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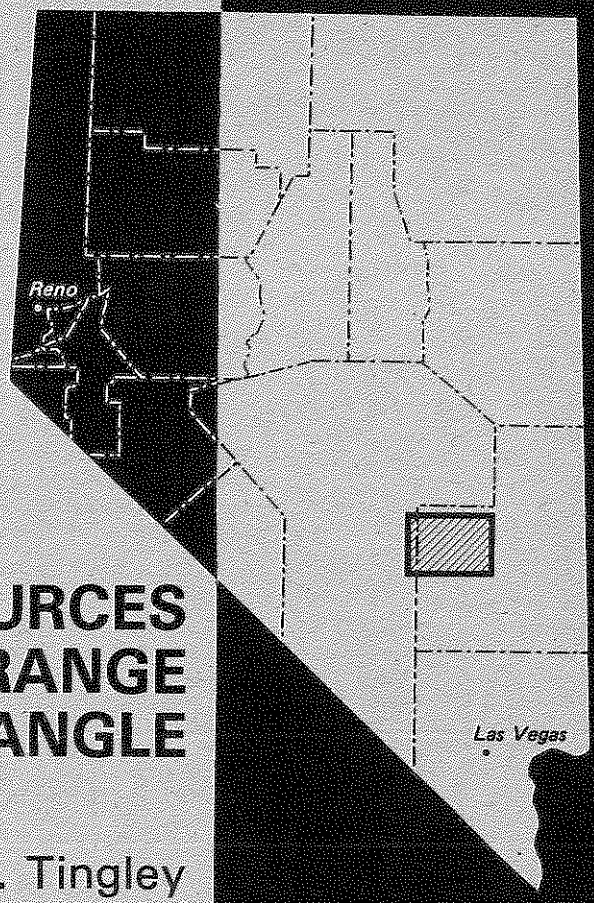

MINERAL RESOURCES OF THE TIMPAHUTE RANGE 30′ BY 60′ QUADRANGLE

Joseph V. Tingley

Prepared in cooperation with the U.S. Geological Survey

A summary of the mineral resources of the Timpahute Range 30′ by 60′ Quadrangle including mining history and geologic setting; descriptions of mines, prospects, and occurrences of metallic and nonmetallic minerals and geothermal resources; and results of geochemical analyses. A 1:100,000-scale map showing the locations of the occurrences is included.

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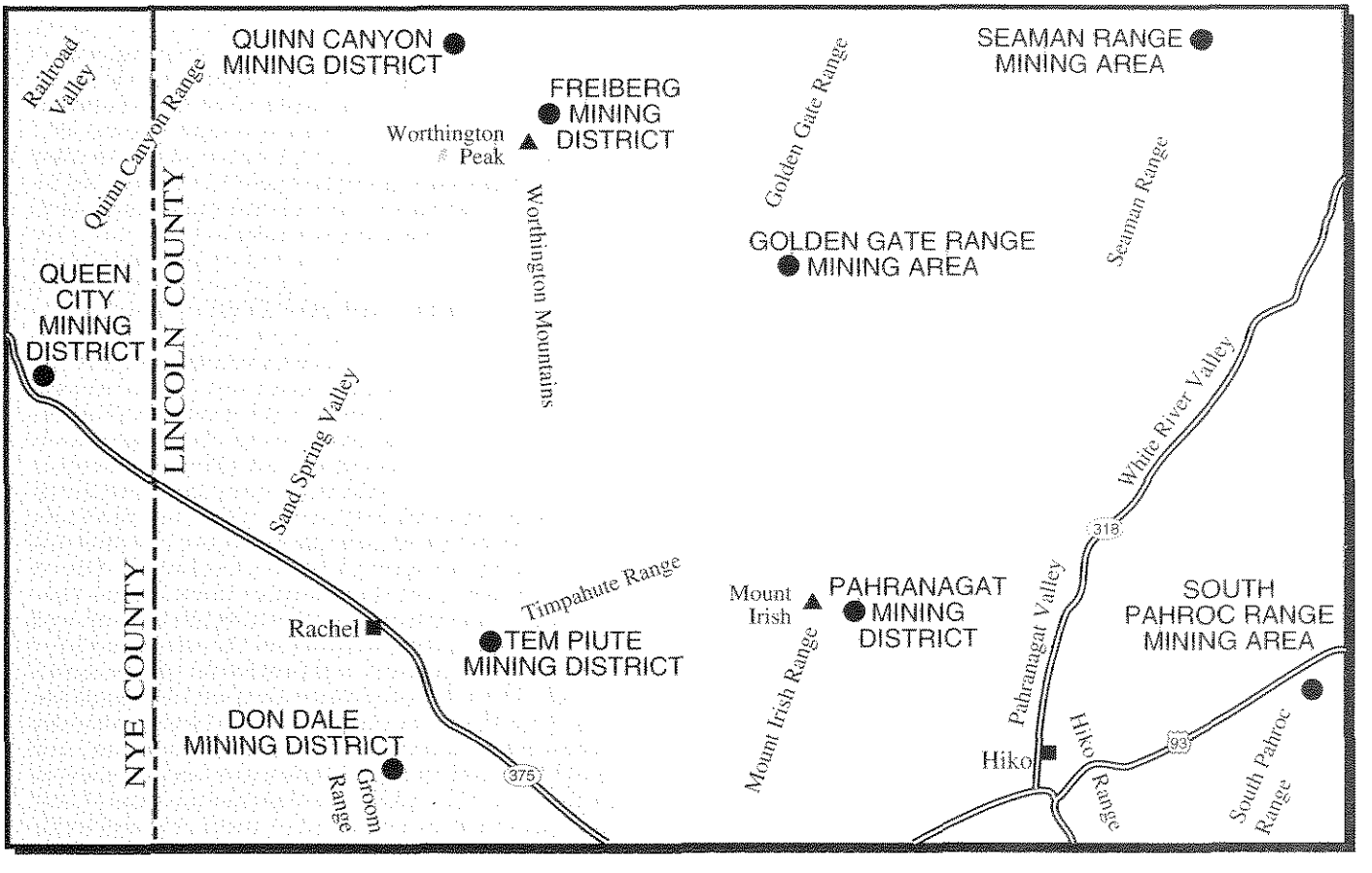
INTRODUCTION

The Timpahute Range 30′ by 60′ Quadrangle is in northwestern Lincoln County and eastern Nye County about 100 miles north of Las Vegas. The quadrangle extends from Railroad Valley on the west to White River Valley on the east, and includes the Timpahute Range, the Worthington Mountains, and portions of the Quinn Canyon, Groom, Golden Gate, Mount Irish, Hiko, Seaman, and South Pahroc Ranges. The White River enters the quadrangle near its northeastern corner and flows through the White River Narrows and the Hiko Narrows into the upper Pahranagat Valley in the southeastern part of the quadrangle. The western part of the quadrangle is dominated by Sand Spring Valley which lies between the southern tip of the Quinn Canyon Range on the northwest and the Groom and Timpahute Ranges and Worthington Mountains on the southeast. The Groom Range, Chalk Mountain, and most of the Nye County portion of the quadrangle southwest of State Highway 375 are within the Nellis Air Force Range and are closed to public entry. Only two small settlements are located within the Timpahute Range Quadrangle: several families live near the old townsite of Hiko in Pahranagat Valley; and farms in the Sand Springs Valley support a small population at Rachel, located on State Highway 375 on the east side of the valley.

Recorded information on the history of this area begins with accounts of mineral discoveries in the Pahranagat district in the spring of 1865. Earlier, however, emigrants may have passed through the eastern part of the quadrangle along the Death Valley Emigrant Trail. This trail, used in the late 1840s, entered the quadrangle east of the White River Narrows, followed White River Valley southwest to the vicinity of Crystal Springs, turned west to cross the Pahranagat Range at Hancock Summit just south of the quadrangle boundary, and continued southwest into Emigrant Valley and, eventually, into Death Valley on its way to southern California.

The general geology of the Timpahute Range Quadrangle was described in early reports of Nevada's first State Mineralogists (Stretch, 1867; White, 1869). G. K. Gilbert, geologist with the Wheeler Survey, visited the "Pahranagat Lake" district in 1871, and others in the Wheeler party visited the Freiberg and "Tim-Pah-Ute" districts; descriptions of these areas are included in the preliminary report of the Wheeler Survey (Wheeler, 1872, p. 42–44). The final Wheeler report, *The U.S. Geographic Survey West of the One Hundredth Meridian* (Wheeler, 1875, p. 37–42), contains general geologic descriptions of the principal ranges of the quadrangle; much of this information is also included in a report of a reconnaissance survey of the geology of southern Nevada and adjacent portions of California by J. E. Spurr (1903). Tschanz and



Pampeyan (1970) described mineral deposits in the Lincoln County part of the quadrangle, and also described the general geology of this portion of Lincoln County. Kral (1951), and Cornwall (1972) briefly described mineral deposits along the western border of the quadrangle in Nye County. Cornwall's (1972) work also contains a general geologic description of the Nye County part of the quadrangle. Ekren and others (1977) mapped the Tertiary volcanic and sedimentary rocks of the quadrangle as part of a project to complete a geologic map of the state (Stewart and Carlson, 1978).

The earliest mining locations within the Timpahute Range Quadrangle were made on silver discoveries on Mount Irish, in the Pahranagat district, in March 1865 (Angel, 1881, p. 485). The strength of the mineral showings in this district, and the anticipated rush of population to the area, led to the creation of Lincoln County from the eastern portion of Nye County in 1866 and the designation of the settlement of Crystal Springs as the county seat. In 1867, the county seat was moved a few miles north to Hiko where it remained until 1871 when it was moved to its present location at Pioche (Angel, 1881, p. 477). Mineral discoveries were made in the Freiberg district in the fall of 1865, and in the Tem Piute district in 1867 (White, 1869, p. 85). Although surface showings in all three of these districts appeared promising at the time of their discovery, none developed into major precious metals producers and, by 1881, significant mining activity had ceased within the quadrangle.

