.	100.	5.	N10.	700.	N100.	50.	N20.	15.	<200.	50.
2104	0.3	3.	0.15	N0.2	<0.2	0.2	1.5	<200.	N10.	15.	1000.	2.	N10.	N20.	10.	50.	30.	10.	N10.	50.	300.	N5.	<20.	20.	20.	N100.	<5.	N10.	N100.	N100.	70.	N20.	15.	N200.	100.
4400	0.05	5.	0.1	0.3	N0.2	0.1	1.5	N200.	N10.	300.	50.	<1.	N10.	N20.	20.	<10.	200.	10.	N10.	<50.	150.	N5.	N20.	20.	70.	N100.	7.	N10.	N100.	N100.	100.	N20.	15.	N200.	<10.
Pioche Mining District																																			
1434	5.	3.	.3			.1	200.	500.	N	100.	50.	10.	L	300.	N	10.	2000.			50.	5000.	N	L	L	>20000	150.	L	20.	100.	N	50.	100.	L	>10000	20.
Sacramento Mining District																																			
5036	7.	0.15	0.7	N0.2	N0.2	<0.002	7.	N200.	20.	N10.	50.	50.	N10.	N20.	<10.	10.	15.	N5.	20.	N50.	70.	<5.	N20.	N5.	50.	N100.	N5.	N10.	200.	N100.	<10.	1500.	<10.	N200.	<10.
Seaman Range Area																																			
3470	0.5	7.	0.2	N0.2	0.2	0.15	1.5	300.	N10.	30.	1000.	<1.	N10.	N20.	10.	1000.	70.	50.	N10.	150.	700.	N5.	N20.	30.	50.	N100.	5.	N10.	1000.	N100.	300.	N20.	20.	<200.	70.
4071	1.5	10.	1.	N0.2	N0.2	0.002	50.	1500.	N10.	N10.	20.	N1.	150.	150.	N10.	<10.	5000.	7.	N10.	N50.	5000.	10.	N20.	10.	15000.	2000.	N5.	70.	N100.	N100.	150.	N20.	N10.	>10000.	N10.
4072	20.	10.	1.5	N0.2	N0.2	0.01	200.	1000.	N10.	N10.	20.	N1.	300.	100.	N10.	<10.	5000.	20.	N10.	N50.	1500.	N5.	N20.	<5.	15000.	7000.	N5.	70.	N100.	N100.	15.	N20.	N10.	7000.	30.
4073	3.	3.	0.2	N0.2	N0.2	0.07	1.	700.	N10.	20.	50.	1.	N10.	<20.	<10.	<10.	150.	<5.	N10.	N50.	100.	7.	N20.	5.	70.	500.	N5.	N10.	<100.	N100.	70.	N20.	N10.	200.	100.
4074	1.5	5.	0.2	N0.2	1.5	0.15	3.	200.	N10.	50.	700.	3.	N10.	N20.	N10.	300.	150.	5.	N10.	200.	20.	20.	N20.	30.	30.	N100.	7.	N10.	1000.	N100.	500.	N20.	200.	<200.	100.