Tungsten was discovered in the northern part of the Tem Piute district in 1916 (Binyon and others, 1950, p. 4), mercury was discovered in the Don Dale district in 1919 (Melbye, 1956) and, in 1929, mercury deposits were found in the Queen City district, Nye County, on the western border of the quadrangle (Kral, 1951, p. 92). Tungsten mining began in the Tem Piute district about 1940 and the activity increased until, between 1952 and 1957, the town of Tempiute at the mine site supported a population of 500 (Tschanz and Pampeyan, 1970, p. 5). Tungsten mining ceased in 1957, when a government price support for tungsten came to an end. Mining resumed for a short time between 1977 and 1982, but the properties are not active at the present time. Neither of the two mercury districts within the quadrangle have supported more than sporadic activity since their discovery. In about 1941, manganese deposits in the northern part of the Pahranagat district were explored. One mine, the South Paw, produced significant amounts of manganese ore between 1950 and 1958.

Total metallic mineral production from deposits within the Timpahute Range Quadrangle is not well defined; early silver production from the three historic districts went largely unreported but is estimated to total at least $256,000 (Couch and Carpenter, 1943, p. 84–89; Tschanz and Pampeyan, 1970, p. 155–156). Recorded mercury production is small, totaling only 83 flasks (Bailey and others, in prep.); manganese production from the Pahranagat district is recorded at $630,300 (Tschanz and Pampeyan, 1970, p. 155); and tungsten production from the Tem Piute district is estimated to be about 500,000 units of WO_3 (Stager and Tingley, 1988, p. 107). The only recorded production of nonmetallic mineral commodities within the Timpahute Range Quadrangle has been from small perlite deposits in the South Pahroc Range. The Mackie mine, the largest of these deposits, has produced about 108,000 tons of perlite since the 1940s (Neumann, 1986, p. 13).

In 1990, the Mackie perlite mine was the only active mineral property within the Timpahute Range Quadrangle. The large mine and mill complex at Tempiute in the Tem Piute district remained closed, and no metallic mineral production was reported from anywhere within the quadrangle.

Several hot springs occur along the eastern edge of Pahranagat Valley. These springs, including Hiko Spring on the north and Crystal Springs on the south, provide water for irrigation and domestic purposes but there has been no geothermal development within the quadrangle.

There has been exploration for oil within the quadrangle and one test well has been drilled in Coal Valley, near the northern boundary (Garside and others, 1988, p. 41); the well was dry and there has been no production of oil or gas from within the Timpahute Range Quadrangle.

In 1983, the Nevada Bureau of Mines and Geology conducted a mineral inventory of the Caliente Resource Area for the Bureau of Land Management and, as part of that project, many mines and prospects in the Don Dale, Freiberg, Queen City, and Tem Piute districts were examined and sampled by P. Smith and J. Bentz. In 1985, a similar inventory was conducted in the Groom Range for the U.S. Air Force and many additional properties in the Don Dale district were examined and sampled by J. Quade and J. V. Tingley. In 1987, a cooperative program was begun with the Branch of Western Regional Geology, U.S. Geological Survey, to complete mineral inventories of a number of 30′ by 60′ quadrangles in southeastern Nevada. The Timpahute Range Quadrangle is the third of these studies to be completed. Field examinations for this study were carried out by J. V. Tingley in 1987, 1988, and 1989. For all of these projects, samples were selected from dumps and mineralized outcrops to examine trace element associations. Sample descriptions and results of geochemical analyses are included in appendices A and B. The samples are high grade and do not represent average ore grades. The U.S. Geological Survey Branch of Geochemistry performed trace element analyses of these samples as part of a cooperative agreement with the Nevada Bureau of Mines and Geology.

The information in this report draws from all known sources and is intended to be a compilation of data on mines, prospects, and mineral, geothermal, and oil and gas occurrences within the Timpahute Range 30′ by 60′ Quadrangle. When information sources are cited, the first source listed has provided the primary information. The information from literature sources has been adjusted to reflect field observations, when available.

GEOLOGIC SETTING

Rocks in the Timpahute Range Quadrangle range in age from Precambrian through Quaternary. Quartzite and siltstone of probable Precambrian age crop out along the west side of the northern Groom Range. Although shown on the Lincoln County geologic map as Cambrian Prospect Mountain Quartzite (Tschanz and Pampeyan, 1970), these rocks probably correlate with units in the central Groom Range, south of the quadrangle boundary, which have been mapped as Precambrian Sterling Quartzite by Barnes and Christiansen (1967). Cambrian rocks, mainly carbonate and shaly units of the Nopah, Highland Peak, and Dunderberg Formations, crop out in the southern Quinn Canyon Range, along the western border of the quadrangle, and in the northern Groom and central Timpahute Ranges, near the southwestern border of the quadrangle. Extensive outcrops of limestone, dolomite, quartzite, and shale of Ordovician through Mississippian age are found in the ranges in the central and eastern portion of the quadrangle, and Permian carbonate rocks and sandstone crop out in the central Timpahute Range. No sedimentary

rocks of Mesozoic age have been mapped within the Timpahute Range Quadrangle. Tertiary volcanic units, including andesite and basalt flows, welded ash-flow tuffs, and intervolcanic sedimentary units, cover large areas in the Quinn Canyon, Groom, Timpahute, Mount Irish, Golden Gate, Seaman, Hiko, and Pahroc Ranges. Tertiary lakebed deposits, consisting of siltstone and clay shale, similar to the Panaca and Muddy Creek Formations in the southern part of Lincoln county, have been mapped in Pahranagat and Garden Valleys (Tschanz and Pampeyan, 1970, p. 76–77). Almost half of the Timpahute Range Quadrangle is covered by unconsolidated Quaternary deposits that fill basins between the ranges. These deposits consist of older gravels and alluvium deposited in fans and aprons along the mountain fronts, lakebed deposits in playas in interior drainage basins, and dune sand (Tschanz and Pampeyan, 1970, p. 78–80).

Intrusive rocks have been mapped in five of the mountain ranges within the Timpahute Range Quadrangle. Two granite stocks crop out in the southern Timpahute Range, and two small stocks of porphyritic granite crop out in the northern Worthington Mountains (Tschanz and Pampeyan, 1970, p. 75–76). Dikes and plugs of quartz latite and rhyolite are present in the southern Quinn Canyon range, in the western part of the quadrangle, and a rhyodacite plug crops out in the southern Seaman Range (Ekren and others, 1977). Granitic rocks crop out in the northern Groom Range, and a small rhyolite intrusive crops out on the northern tip of the Groom Range, on the southern edge of Sand Spring Valley (Ekren and others, 1977).

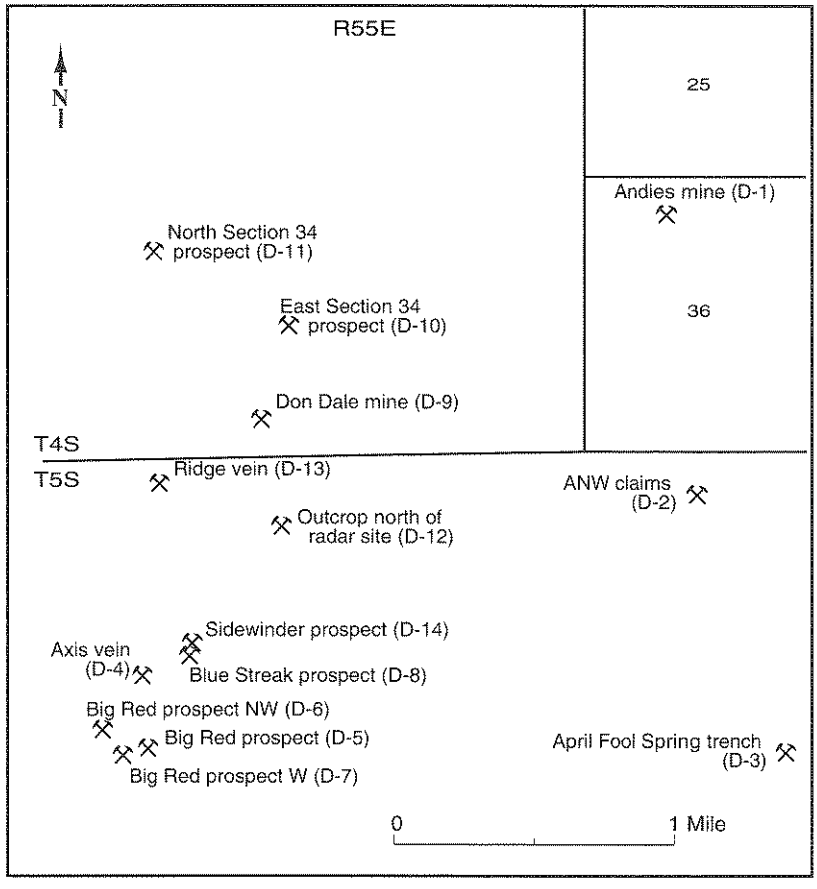
The major regional structural features of the quadrangle are thrust faults, east-striking strike-slip faults, and basin-range normal faults. The largest thrust plates are Laramide in age and may once have extended over very large areas in western and southern Lincoln County (Tschanz and Pampeyan, 1970, p. 81). Within the Timpahute Range Quadrangle, remnants of these thrust sheets are found in the Timpahute Range and on Mount Irish. The most prominent strike-slip faulting within the quadrangle has occurred along the Timpahute lineament (Ekren and others, 1976, p. 2–4). This lineament extends along an east-northeast trend across the north end of the Timpahute Range, crosses Mount Irish, and passes between the North and South Pahroc Ranges before crossing into Utah east of the Cedar Range. Contrasting structural styles are found to the north and south of this feature, and numerous igneous intrusive masses, including the granite in the Timpahute Range, occur along the lineament (Ekren and others, 1976, p. 2). Major strike-slip faulting along the Timpahute lineament is post-Laramide in age (Tschanz and Pampeyan, 1970, pl. 3). Nearly all of the basin-range normal faults in the area are also post Laramide in age and most of the basins and ranges were formed by normal faults that cut sedimentary and volcanic rocks of Miocene and early Pliocene age (Tschanz and Pampeyan, 1970, p. 85). There has been Quaternary movement on many of the structures in the area, most notably on the range-front fault on the southeast side of Sand Springs Valley (G. L. Dixon, written commun., 1991).

METALLIC OCCURRENCES

DON DALE MINING DISTRICT

The Don Dale mining district, Lincoln County, is located in the northern Groom Range, in the southwestern corner of the Timpahute Range quadrangle. The district includes the Andies mercury mine on the northeast tip of the Groom Range, small gold prospects south of the Andies mine near Old Tikaboo Spring, the Don Dale mine on the north-central tip of the range, and several precious metals prospects along the western front of the range, south of the Don Dale mine. Prospects near Old Tikaboo Spring on the east side of the district are within the Groom Range portion of Nellis Air Force Range.

The Don Dale district was organized about 1945 (Tschanz and Pampeyan, 1970, p. 172). Many of the mines in the district are much older, however, and probably date from the 1860s when the adjacent Groom district was active. Little information is available on that early activity and, prior to 1945, properties within the present Don Dale district were included in the Tem Piute district. The Andies mercury deposit was discovered in 1919, but the only production was recorded in 1955 (Melbye, 1956). The first record of production from the Don Dale mine was in 1940 (U.S. Bureau of Mines records, NBMG files). Total recorded production from the district consists of 3 flasks of mercury from the Andies mine (Bailey and others, in prep.) and 200 tons of silver-lead-copper ore from the Don Dale mine (Tschanz and Pampeyan, 1970, p. 174).



Locations of mines and prospects in the central part of the Don Dale mining district.

The northern end of the Groom Range is composed of Cambrian and Ordovician rocks which have been intruded by many dikes and small stocks of granitic composition. The lower flanks of the range are covered by Tertiary volcanic rocks which are cut by andesite porphyry dikes (Tschanz and Pampeyan, 1970, p. 174). The volcanic rocks on the west flank of the range are intruded by masses of rhyolite that may be the same age as the intensely altered rhyolite tuffs that crop out near the Andies mine. Ekren and others (1977) inferred that the volcanic rocks on the north end of the Groom Range may have originated in the Bald Mountain caldera, located in the central part of the range about 7 miles south of the Don Dale district.

At the Don Dale mine, workings follow a quartz vein that cuts shaly limestone and quartzite of Cambrian age. The vein follows and is probably related to the contact of a quartz porphyry intrusive with the older rocks. Mineralization appears to occur mainly in the intrusive rock, but some fine-grained sulfides also occur in vein material and in quartzite. At the Andies mine, cinnabar occurs as disseminations, fracture coatings, and in silicified breccias in altered, silicified rhyolite tuffs and flows. The old workings on the west side of the district, south of the Don Dale mine, explore narrow tetrahedrite- and pyrite-bearing quartz veins which cut Cambrian quartzite.

Some prospecting for disseminated gold was reportedly done in the northern part of the district in the mid to late 1980s, but there was no activity in the district in 1989.

Andies mine (D-1)

Other names: MDDS claims, Mayday and Shendell claims, WM and UC Fractions

Commodity: mercury

Location: sec. 25,36, T4S, R55E
UTM 4157650N 610800E

Production: Three flasks of mercury are reported to have been produced in 1956 by Western Mercury and Uranium Corp.

History: Cinnabar is reported to have been found in the Andies area in 1919 by C.A. Anderson who, however, did not stake claims on the occurrence until 1954. In 1955, Anderson and his partner, R.R. Robinson, leased their claims to J. H. Smith and Lowell Bonnett who, in turn, leased to Western Mercury and Uranium Corp. In late 1955 and early 1956, Cordero Mining Co. evaluated the property by surface and underground sampling. Later in 1956, the land was leased to Mullen-Buckley Uranium Corp. who employed Colorado Exploration Co. to further evaluate the property. After drilling 67 holes with an aggregate length of 4,218 feet, and obtaining many assays from numerous pits and trenches, they reported the presence of a thinly covered blanket-like orebody containing 45,000 tons of proven ore averaging 3.371 lbs/ton and 24,000 tons of probable and possible ore of slightly better grade. The total mercury included in all classes of these reserves is a little less than 4,000 flasks. In 1957, the U.S. Bureau of Mines, on the basis of 28 check samples cut to evaluate a Defense Minerals Exploration Administration (DMEA) proposal, concluded that indicated and inferred ore amounted to about half this quantity with an average grade of 3.0 lbs/ton.

Development: Workings consist of a 30-foot-deep shaft, a 145-foot-deep inclined shaft, seven trenches, and numerous prospect pits, churn drill holes, and rotary drill holes.

Geology: Rocks exposed in the Andies mine area consist of Tertiary andesite capped by rhyolite. The volcanic rocks in the zone of mercury mineralization are pervasively fractured, argillized, and bleached nearly white; elsewhere they are harder, darker colored, and coated with yellow-brown stains of iron oxides. Cinnabar occurs as minute crystals scattered throughout the altered rhyolite, locally in thin irregular quartz veinlets, and as coatings on fracture surfaces. Accompanying minerals include pyrite, limonite, jarosite, calcite, gypsum, and unidentified clay minerals. The orebody that has been developed by drilling and underground exploration is nearly flat, 300 feet long, 100 feet wide, and has a variable thickness that reaches a maximum of 45 feet but averages about 15 feet. The average grade is reported to be about 3 lbs of mercury per ton.

Source of information: Bailey and others (in prep.)

Field examination: P. Smith, J. Bentz, 1983; J. V. Tingley, 1984; J. Quade, 1985

Andies mercury mine, Don Dale mining district, showing areas of bleaching and argillic alteration.

ANW claims (D-2)

Other names: May include PA, PB, PC, PD placer claims.
Commodity: mercury
Location: sec. 1, T5S, R55½E
UTM 4156000N 611000E
Production: unknown
History: The claims were staked in mid to late 1960s when the price of mercury was high. Most of the claims were located and explored by D.F. Miller for the Southern Pacific Production Co., but the latest recorded work was done in 1970 for Leber Mining Co.
Development: Exploration consists of several long, very shallow, bulldozer cuts, reported drilling of unknown extent, and IP geophysical work.
Geology: Most of the area is underlain by Cambrian Prospect Mountain Quartzite which, although locally iron stained, appears to be little mineralized. In a brief examination, no evidence of mercury mineralization was seen.
Source of information: Bailey and others (in prep.)

April Fool Spring trench (D-3)

Commodity: gold(?)
Location: sec. 4, T5S, R55½E
UTM 4154600N 611480E
Production: none
Development: Workings seen consist of one trench and a drill site.
Geology: Iron oxides occur on fracture surfaces in volcanic tuff; no evidence of mineralization was seen.
Remarks: The trench is located in the major drainage, near a drill site.
Field examination: J. Quade, 1985

Axis vein (D-4)

Commodities: silver, gold
Location: sec. 6, T5S, R55½E
UTM 4155000N 607750E
Production: unknown
Development: A small prospect pit.
Geology: The prospect exposes a N30°-45°E-striking, vertical quartz vein, 18 inches thick, which cuts Cambrian Prospect Mountain Quartzite. The vein is stained with iron oxides and contains a fine-grained, unidentified gray sulfide.
Field examination: J. Quade, J. V. Tingley, 1985

Big Red prospect (D-5)

Commodities: gold, silver
Location: sec. 6, T5S, R55½E
UTM 4154600N 607750E
Production: unknown
Development: Workings consist of an inclined shaft, adit, drift, and cuts.
Geology: At least three parallel, brecciated, silicified fault structures which cut Cambrian Prospect Mountain Quartzite crop out along an east-trending wash at this site. All are iron-oxide stained and form prominent outcrops. The shear zones trend N60°-80°W, but the old mine workings follow N20°-30°E cross-structures which cut the prominent silicified outcrops. The drift extending from the inclined shaft follows a 5- to 6-foot-thick breccia zone that strikes N25°E and dips 85° NW. The breccia material is composed of fine-grained, bluish quartz with clots and streaks of pyrite and an unidentified gray sulfide. The breccia is vuggy and the vugs are filled with acicular quartz crystals; some are filled with pyrite.
Remarks: Old monuments in this area may date from the 1870s and 1880s. There was no activity at time of the examination.
Field examination: J. Quade, J. V. Tingley, 1985

Big Red prospect NW (D-6)

Commodities: gold, silver
Location: sec. 6, T5S, R55½E
UTM 4154700N 607530E
Production: unknown
Development: Workings consist of two small prospect pits, workings are very old, and there are no roads to any prospects in this area.
Geology: Prospecting was done on a manganese- and iron-oxide-stained quartz vein in Cambrian Prospect Mountain Quartzite. Pyrite and unidentified, gray sulfides occur in the vein. The vein strikes N30°W and dips 70°NE; a vertical, N50°E-striking cross-structure intersects the main vein.
Remarks: There was no activity at time of the examination in 1985.
Field examination: J. Quade, J. V. Tingley, 1985

Big Red prospect W (D-7)

Commodities: silver, gold
Location: sec. 6, T5S, R55½E
UTM 4154550N 607650E
Production: unknown

Big Red prospect, Don Dale mining district, showing outcrop of silicified breccia.