MINING DISTRICTS, SCHELL RESOURCE AREA--SPECTROGRAPHIC ANALYSES

SAMPLE NO	Ca%	Fe%	Mg%	Na%	P%	Ti%	Ag	As	Au	B	Ba	Be	Bi	Cd	Co	Cr	Cu	Ga	Ge	La	Mn	Mo	Nb	Ni	Pb	Sb	Sc	Sn	Sr	Th	V	W	Y	Zn	Zr
Shoshone Mining District																																			
3277	5.	L	.1			.003	20.	N	N	L	150.	1.	N	N	N	L	15.			N	150.	L	N	L	500.	N	L	N	200.	N	L	500.	N	N	N
3278	>20.	.1	.15			.005	20.	N	N	N	L	L	N	N	N	L	10.			N	2000.	L	N	L	150.	N	N	N	1500.	N	10.	500.	N	N	10.
3279	10.	.05	.1			.015	70.	N	N	N	70.	1.	N	N	N	10.	30.			N	100.	L	N	5.	500.	150.	L	N	100.	N	10.	150.	N	N	L
3280	20.	.07	.3			.007	5.	N	N	L	L	1.	N	N	N	30.	15.			L	1000.	L	N	L	1000.	N	L	N	200.	N	20.	500.	L	N	10.
4391	20.	0.3	0.3	N0.2	N0.2	N0.002	7.	N200.	N10.	N10.	200.	<1.	N10.	N20.	N10.	10.	30.	N5.	10.	N50.	500.	<5.	N20.	N5.	300.	N100.	<5.	N10.	700.	N100.	20.	1500.	<10.	N200.	N10.
4392	15.	0.3	7.	<0.2	N0.2	0.015	7.	N200.	N10.	N10.	100.	1.5	N10.	N20.	N10.	30.	30.	N5.	N10.	N50.	500.	<5.	N20.	5.	200.	N100.	<5.	N10.	200.	N100.	<10.	20.	<10.	N200.	<10.
Silver King Mining District																																			
100	.7	>20	.1			.002	N	200.	N	100.	5000.	1.	N	N	20.	20.	70.			L	>5000	300.	N	20.	10.	N	L	N	200.	N	10.	N	30.	200.	15.
267	15.	10.	.2			.007	500.	L	N	L	L	1.	20.	>500.	15.	10.	20000.			L	5000.	50.	N	10.	>20000.	200.	L	150.	200.	N	10.	N	10.	>10000	N
268	.5	1.5	.3			.1	.5	N	N	15.	500.	3.	N	N	N	L	50.			N	500.	N	L	L	200.	N	7.	N	150.	N	20.	N	20.	N	150.
269	2.	>20	.1			.015	500.	10000.	N	10.	200.	N	15.	100.	N	20.	1000.			L	200.	10.	N	5.	>20000	1000.	L	70.	200.	N	70.	N	15.	10000.	10.
4075	5.	15.	0.15	N0.2	N0.2	0.03	5000.	>10000.	N10.	N10.	N20.	<1.	N10.	300.	N10.	N10.	3000.	20.	N10.	300.	1000.	15.	N20.	15.	>20000.	1500.	N5.	>1000.	700.	N100.	150.	N20.	<10.	7000.	N10.
Silverhorn Mining District																																			
2601	1.	.7	.1			.07	200.	200.	N	50.	100.	L	N	N	N	100.	70.			N	1000.	20.	L	70.	200.	300.	N	N	N	N	70.	N	N	500.	10.
4076	0.1	0.7	0.07	N0.2	N0.2	0.07	10.	500.	N10.	20.	70.	<1.	N10.	N20.	<10.	15.	30.	N5.	N10.	N50.	300.	15.	N20.	100.	150.	100.	N5.	N10.	<100.	N100.	70.	N20.	<10.	500.	50.
4077	0.15	0.2	0.07	N0.2	N0.2	0.02	7.	<200.	N10.	15.	500.	5.	N10.	N20.	N10.	<10.	50.	N5.	N10.	N50.	300.	10.	N20.	700.	100.	<100.	N5.	N10.	N100.	N100.	50.	N20.	70.	1500.	15.
4078	2.	2.	1.	N0.2	N0.2	0.01	150.	1500.	N10.	50.	<20.	1.	N10.	70.	N10.	<10.	3000.	5.	N10.	N50.	1500.	10.	N20.	5.	>20000.	1500.	N5.	N10.	200.	N100.	10.	N20.	N10.	>10000.	<10.
4079	1.5	5.	1.	N0.2	N0.2	0.03	30.	700.	N10.	10.	30.	<1.	N10.	20.	N10.	<10.	200.	5.	N10.	N50.	1500.	30.	N20.	7.	>20000.	200.	N5.	N10.	N100.	N100.	70.	N20.	N10.	3000.	70.
4080	0.15	1.	0.05	N0.2	N0.2	0.02	70.	500.	N10.	<10.	50.	<1.	N10.	N20.	N10.	<10.	70.	N5.	N10.	N50.	500.	30.	N20.	N5.	>20000.	700.	N5.	N10.	<100.	N100.	<10.	N20.	N10.	200.	50.
4081	0.7	0.7	0.1	N0.2	N0.2	0.02	100.	1000.	N10.	<10.	200.	2.	N10.	N20.	N10.	10.	1000.	N5.	N10.	<50.	1500.	15.	N20.	N5.	7000.	500.	N5.	N10.	<100.	N100.	300.	70.	N10.	2000.	70.
4082	10.	7.	0.3	N0.2	N0.2	0.05	70.	700.	N10.	<10.	1000.	5.	N10.	70.	<10.	30.	700.	5.	N10.	<500.	>5000.	N5.	N20.	70.	7000.	150.	5.	N10.	150.	N100.	200.	30.	15.	2000.	50.
Tungsten Mining District																																			
3275	1.	.5	.03			.015	3.	N	N	15.	300.	7.	N	N	N	150.	100.			N	>5000.	5.	20.	L	300.	N	5.	N	N	N	10.	2000.	10.	N	N
3276	1.5	.15	.1			.01	50.	N	N	15.	300.	5.	30.	150.	N	L	150.			N	5000.	L	N	L	2000.	N	L	N	L	N	L	150.	N	10000.	N
White Cloud Mining District																																			
2126	0.7	1.5	0.3	N0.2	N0.2	<0.002	50.	<200.	N10.	<10.	50.	<1.	15.	50.	N10.	10.	100.	<5.	N10.	N50.	500.	<5.	N20.	<5..	15000.	N100..	<5.	N10.	N100.	N100.	<10.	<20.	<10.	3000.	<10.
2127	20.	3.	3.	N0.2	N0.2	<0.002	20.	N200.	N10.	N10.	<20.	<1.	30.	N20.	N10.	15.	200.	<5.	N10.	<50.	1000.	N5.	N20.	N5.	>20000.	N100.	N5.	15.	300.	N100.	10.	N20.	>10.	300.	<10.
Willow Creek Mining District																																			
3123	.7	5.	.3			.007	700.	>10000.	N	N	L	N	L	>500.	N	L	70.			N	500.	15.	N	15.	>20000.	1500.	N	150.	N	N	L	N	N	>10000.	N
3124	.05	3.	.03			L	700.	10000.	N	N	L	N	N	N	N	N	700.			L	15.	20.	N	L	>20000.	2000.	N	>1000.	N	N	200.	N	N	2000.	N
3125	10.	1.5	3.			N	150.	7000.	N	N	N	L	N	>500.	7.	N	5000.			N	1000.	15.	N	L	>20000.	300.	N	70.	N	N	200.	N	N	>10000.	N
3126	5.	3.	.1			.003	1000.	N	N	N	N	N	N	100.	N	N	50.			20.	>5000.	L	N	5.	20000.	100.	N	100.	300.	N	50.	N	N	5000.	N

Mineral Resources Inventory
Bureau of Land Management,
Schell Resource Area, Ely District, Nevada



Appendix C
Topographic Map Set

Prepared for:
UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Ely Office
Ely, Nevada

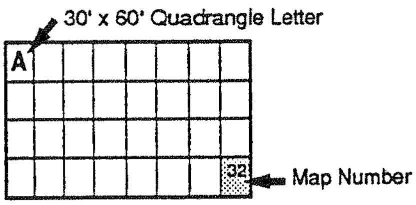
Under Cooperative Agreement 14-08-0001-A-0586
with the
U.S. GEOLOGICAL SURVEY

NEVADA BUREAU OF MINES AND GEOLOGY
UNIVERSITY OF NEVADA, RENO
October 1991

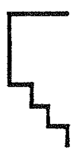
SCHELL RESOURCE AREA

Map Index

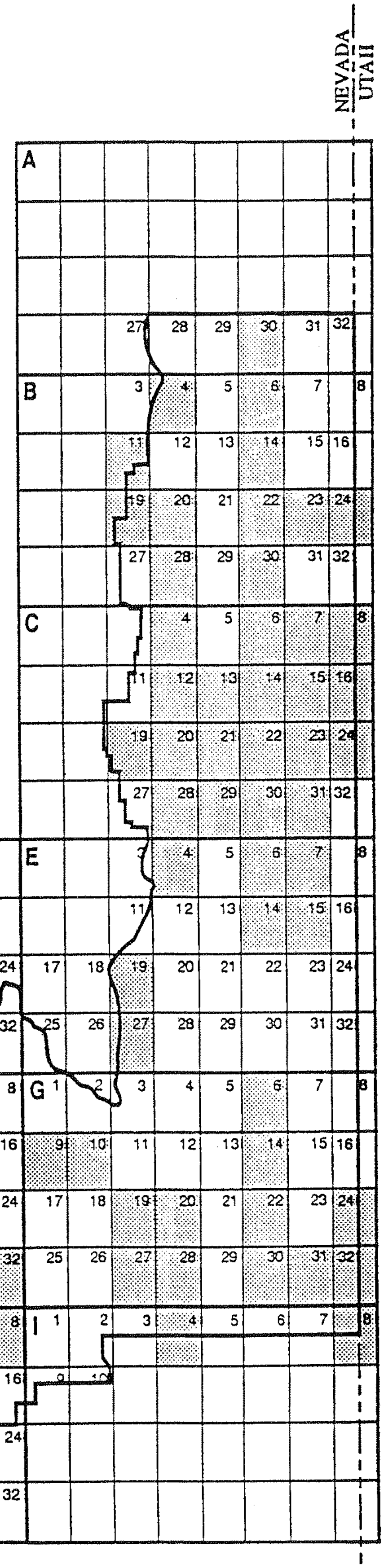
KEY



Shading indicates map included in set (no data on other maps)