Development: Workings consist of a shallow inclined shaft; no roads lead to the prospect.

Geology: The workings are located on a silicified breccia zone in Cambrian Prospect Mountain Quartzite. A 5- to 6-foot-thick quartzite breccia, flooded with silica, contains some pyrite, and unidentified, dark gray sulfides; the outcrop is iron-oxide stained. The breccia strikes N25°E, dips 85°NW; a second brecciated, silicified zone strikes N80°W, and is near-vertical. The old mine workings follow the northeast-striking breccia zone.

Remarks: Workings in this area are old; there was no activity at time of the examination in 1985.

Field examination: J. Quade, J. V. Tingley, 1985

Blue Streak prospect (D-8)

Commodities: gold, silver

Location: sec. 6, T5S, R55½E
UTM 4155100N 608040E

Production: unknown

Development: Workings consist of one small, very old prospect pit.

Geology: The prospect pit exposes a vuggy, iron-oxide-stained quartz vein cutting Cambrian Prospect Mountain Quartzite. The vein contains pyrite and a unidentified, gray sulfide. The vein strikes N65°W, is vertical and, where exposed in the pit, intersects a N30°E-striking, 80°SE-dipping, rubbly, 5- to 6-foot-wide shear zone.

Field examination: J. Quade, J. V. Tingley, 1985

Don Dale mine (D-9)

Other name: Blue Bird claims

Commodities: lead, silver, copper

Location: sec. 34, T4S, R55E
UTM 4156450N 608450E

Production: 200 tons of silver-lead-copper ore was shipped from the Don Dale mine.

History: The Don Dale district was organized about 1945. After production of 200 tons of ore in the 1950s, apparently very little activity has taken place in the district.

Development: Workings at the Don Dale mine consist of a single, partially caved, 40-foot-deep shaft, several surface cuts, prospect pits, and bulldozer scrapings along east- and west-facing slopes of the canyon.

Geology: Workings of the Don Dale mine follow a quartz vein that cuts both shaly limestone of the Cambrian Pioche Shale and quartzite of the Cambrian Prospect Mountain Quartzite. The N65°E-striking vein, which contains oxidized lead, copper, and silver minerals in a quartz gouge, is probably related to a quartz porphyry contact. Mineralization also occurs in a set of north-striking cross-fractures that dip 40°–60°E. An ore shoot at the intersection of the vein and one of these cross-fractures was mined to a depth of 40 feet. About 50 yards west of the main adit, surface scrapings reveal a quartz vein containing very fine-grained pyrite, chalcopyrite, galena, and tetrahedrite disseminated in both the vein and adjacent quartzite wall rock. The wall rocks are highly fractured and stained with iron oxides. The vein, estimated to be about 8 feet wide, is sacchroidal and vuggy; vugs are lined with euhedral quartz crystals. At the adit, very fine sprays of malachite were observed coating exposed rock surfaces and filling fractures in the quartz porphyry. Both shale and quartzite were observed on the dump, along with iron- and manganese-oxide-stained vein material containing copper, lead, and silver minerals.

Remarks: The road to the area is maintained as it serves the microwave site on the ridge to the south of the mine. No activity was apparent at the time of the examinations in 1983 and 1985. The most recent claim notice found on the property was dated 1964.

Field examination: P. Smith, J. Bentz, 1983; J. Quade, 1985

East Section 34 prospect (D-10)

Commodities: silver, gold(?), copper

Location: sec. 34, T4S, R55E
UTM 4157000N 608570E

Production: unknown

Development: Workings consist of a trench and minor surface scrapings along slope.

Geology: Workings expose a massive, white quartz vein, highly shattered and brecciated, that contains fragments of quartz porphyry intrusive and carries minor pyrite and hematite-limonite gossan. The vein trends N55°E, is near-vertical, and is about 2 feet wide; prominent shearing perpendicular to the vein is present. The vein is probably filling a fault which separates bluish-gray shale (Cambrian Pioche Shale?) from overlying quartzite. Malachite was observed in float nearby; additional quartz veins crop out upslope from the site.

Field examination: P. Smith, J. Bentz, 1983

North Section 34 prospect (D-11)

Commodities: silver, gold

Location: sec. 34, T4S, R55E
UTM 4157400N 607860E

Production: unknown

Development: Three shafts, prospect pits, and numerous cuts.

Geology: The mine workings expose a N75°W, 85°SW-dipping, 3- to 4-foot-thick quartz vein in Cambrian Prospect Mountain Quartzite. Prospects and cuts explore vein for several hundred feet along strike. The vein continues in outcrop along the ridge to the north and south.

Field examination: J. Quade, 1985

Outcrop north of radar site (D-12)

Commodity: gold(?)

Location: sec. 6, T3S, R55½E
UTM 4155850N 608550E

Production: none

Development: none

Geology: Brecciated, iron-oxide-stained quartz vein cutting quartzite crops out along the slope north of the radar site.

Field examination: J. Quade, 1985

Ridge vein (D-13)

Commodity: gold(?)

Location: sec. 6, T3S, R55½E
UTM 4156100N 607860E

Production: none

Development: none

Geology: A brecciated and manganese-oxide-rich quartz vein is exposed along a ridge. The vein strikes N40°W, dips 55°SW, and is within a 20-foot-wide shear zone.

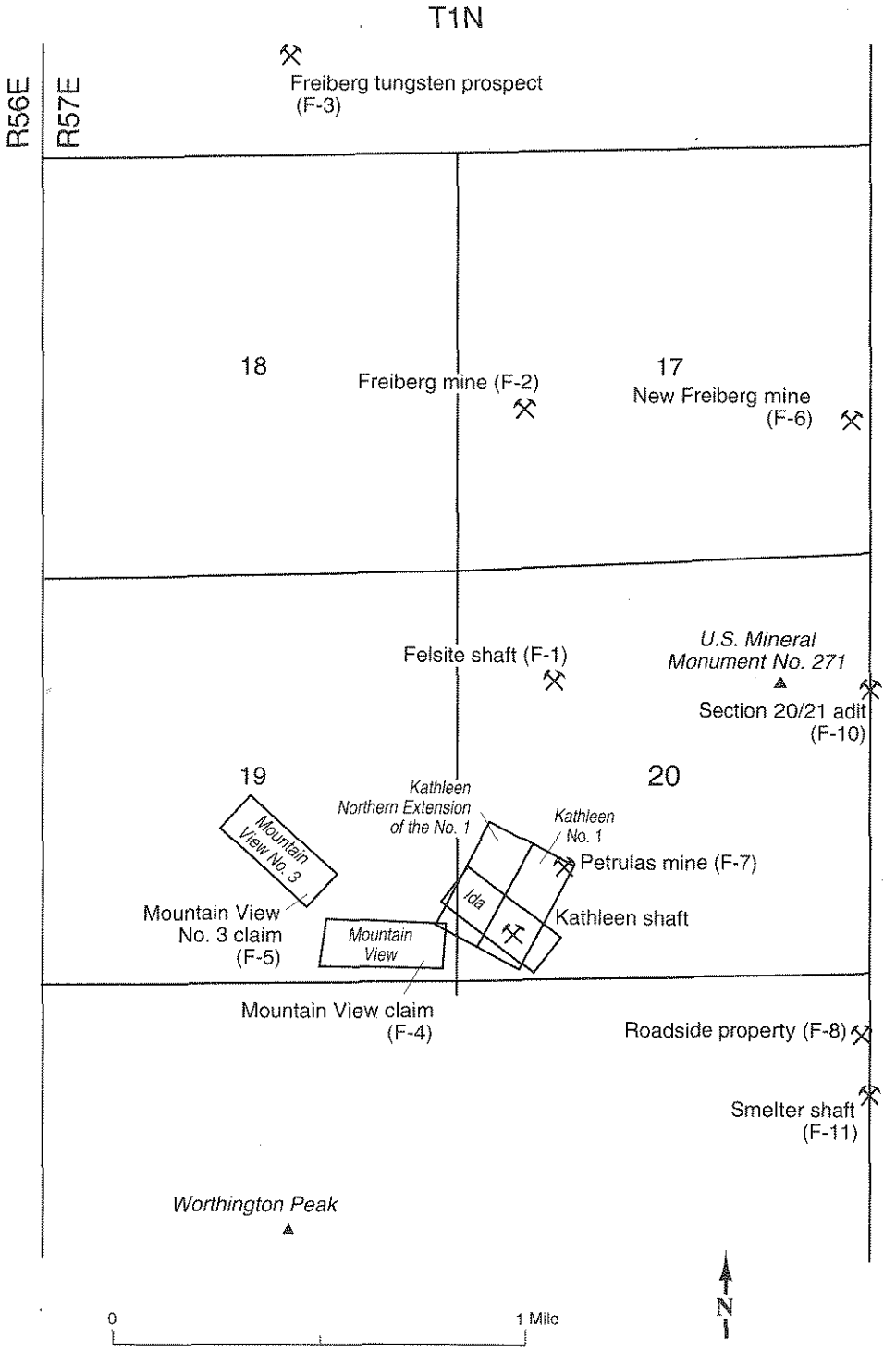
Field examination: J. Quade, 1985

Sidewinder prospect (D-14)

Commodities: gold, silver
Location: sec. 6, T5S, R55½E
UTM 4155150N 608070E
Production: none
Development: Prospect pit and dump.
Geology: The Sidewinder prospect is located on a N25°W-striking, vertical structure, 5 to 6 feet thick, in Cambrian Prospect Mountain Quartzite; bedding is oriented N40°W and dips 30°NE. Minor sulfides are present.
Field examination: J. Quade, J. V. Tingley, 1985

FREIBERG MINING DISTRICT

The Freiberg district, Lincoln County, is located in the northern Worthington Mountains below the north central border of the quadrangle. The historic mines of the district are located in the central part of T1N, R57E, on the northeast flank of Worthington Peak. With the exception of one prospect in the southern Worthington Mountains, all of the properties discussed in this report are also located on the northeast side of Worthington Peak.



Locations of patented claims, mines, and prospects in the Freiberg mining district.

According to Angel (1881, p. 485) ore was discovered in this district in the fall of 1865 and the Worthington district was organized. No work was done in the area until 1869, when additional discoveries were made 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 was reportedly shipped from the Shonte mine that year (Whitehill, 1873, p. 113). The earliest recorded production from the district, however, 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 was $18,000 (Tschanz and Pampeyan, 1970, p. 173).

Between 1980 and 1982, the Freiberg Mining Corp. was active in the district. During this time, 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.

Rocks in the Freiberg district consist of complexly faulted lower Paleozoic limestone and dolomite which have been intruded by two granite stocks. Many granitic and lamprophyre dikes cut the area, and most of the limestone around the stocks have been marbleized. Except for 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 plate, 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 the 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 orebodies in the Freiberg district occur in rocks below both thrust sheets (Tschanz and Pampeyan, 1970, p. 172–173).

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

Felsite shaft (F-1)

Commodities: zinc, lead
Location: sec. 20, T1N, R57E
UTM 4199520N 623140E
Production: unknown
Development: Workings consist of an inclined shaft, 30 to 40 feet deep.
Geology: The shaft is sunk on the contact of a felsite dike with marbleized limestone. The dike is fine-grained (mainly granular), quartz with sparse, green biotite and very fine-grained black sulfides (possibly pyrrhotite). The contact strikes N20°W and dips 65°SW. A lenticular sulfide-replacement lens follows the contact; the lens is about 5 feet wide, as exposed in the shaft, and contains pyrite and sphalerite along with silicate minerals.
Field examination: J. V. Tingley, 1988

Freiberg mine (F-2)

Other name: New Freiberg project
Commodities: silver, lead, zinc, gold
Location: sec. 17, T1N, R57E
UTM 4200620N 623000E
Production: small
History: This property is probably the site of the original 1865 discovery in the district. No work is reported to have been done at that time, however.
Development: Clusters of small workings are scattered throughout the canyon. The entire canyon, both at its mouth and interior, has a heavy overprint of drill roads and related surface exploration. Some of the older workings have been obliterated and old dumps have been removed and stockpiled at the mouth of the canyon. Several old cabins remain in this area.
Geology: The mine site is underlain by carbonates of the Ordovician Pogonip Group. Near the shaft, the limestone is slightly silicated, bleached and recrystallized. The shaft exposes an irregular replacement vein of iron-rich, sulfide-bearing skarn developed within greenish-white marble or recrystallized limestone. The limestone beds are visibly fractured and, for the most part, the beds strike N5°E and dip 25°ESE. The replacement vein is steeply inclined to the west at a high angle to bedding but also extends outward along bedding planes east of the main vein. Light-green and white, dense, granular calc-silicate minerals have developed adjacent to the vein. Some skarn has also developed along east-west fractures perpendicular to the main body. The main north-trending skarn body has irregular contacts with the wall rock and contains large gossan pods. The body may have developed along a set of intersecting fractures or fissures. The dump is sorted into two different kinds of skarn: olive-green skarn containing fine-grained chalcopyrite and yellow sphalerite; and dark (iron-rich) red-brown-green skarn containing abundant crystalline, black sphalerite with some chalcopyrite and pyrite (this material is associated with or contains pods of hematitic gossan). A granite stock, with a reddish, nonresistant weathered appearance, crops out on the ridge south of this location. This stock, or dikes related to it, is probably the source for the alteration and mineralization observed here.
Field examination: P. Smith, J. Bentz, 1983

Freiberg tungsten prospect (F-3)

Commodities: tungsten, molybdenum
Location: sec. 7, T1N, R57E
UTM 4201950N 622060E
Production: none recorded
Development: Old underground workings consist of one S75°E-trending adit, now mostly caved, but track and a small dump still remain along with one, well-timbered, 30-foot-deep, vertical shaft located 25 to

30 feet northeast of the adit. Shallow trenching and possibly drill roads(?) surround the area of the old workings and extend to south and east along the contact zone. The trenching is probably 5 to 10 years old.

Geology: Workings (both old and new) are in bedded carbonates of the Ordovician Pogonip Group which lie adjacent to the northeast edge of a granitic stock. The stock, the larger of two stocks that occupy the north end of the Worthington Mountains, intrudes both Ordovician and Devonian carbonate rocks and has formed skarns along its margin. The adit follows a N70°W-striking, 75°NE-dipping fracture (fault?) zone cutting light-green, epidote-calcite-diopside-quartz skarn. The fracture zone is about 3 feet wide. The bedding of the skarn is disrupted but generally dips to the southwest or south. Overlying the skarn is a dense, finely crystalline, epidotized, red-brown hornfels. The contrasting rock types indicate a lithology change in metamorphosed host: the more limy units formed skarn and the more shaly units formed hornfels. The shaft workings also explore an east-trending fracture zone. Steeply inclined fracture surfaces in the skarn are coated by massive to crystalline epidote. Skarn collected from the dump is epidote-rich and dense, and contains coarse crystals and pods of white calcite. Calcite coats fracture surfaces and the rock contains only very minor iron oxides. Under ultraviolet light, the sample from this location displayed coarse, scattered flakes of scheelite and powellite; some crystals are intergrown or gradational. Wolframite is reported to be present at this location, but none was observed.

Field examination: P. Smith, J. Bentz, 1983

Mountain View claim (F-4)

Commodities: silver, lead, zinc

Location: sec. 19, T1N, R57E
UTM 4198500N 622500E

Production: unknown

History: Claim was staked October 14, 1914, and patented in 1919.

Development: Workings consist of two adits, connected by stoping, totaling 130 feet in length.

Geology: Calcite, galena, pyrite, and secondary limonite occur along a generally east-trending fault zone cutting Pogonip Group limestone. The fault-controlled mineral occurrence exposed in the upper adit narrows to less than 1 inch in the lower adit where only limonite and calcite were identified. Samples from the main fault contained between 0.01 and 0.19 ounces of gold per ton, 3.5 and 12.6 ounces of silver per ton, 6.0 and 18.4% lead, and 0.55 and 3.3% zinc.

Remarks: The main mineralized fault zone associated with the workings on this claim extends westward beyond the boundaries of the claim.

Source of information: Wood (1985, p. 24–25)

Mountain View No. 3 claim (F-5)

Commodities: silver, lead, zinc, gold

Location: sec. 19, T1N, R57E
UTM 4198800N 622100E

Production: unknown

History: Claim was located October 21, 1914, and patented in 1919. The claim was owned in 1919 by the Olympus Mining and Milling Co.

Development: The Mountain View No. 3 patented claim is not accessible by road. One 25-foot-long adit was found on this claim. Two adits, both less than 15 feet long, and one pit are within ½ mile northwest of the claim.

Geology: Precious and base metals occur along bedding planes and along faults in Pogonip Group limestone on and near the Mountain View No. 3 claim. The mineralized pockets formed along the faults and bedding planes are small and discontinuous where examined in exposures within the claim. Calcite, galena, limonite, and pyrite were identified in some of these workings. Samples across mineralized faults in the 25-foot-long adit on the claim contained as much as 0.18 ounces of gold and 6.7 ounces of silver per ton, 18.5% lead, and 16.3% zinc. Generally lower values, up to 0.02 ounces of gold and 3.9 ounces of silver per ton, 1.6% lead, and 0.13% zinc were obtained from the other nearby prospects.

Source of information: Wood (1985, p. 25)

New Freiberg mine (F-6)

Commodities: silver, lead, zinc, copper

Location: sec. 17, T1N, R57E
UTM 4200600N 624300E

Production: Recorded production is $18,000, 1919-1948.

History: First production was recorded in 1919. The property was mined in 1943 by East Standard Mining Co. of Utah, who moved a 150-ton concentrating mill to the mine and drove a new tunnel.

Development: This is the largest working observed in the district, consisting of a small open pit benched and blasted along an east-facing slope. Drill roads extend up the canyon to the west, and along low slopes north and south of the mine site. The remains of a leach pad are in the drainage south of the pit. Stockpiles of ore lie below the pit near the leach pad.