Resource Area Boundary



APPENDIX C
List of Topographic Maps

100K Sheet	Letter	Quadrangle	Number
Caliente	I	Deer Lodge Canyon	8
		Highland Peak	4
Currie	A	Chin Creek Reservoir	30
Ely	C	Cave Creek	19
		Cave Mountain	20
		Hogum	29
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		Little Horse Canyon	16
		Majors Place	28
		Mormon Jack Pass	7
		Mount Moriah	15
		North Schell Peak	4
		Old Mans Canyon	23
		Sacramento Pass	22
		Sixmile Canyon	14
		South Bastian Spring	21
		South Schell Peak	12
		Spring Mountain	8
		The Cove	24
		Third Butte East	6
		Windy Peak	30
		Yelland Dry Lake	13
Garrison	E	Arch Canyon	15
		Kious Spring	7
		Milk Ranch Spring	27
		Minerva Canyon	14
		Mount Grafton	19
		North Point Spring	4
		Wheeler Peak	6
Kern Mountains	B	Becky Peak	4
		Blue Mass Canyon	23
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		Schellbourne	11
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Quinn Canyon Range	F	Timber Mountain Pass East	32
		Timber Mountain Pass West	31
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APPENDIX C
List of Topographic Maps

100K Sheet	Letter	Quadrangle	Number
Timpahute Range	H	Oreana Spring	7
		Weepah Spring	8
		Worthington Peak	4
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		Bristol Range NE	20
		Bristol Range SE	28
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		Eagle Valley Reservoir	31
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		Parsnip Peak	22
		Pierson Summit	30
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		Sidehill Pass	10
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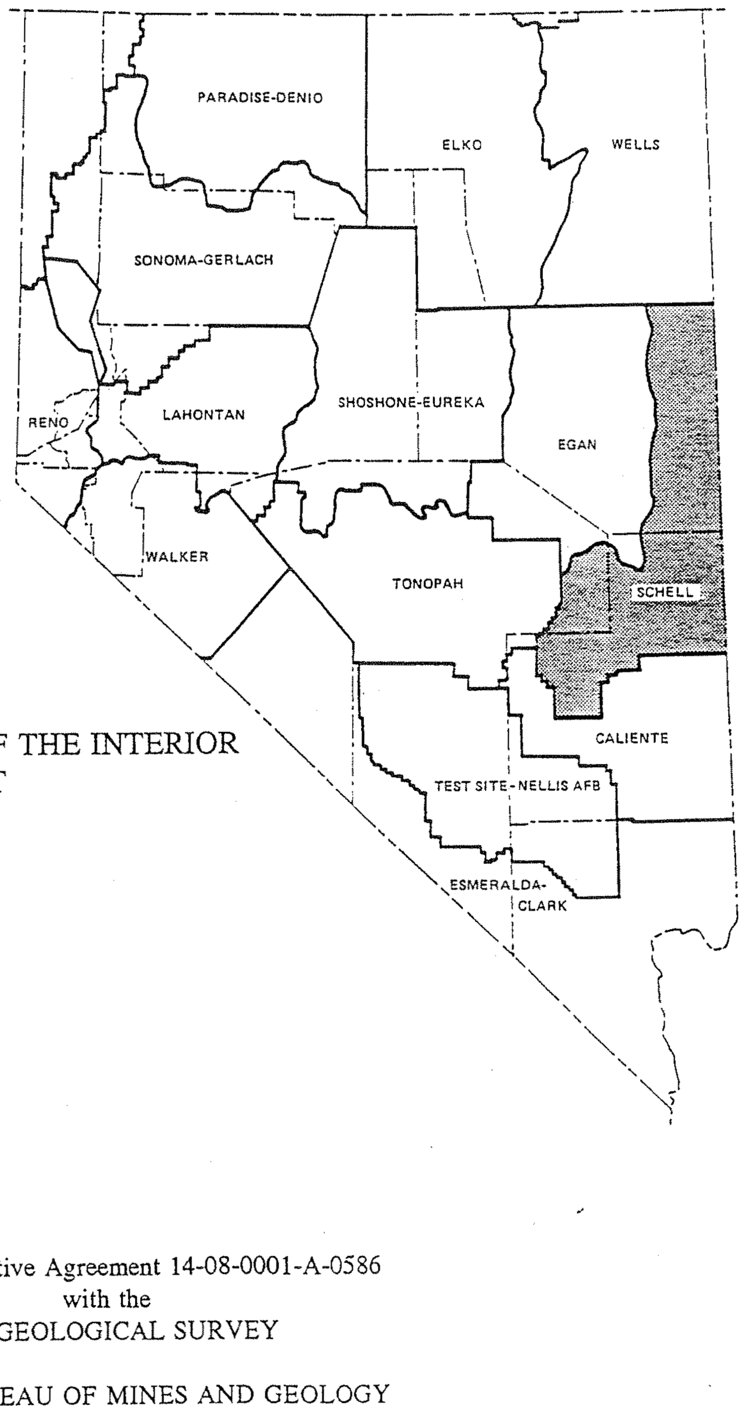
		Trail Canyon	14
		White Rock Peak	24

Mineral Resources Inventory
Bureau of Land Management,
Schell Resource Area, Ely District, Nevada