Geology: The open pit is developed in bedded carbonates of the Ordovician Pogonip group. The main rock type exposed in the floor and west wall of the pit is dark-gray, fine- to medium-grained, crystalline dolomite and dolomitic limestone. The rocks are fractured, faulted, and commonly bleached and marbleized. Some zones are finely brecciated, silicified, and recemented by pink and white quartz and calcite. Hematite veinlets cut through the rock and carry pyrite, mostly oxidized. Dolomite beds strike approximately north and dip 20°W. Several light-colored, siliceous dikes (aplite) cut the carbonate rocks at a high angle to bedding (with N80°E and east-west orientations). Oxidized, silicified, and iron-oxide-filled veins occupy steep fissures and fractures throughout the pit face; a vein exposed at the south end of the pit strikes N70°E and is inclined steeply to the north. A few irregularly shaped white quartz veins cut through the rocks exposed at the south end of the pit. The quartz is white to clear, sugary to massive in texture, and contains fracture coatings and vug fillings of iron oxides. Wall rocks adjacent to the vein are notably bleached and marbleized. Most of the ore is oxidized and gossany pods and veinlets are common. A high-grade sample of brecciated calcite vein and gossan collected from an ore pile on the floor of the pit contains pods of (argentiferous?) galena, oxidized pyrite, sphalerite, cerussite, minor chalcopyrite, anglesite(?), and rhodochrosite. Cerussite, malachite, and crusts of an unusual green mineral (AgCl?) coat fracture surfaces.

Remarks: Stockpile ore may have been derived from several locations within the district, including the open pit.

Source of information: Lincoln (1923, p. 120); Tschantz and Pampeyan (1970, p. 173)

Field examination: P. Smith, J. Bentz, 1983

Petrulas mine (F-7)

Other names: Kathleen shaft, Middle tunnel, Kathleen claims, Ida claim

Commodities: silver, lead, zinc

Location: sec. 20, T1N, R57E
UTM 4198570N 623000E

Production: Produced high-grade ore around 1900 and possibly again in 1937

History: Ida lode claim on this occurrence was surveyed for patent in January 1876; at that time, there was a 120-foot shaft on the claim (probably the Kathleen shaft). Kathleen claims were located in 1915 and 1916 and patented in 1919.

Development: Most of the ore at this mine was developed above the 100-foot level in the 175-foot-deep Kathleen shaft. The 1,300 foot-long Middle tunnel, and possibly a 100-foot-long adit below the Middle tunnel, known locally as the Lower tunnel, were driven to intersect the Kathleen shaft ore shoot but did not connect with it or encounter any ore zones. The Kathleen shaft is accessible by a jeep trail. The underground workings are inaccessible, but the Middle tunnel is accessible.

Geology: Small, scattered, irregular pockets of oxidized silver-lead-zinc ore occur in skarn and along faults in Ordovician limestone of the Pogonip Group. Skarn is related to porphyry dikes. A regional north-trending thrust fault bisects areas both to the north and south. Several faults, up to 4 feet wide, and a porphyry dike, up to 25 feet wide, are intersected by the Middle tunnel. The last half of the Middle tunnel follows a 1-foot-wide fault. Minerals identified from this working include pyrite, arsenopyrite, galena, limonite, and calcite. The Lower tunnel is driven in barren limestone.

Remarks: The Ida claim was never patented. The Ida millsite was located at Freiburg Well, north of the Ida claim, probably at the mouth of the canyon east of the original Freiberg mine.

Analyses were performed by the U.S. Bureau of Mines on samples from the Middle tunnel and from a stockpile at the Kathleen shaft. Precious and base metal values of as much as 0.01 ounces of gold per ton, 3.9 ounces of silver per ton, 4.9% lead, and 4.6% zinc were obtained from samples from the shaft. The sample from the stockpile at the Kathleen shaft was very high in arsenic (28%) and contained 0.25 ounces of gold per ton.

Source of information: Wood (1985 p. 15, 20–21); Lincoln (1923, p. 120)

Roadside property (F-8)

Commodities: silver, lead

Location: sec. 21,28, T1N, R57E
UTM 4198160N 624420E

Production: Between 1919 and 1921, lead-silver ore valued at $5,000 was produced from the Roadside property.

Development: At least 10 small pits are present.

Geology: Production from this area reportedly came from a heavily iron-stained pocket of replacement ore formed in Ordovician Pogonip Group limestone above a fault intersection.

Remarks: Samples taken from this property by the U.S. Bureau of Mines (Wood, 1985) contained as much as 0.02 ounces of gold per ton, 13.5 ounces of silver per ton, 5.8% lead, and 3.5% zinc. Spectrographic analyses detected antimony, arsenic, copper, and manganese values in one or more of the samples.

Source of information: Wood (1985, p. 15)

Section 17 prospect (F-9)

Commodities: silver, lead(?)

Location: sec. 17, T2S, R57E
UTM 4181770N 622970E

Production: none

Development: A small prospect pit.

Geology: A 4-foot-wide fault zone, striking N45°W and dipping 70°NE, cuts limestone; limonite occurs along the fault.

Remarks: No gold or silver was detected in a 4-foot-long chip sample taken at this location by the U.S. Bureau of Mines; 0.05% zinc was detected, and lead was less than 0.06%.

Source of information: Wood (1985, table 2)

Section 20/21 adit (F-10)

Other name: New Freiberg project

Commodities: copper, lead, zinc, silver(?)

Location: sec. 20,21, T1N, R57E
UTM 4199600N 624400E

Production: unknown

History: The property was drilled in about 1979.

Development: Several old shacks are located in the canyon near this prospect. Evidently this was the main site of the old mining camp of Freiburg. Workings are scattered throughout the canyon, but most are of relatively small extent. Low slopes within the canyon have been drilled and scraped (surface exploration).

Geology: The host rock for the deposit is tan to gray-brown limestone which forms beds about 1 to 2 feet thick. The limestone, which is part of the Ordovician Pogonip Group, dips gently to the north or northwest in area of the workings. Locally the rocks are moderately silicated to a greenish-white, dense calc-silicate. Other types of alteration effects observed are recrystallization (marbleization), bleaching, and brecciation of the limestone. The limestone exposed at the portal of the main adit is fractured and brecciated, indicating the adit may follow a north-striking fault zone. West of this adit, a vertical, 5-foot-wide, brecciated fault-vein strikes N30°E. The fault surface shows slickensides; and calcite, chlorite, and some epidote gouge are deposited along the fracture. Within the zone, limestone breccia fragments are cemented by white calcite or are cut by radiating veinlets of calcite. An east-striking fault zone was observed near the portal of the adit where it is marked by slight silicification and recrystallization of the wall rocks. Here, silicated limestone is mottled greenish (from epidote), and associated with gossan composed of iron and manganese oxides. Some gossan surfaces are coated with opaline material. Calc-silicate rock and recrystallized limestone from the dump is marly, light colored, and contains irregular lenses of calcite and abundant clay and iron-and manganese-oxide coatings. The rocks are dense and may contain fine-grained sulfides. Under ultraviolet light, the rocks showed scattered, minute flecks of scheelite.

Source of information: Tschanz and Pampeyan (1970, p. 172)

Field examination: P. Smith, J. Bentz, 1983

Smelter shaft (F-11)

Other names: Florence claims, Florence No. 1 and Florence No. 2 claims, Ellen, Shonte, Trident (1869-era names)

Commodities: silver, zinc, lead, copper

Location: sec. 28,29, T1N, R57E
UTM 4197970N 624410E

Production: Some production may have originated from this property early in the history of the district, and again in the late 1970s to early 1980s; there is, however, no recorded production from either of these two periods.

History: Ruins of an old silver smelter on the site probably date from 1870–1900; Wood (1985) stated that the old dumps were removed to a leach pad and processed for silver in late 1970s to early 1980s.

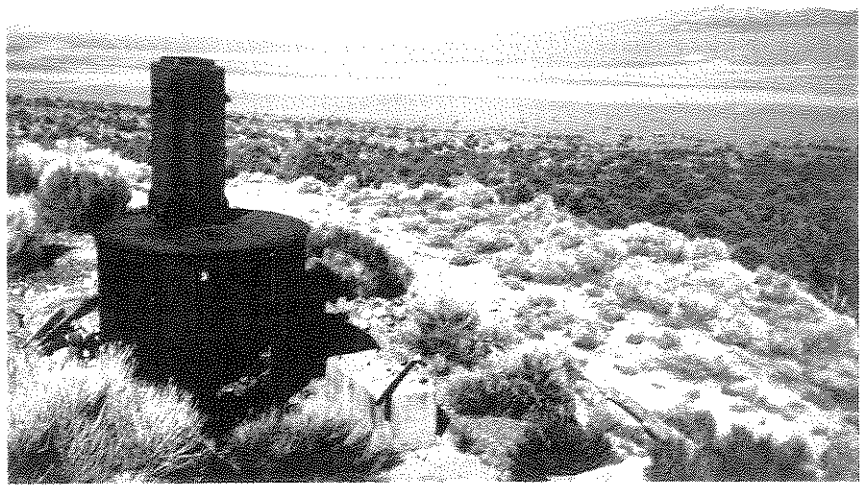
Development: The main workings consist of a 100-foot-deep shaft and about 800 feet of underground workings; several other shafts and shallow prospect pits are located in the area. The shaft area has recently (1983) been drilled; hole spacing is 10 to 20 feet.

Geology: The workings explore a breccia zone in Ordovician Pogonip Group limestone. Aurichalcite, calcite, limonite, cerussite, malachite, galena, and pyrite occur in brecciated rock in the hanging wall of generally north-striking faults. The brecciated, mineralized zone outcrops as a jasper and gossan zone within bleached, recrystallized, silicified limestone; clots of botryoidal malachite occur in vugs in the gossan. The main jasperoid outcrop strikes N10°–20°E and dips 70°–75°NW; it extends 50 to 70 feet along strike and, at its best exposure, is 25 to 30 feet wide. The jasperoid body shows fracture planes developed parallel to the trend of the outcrop. A light-colored, altered dike cuts the jasperoid zone to the south.