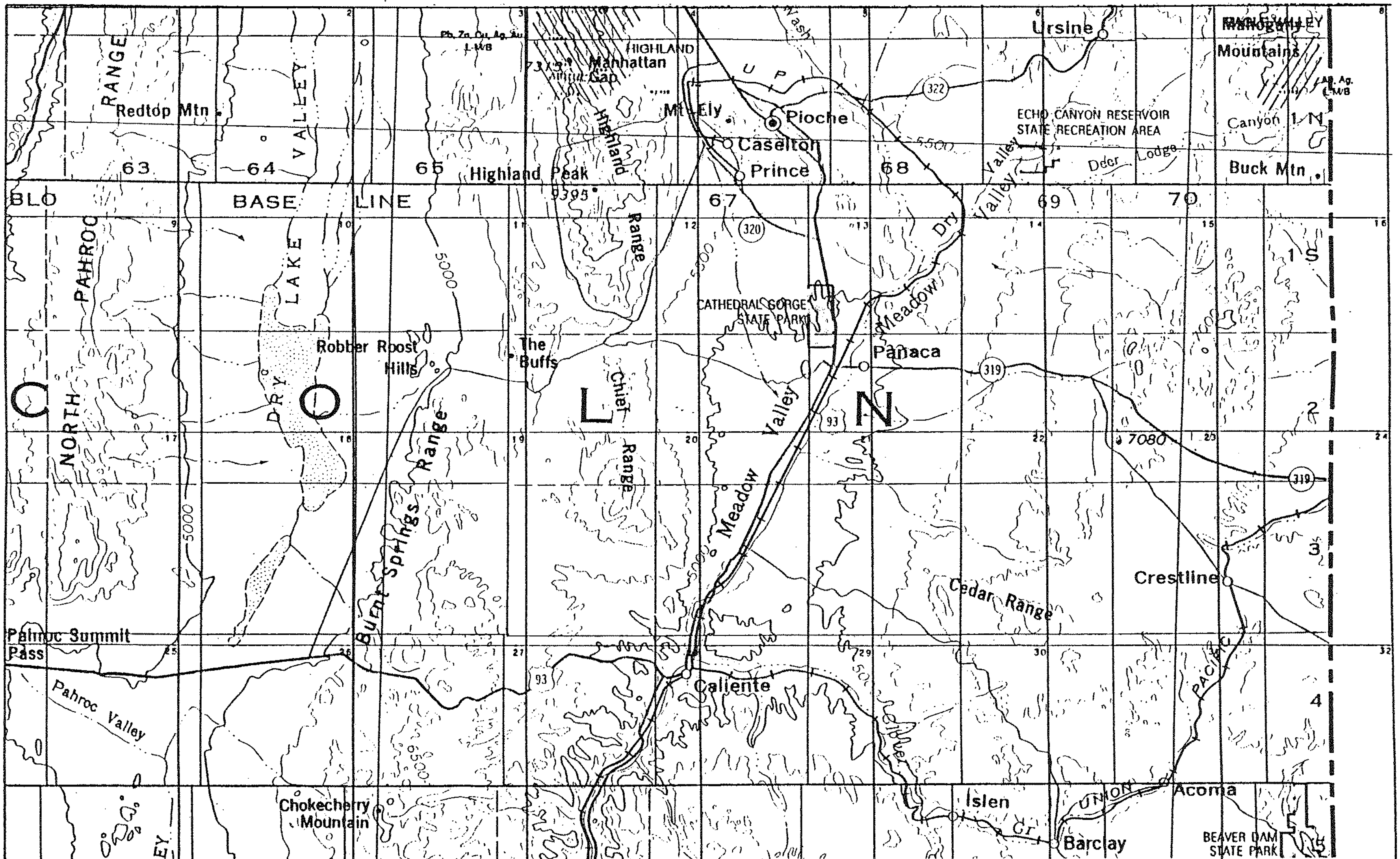


Appendix D
Mineral Assessment Map Set

Prepared for:
UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Ely Office
Ely, Nevada

Under Cooperative Agreement 14-08-0001-A-0586
with the
U.S. GEOLOGICAL SURVEY

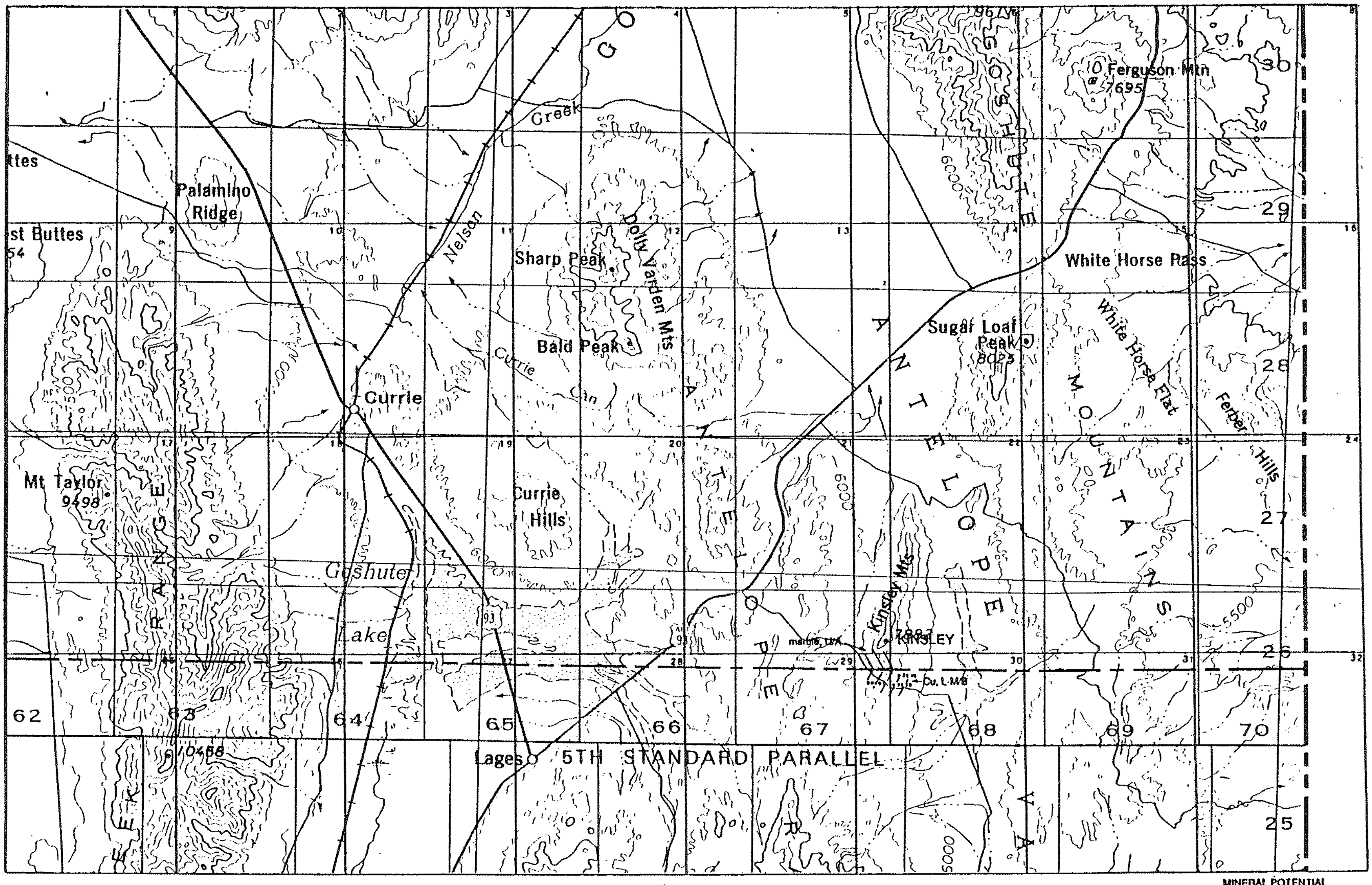
NEVADA BUREAU OF MINES AND GEOLOGY
UNIVERSITY OF NEVADA, RENO
October 1991



CALIENTE 30' x 60' Quadrangle
NBMG - 1990

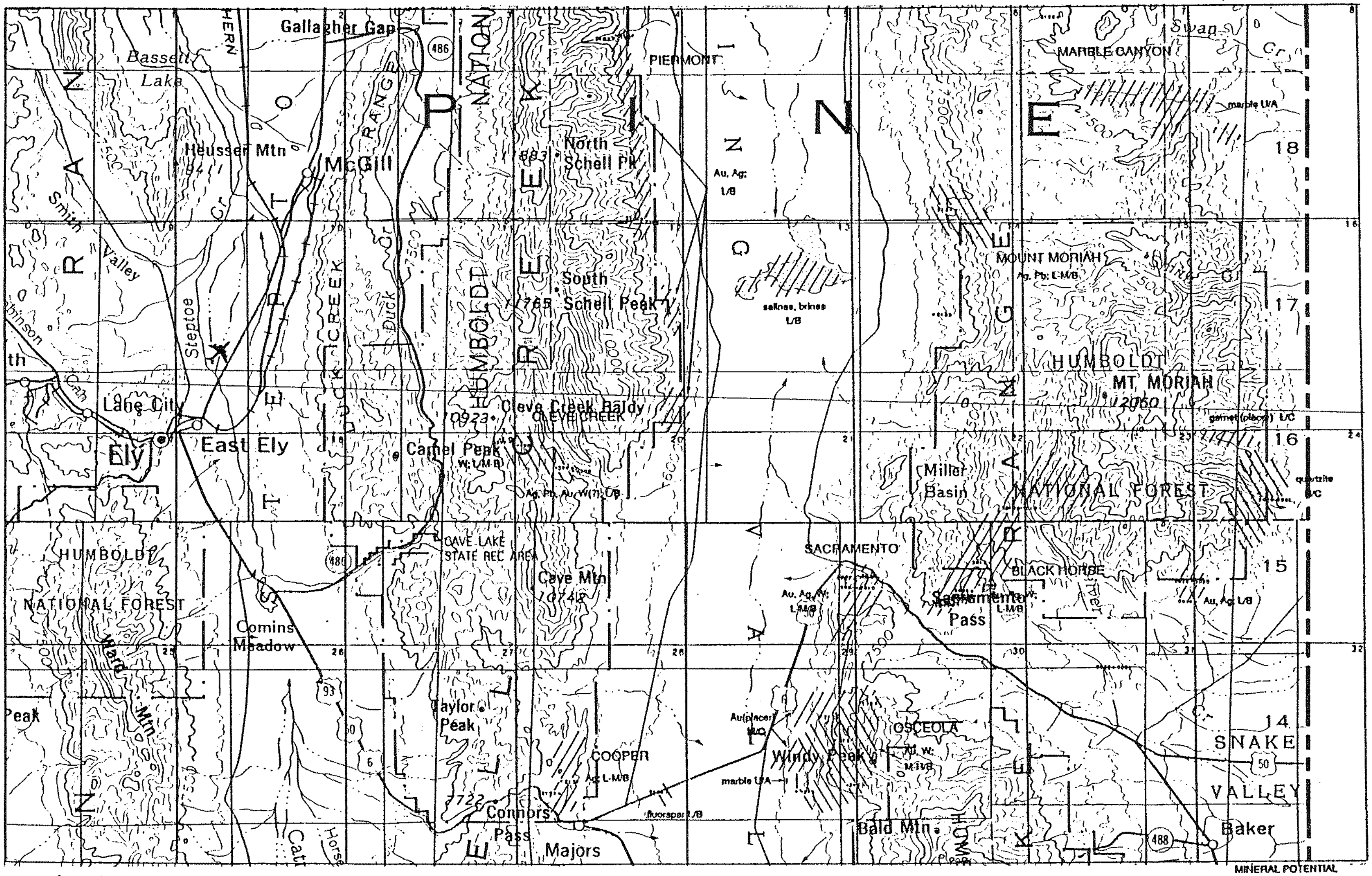
CALIENTE

MINERAL POTENTIAL



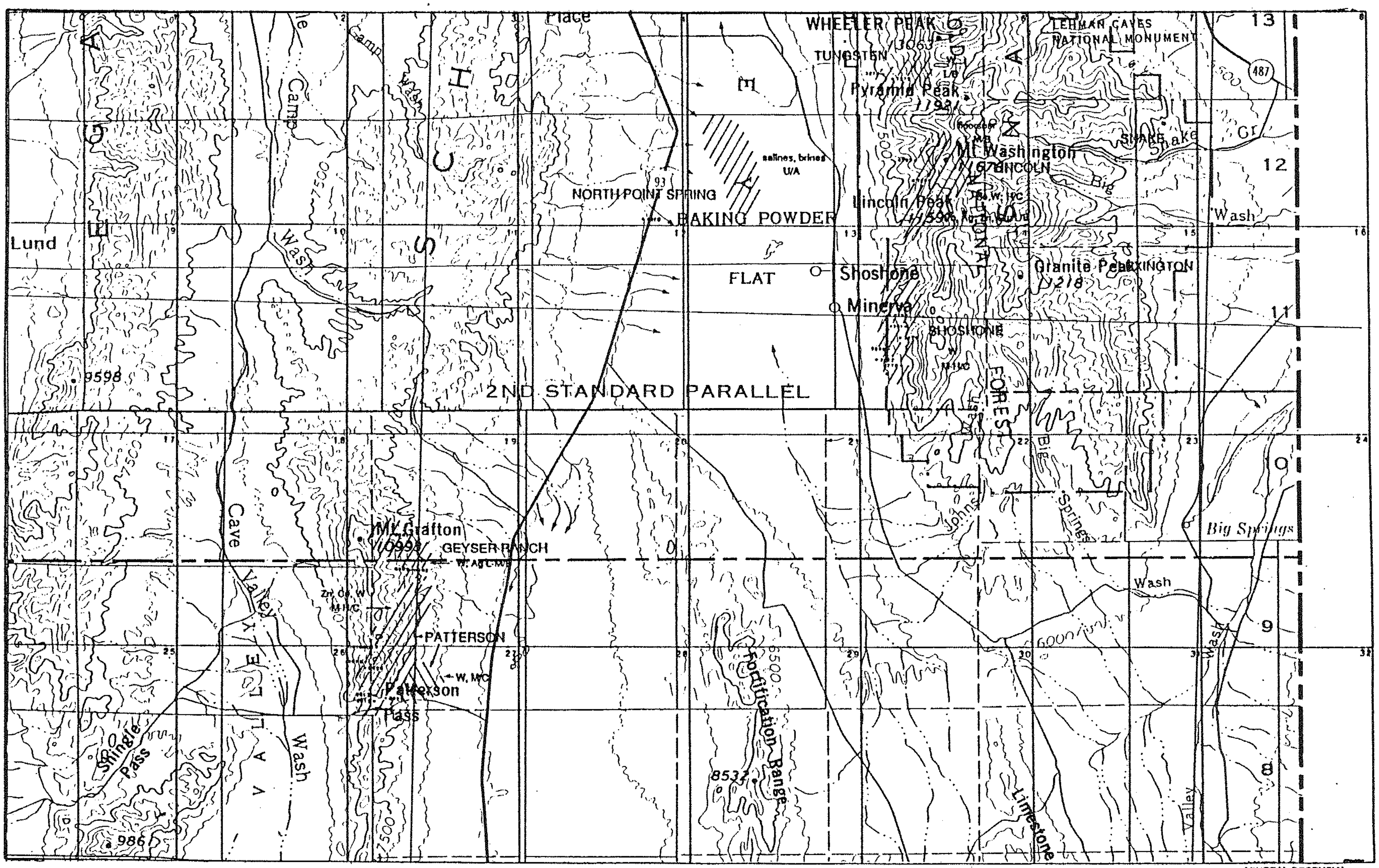
CURRIE 30' x 60' Quadrangle
NBMG - 1990