Remarks: Wood (1985) estimated that a resource of 850,000 tons of indicated and inferred ore averaging 2.91 ounces of silver per ton, 0.99% copper, 1.95% lead, and 7.4% zinc is present within the property. This area is probably the part of the district active in 1869 when the district was rediscovered and the name was changed from Worthington to Freyberg. Prospects described as active in this area in 1869 included the Ellen, Shonte, and Trident mines.

Source of information: Wood (1985, p. 8–15)

Field examination: P. Smith, J. Bentz, 1983; J. V. Tingley, 1988



Remains of old silver smelter, southern Freiberg mining district.

GOLDEN GATE RANGE MINING AREA

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.

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

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 extend north into the Golden Gate Range. The 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.

The one known prospect in this area explores an east-striking gossany lens of jasperoid formed in limestone. In the same area, upslope from the prospect, other parallel fracture zones cut the limestone, and are marked by narrow, pod-like jasperoid lenses.

Golden Gate Range prospect (G-1)

Commodities: lead, silver

Location: sec. 18, T1S, R59E
UTM 4190870N 640740E

Production: none

Development: Workings at this prospect consist of two shafts, each about 10 feet deep and 6 feet apart.

Geology: Shafts are sunk on an east-striking jasperoid-gossan lens in a gray,cherty, fossiliferous limestone. The jasper-gossan zone strikes generally east-west, dips 80° south, and is about 15 to 20 feet wide as exposed in the shafts. Pods of jasper-gossan within the limestone crops out to the west of the shafts. Bedding in the limestone, although not distinct, is estimated to strike N35°E and dip 35°NW. Other parallel jasper zones crop out north of the shaft; these are narrow and follow fractures in the carbonate rocks.

Remarks: Remains of an old camp and trash in the area indicate that the last work on the property was done in the 1950s. Parts of a drill tripod, drill cement, and core fragments scattered about indicate that surface diamond drilling was done; probably only one AX-size hole was drilled.

Field examination: J. V. Tingley, 1988

PAHRANAGAT MINING DISTRICT

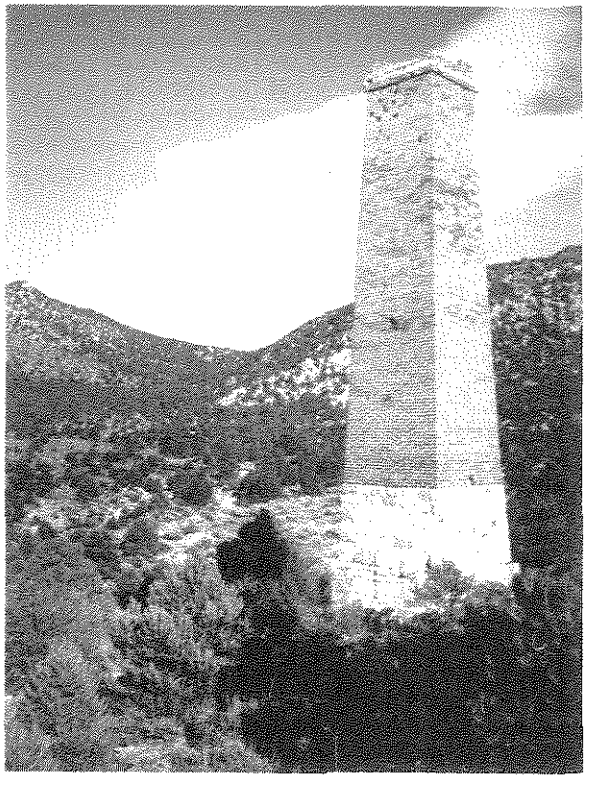
The Pahranagat district, Lincoln County, is located in the Mount Irish Range some 50 miles west of Caliente and about 10 miles northwest of the settlement of Hiko in upper Pahranagat Valley. The mines in the district are located along Silver Canyon east of Mount Irish, high in the central part of the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

district (Stretch, 1867, p. 64) uses the name *Pahranagat* for the district. Wheeler (1872, p. 42–44), however, referred to the area as the Pahranagat Lake district. That name appears on mineral survey plats prepared between 1882 and 1923 (Bureau of Land Management records, Reno State Office), but apparently was not accepted into common use.

According to Stretch (1867, p. 64), the Pahranagat district was established in March 1865 by a group from "Panacker City," Utah. The camp was deserted for a time later that year but, in 1866, 100–200 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 five-stamp mill was erected at Hiko, another was built at Crescent, and a ten-stamp mill was under consideration (Browne, 1868, p. 427–428). By 1868, the mill at Hiko was equipped with ten stamps and five roasting furnaces, and the List mill, at Crescent (Hetfield's) Spring, had ten stamps and four roasting furnaces (White, 1869, p. 84). Raymond (1870, p. 194–201) estimated that, by 1868, nearly $1 million had been spent in the district, but only $20,000 in bullion had been shipped; Raymond estimated bullion production in 1869 did not exceed $80,000. Active operations were suspended in 1871 and, by 1881, only ten miners were at work in the district (Angel, 1881, p. 485). Couch and Carpenter (1943, p. 84-85) recorded small amounts of production from the district for most years between 1881 and 1899, and for 1912, 1939, and 1940; total recorded production through 1943 is, however, only $61,022—less than Raymond's estimate for 1869 alone.

In 1950 mining began in 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 worth of manganese was produced from the Pahranagat district.

Total metal production from the Pahranagat district from 1867 through 1957 is estimated 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).

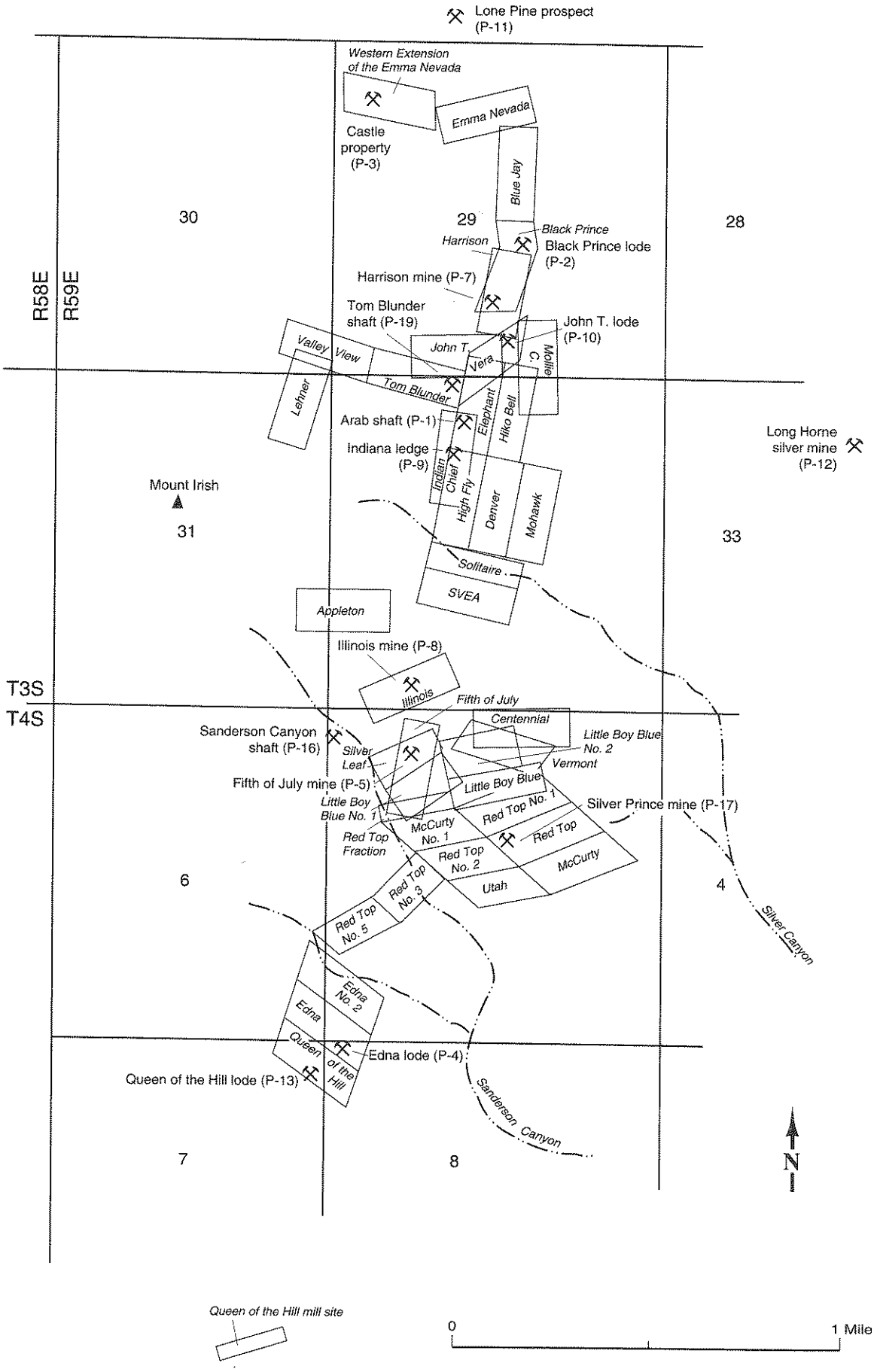


Smelter stack at the site of the List mill, Crescent (Hetfield's) Spring, Pahranagat mining district.