CURRIE



ELY 30' x 60' Quadrangle
NBMG - 1990

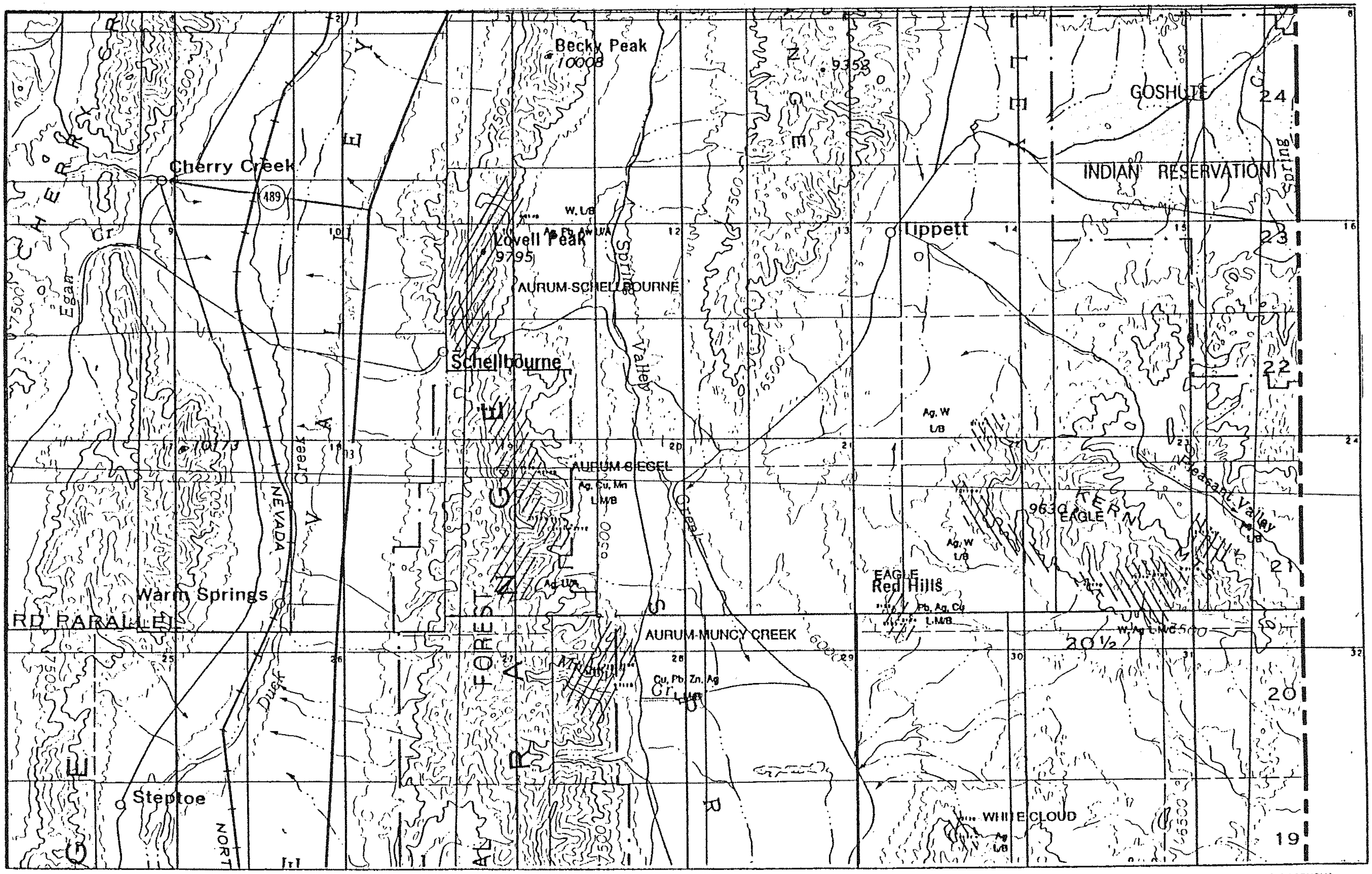
ELY



GARRISON 30' x 60' Quadrangle
NBMG - 1990

MINERAL POTENTIAL

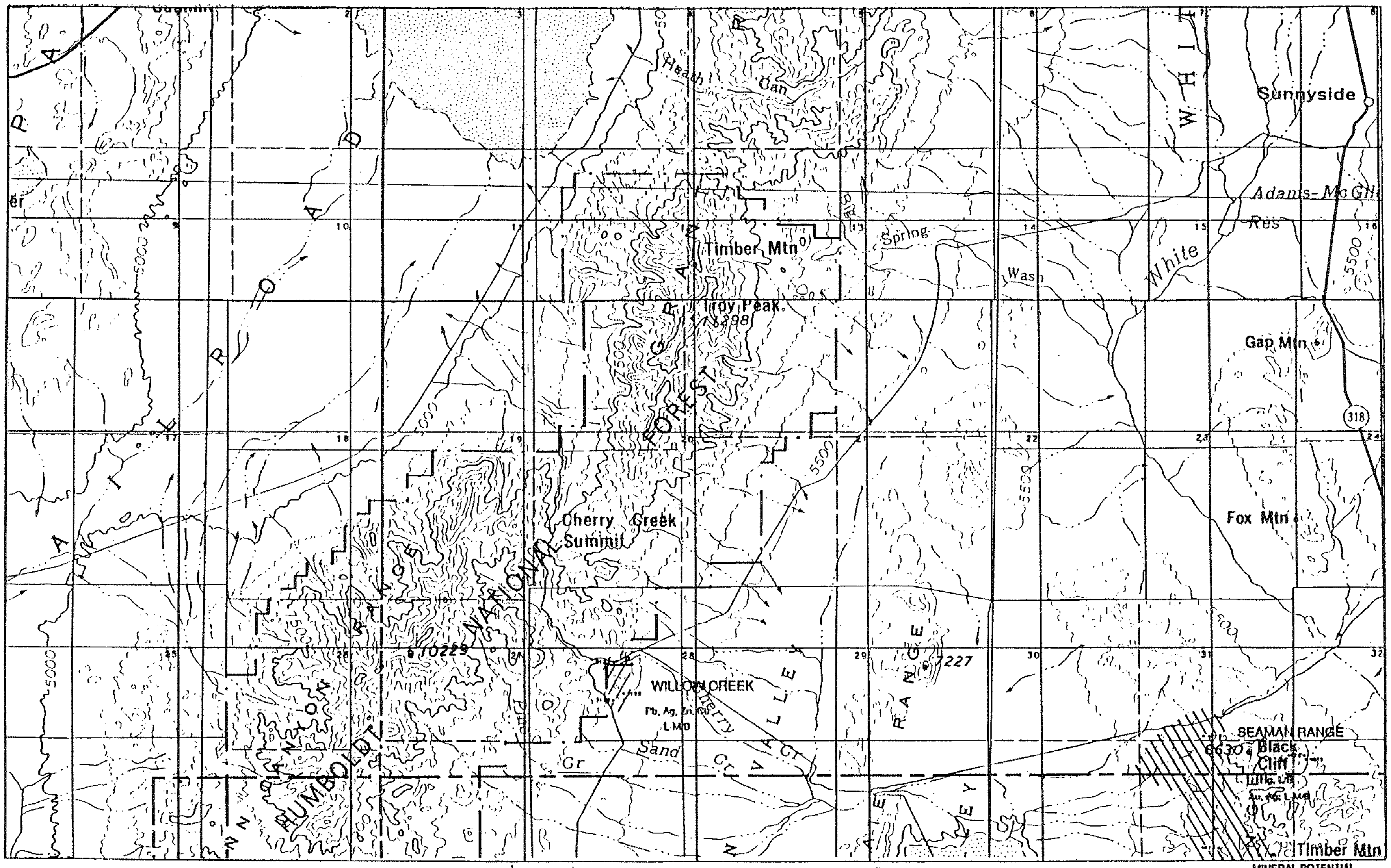
GARRISON



KERN MTS. 30' x 60' Quadrangle
NBMG - 1990

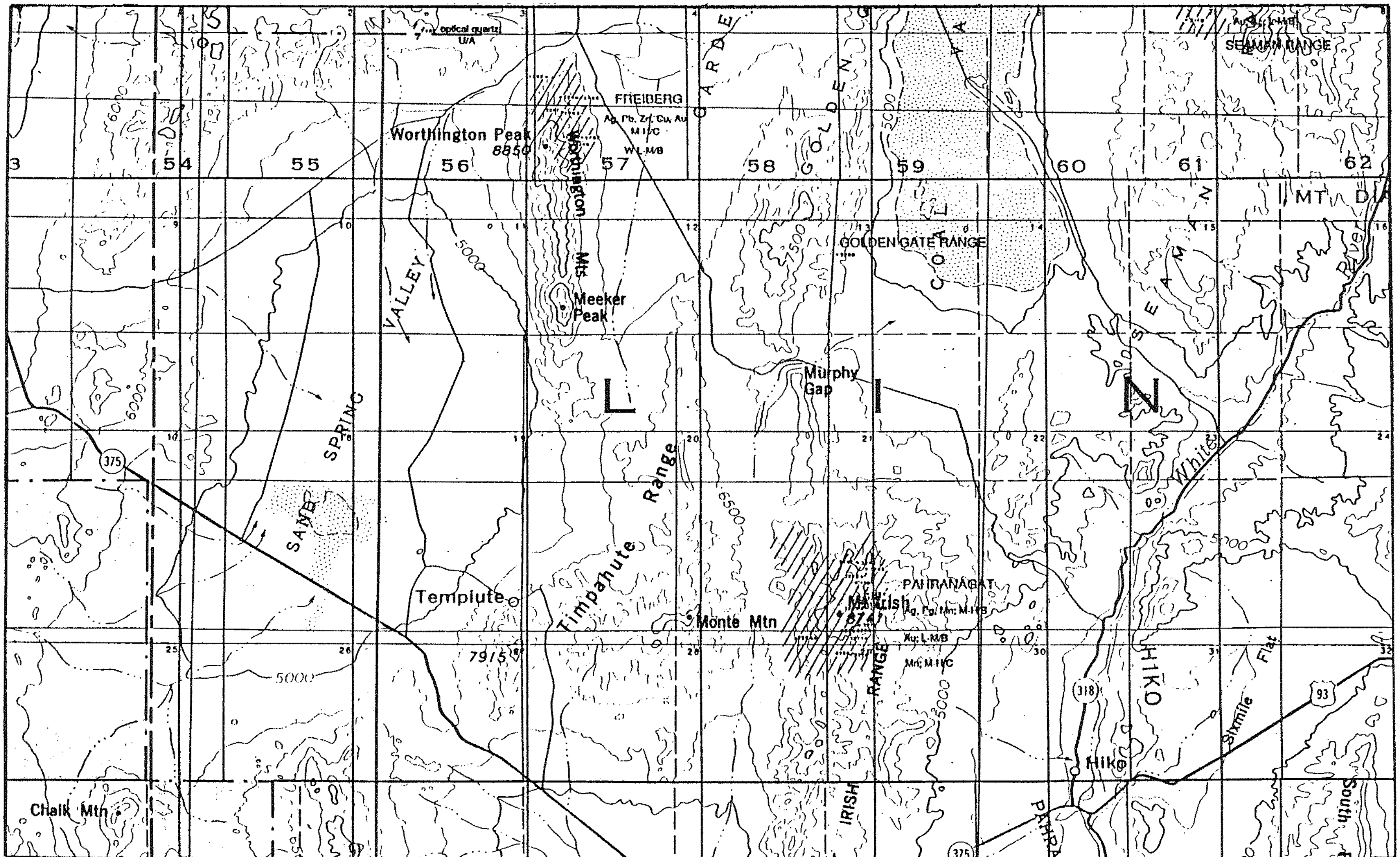
KERN MOUNTAINS

MINERAL POTENTIAL



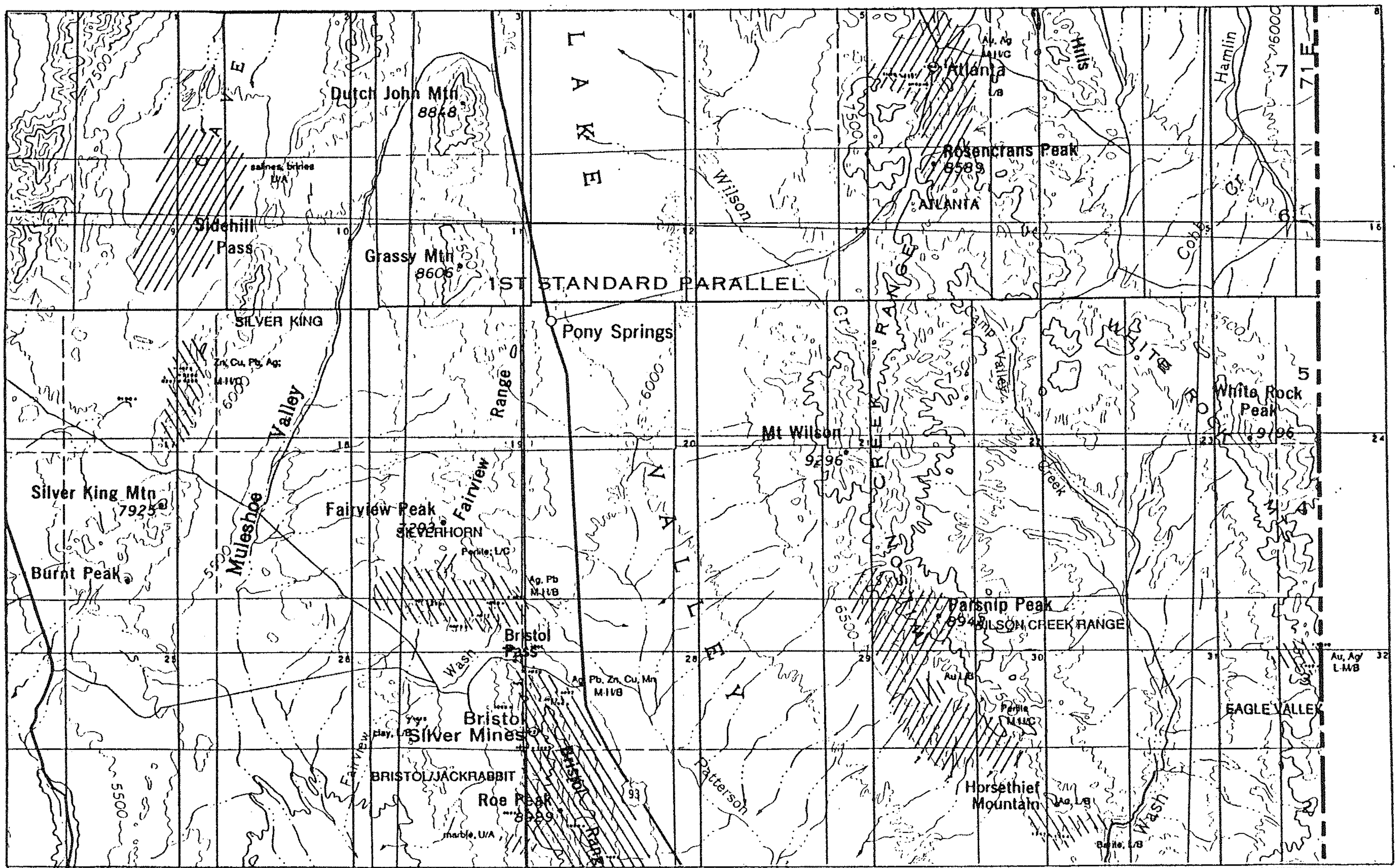
QUINN CANYON RANGE 30' x 60' Quadrangle
NBMG - 1990

QUINN CANYON RANGE



TIMPAHUTE RANGE 30' x 60' Quadrangle
NBMG - 1990

TIMPAHUTE RANGE



WILSON CREEK RANGE 30' x 60' Quadrangle
NBMG - 1990

WILSON CREEK RANGE