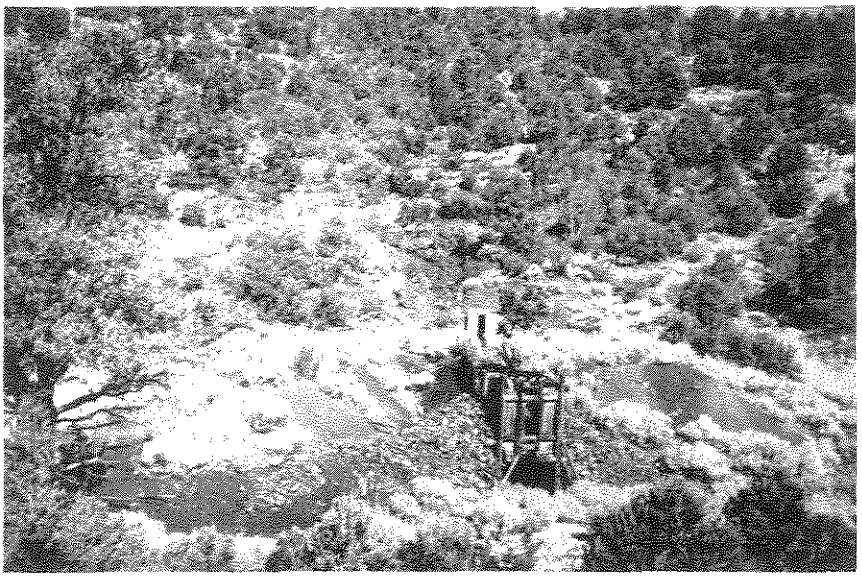
When the government buying program ended, manganese mining ceased and the district has been quiet, except for occasional prospecting, until the present time. In 1987, a large claim block was staked in the southern part of Silver Canyon and limited surface exploration was done in that area. In the spring 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.

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 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 upper plate of this thrust sheet (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

Angular breccia composed fragments of Eureka quartzite (white) in a matrix of manganese and iron oxides (black), Black Prince claim, Pahranagat mining district.



Locations of patented claims, mines, and prospects in the central part of the Pahranagat mining district.



Ore bin and dumps, South Paw manganese mine, northern Pahranagat mining district. The main mine workings open into the draw beyond the small structure.

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.

In the central part of the Pahranagat district, historic properties such as the Illinois and Indiana mines, as well as the more recently worked Harrison mine, 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 copper-oxide 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 orebodies formed along bedding plane faults near the contact between dolomite and the underlying Eureka Quartzite. Jasperoid outcrops near the manganese mine also contain manganese, but they were originally prospected for silver.

Arab shaft (P-1)

Commodity: silver
Location: sec. 32, T3S, R59E
UTM 4167990N 642620E
Production: unknown
History: White (1869) described the Arab shaft to be 160 feet deep, with workings connecting with the Indiana ledge to the west.
Development: Old workings consist of a vertical shaft, 160 feet deep, timbered at collar with hewn, round timbers.
Geology: A fault zone exposed east of the shaft strikes N10°W and dips steeply to the west; a quartz vein along this structure contains green copper oxides formed after tetrahedrite and is stained black with manganese oxides. The vein continues to the northwest and crops out on the slope below the shaft in several places. Where best exposed, in the canyon bottom to the north, the vein strikes N10°W, dips 65°SW, and is about 6 feet wide. At this point, the vein is copper stained, and contains clots of gossan and some tetrahedrite. Limestone in the hanging wall of the vein is brecciated, silicified, and contains manganese oxides and iron oxides. Yellow oxide minerals coat fractures in the vein and wall rock. North of the canyon, the structure can be traced up the hill slope and is marked by old pits and trenches.
Source of information: White (1869, p. 83–84)
Field examination: J. V. Tingley, 1988

Black Prince lode (P-2)

Other name: Cocomongo(?)
Commodities: silver, manganese
Location: sec. 29, T3S, R59E
UTM 4168640N 642950E
Production: unknown
History: The Black Prince lode claim was located on April 20, 1888, and surveyed for patent April and May 1905.
Development: One 6-foot by 6-foot by 4-foot-deep prospect pit was found on the property.
Geology: The old prospect pit was sunk on a jasperoid-manganese-oxide gossan lens formed along bedding in limestone. The replacement horizon is about 6 feet thick; bedding strikes north-south,and dips west. A shear zone follows the strike of the limestone bedding, but dips 85°W; the replacement zone is related to this structure. Pyrolusite crystals and clear quartz crystals coat vugs and fracture surfaces in the manganese-oxide-rich jasperoid.

Remarks: The Cocomongo claim, mentioned by Raymond (1870), may have been in this area; the Cocomongo was described as being part of the Hyko lode which also included the Illinois and Indiana claims, south of the Black Prince, and the Yellow claim, thought to be north of the Black Prince.
Field examination: J. V. Tingley, 1987

Castle property (P-3)
Other name: Western Extension of the Emma Nevada claim
Commodity: silver
Location: sec. 29, T3S, R59E
UTM 4169330N 642210E
Production: unknown
History: unknown
Development: Old pit, 10 feet by 10 feet by 6 feet deep; and an old, slightly inclined prospect drift about 20 feet deep; another 6-foot by 6-foot by 4-foot-deep cut was found about 100 feet to the southwest.
Geology: The main pit and drift expose a N70°E-striking, nearly vertical zone of silicification and jasperoid; the ledge appears to have been a lens of quartzite in the predominantly limestone section that was silicified. The lens contains clots and films of manganese oxides; vugs have stubby quartz crystals in them and fine-grained quartz crystals coat fracture surfaces. There are no signs of lead or silver minerals. The wall rock is gray-black, fossiliferous limestone which is locally brecciated and recemented by white calcite; bedding strikes east-west, and is vertical where seen in outcrops to the east of the pit.
Remarks: These old workings are the only ones found in the area thought to be within the Castle property (Emma Nevada, Western Extension of the Emma Nevada, and Blue Jay claims); the workings may be on the Western Extension of the Emma Nevada claim.
Field examination: J. V. Tingley, 1990

Edna lode (P-4)
Commodity: silver
Location: sec. 8, T4S, R59E
UTM 4164760N 642080E
Production: unknown
History: The Edna lode was staked January 1, 1892 and the Edna No. 2 was staked January 20, 1902; these two claims, plus the adjoining Queen of the Hill, were surveyed for patent in May 1905.
Development: An inclined shaft, approximately 50 feet deep, and, about 400 feet to the northeast, a N25°W-trending adit driven from the western face of a wash; the adit dump is quite large. There are small cuts along the hill slope between the two workings and other workings extending to the southwest, toward the Queen of the Hills lode claim.
Geology: At the inclined shaft, a 2- to 3-foot-thick replacement horizon is exposed within in a N65°W striking, 25°NE-dipping limestone. The zone is composed of siliceous gossan—a quartz replacement containing boxworks with iron- and copper-oxide minerals. The quartz is vuggy and displays cockscomb structure; clots of galena rimmed with anglesite occur in the vein-like structure along with acicular quartz crystals, massive hematite-limonite and some manganese oxides lenses. At the large adit to the northeast, most of the dump is composed of tan to white, bleached, silicated limestone; very little mineralization can been seen on the dump, and the mineral zone apparently does not outcrop here. Limestone outcrops strike N25°W and dip 85°SE to vertical.
Field examination: J. V. Tingley, 1990

Fifth of July mine (P-5)
Other names: Red Top Fraction, Silver Leaf, Little Boy Blue patents
Commodities: silver, lead
Location: sec. 5, T4S, R59E
UTM 4166220N 642420E
Production: unknown
History: The Fifth of July claim was surveyed for patent in June 1882.
Development: Four adits and numerous cuts located on the hill slope south of the Illinois mine.
Geology: The mine workings expose northeast-trending fault zones cutting silicified limestone; the fault zones strike N20°E, N60°E, and N80°E, and dip 65° to 85°NW. Individual zones are 1 to 4 feet thick, and quartz veins occurring within them are from 2 to 4 inches thick. The veins contain spots of dark sulfides and display some copper- and iron-oxide staining. The main stope follows a manganese-oxide-rich lens that formed along bedding in the limestone; the lens strikes N30°W and dips 40°NE. Mining has followed this zone for about 30 feet along strike and down dip.
Remarks: The Fifth of July claim is overlapped by the Red Top Fraction, Silver Leaf, and Little Boy Blue claims; which were surveyed for patent in 1923.
Field examination: J. V. Tingley, 1987

Gentry prospect (P-6)
Other names: Irish Mountain manganese deposits, Brownlow prospect, Yellow mine
Commodity: manganese
Location: sec. 20, T3S, R59E
UTM 4170240N 642560E
Production: unknown
History: White (1869) described a "Yellow mine" located at the head of Dedric's Canyon, 2 miles north of Silver Canyon; this could have been an early name for the Gentry prospect.
Development: One or possibly two old adits, along with considerable bulldozer work, occur in this area. The adits probably date from the 1860s, but the bulldozer work was probably done in the 1950s when the district was explored for manganese.
Geology: A manganese-oxide-rich lens of jasperoid occurs along bedding in dark gray, thin-bedded limestone. The limestone is silicified and only minor amounts of iron oxide are present. The replacement lens lies exposed along the upper part of a north-facing slope, strikes about N30°W, and dips 50°SW.
Remarks: No old dumps were noted in the area. Possibly they contained enough manganese oxides to have been shipped as manganese ore when the nearby South Paw manganese mine was operating. This prospect may be the Gentry property described by Tschanz and Pampeyan (1970). A sample taken at the Gentry property by the U.S. Bureau of Mines in 1941, over a 5-foot width, assayed 10% manganese, 3.08% iron, 0.036% phosphorus, and 36.82% insoluble.
Source of information: U.S. Bureau of Mines (1941); White (1869, p. 84)
Field examination: J. V. Tingley, 1987

Harrison mine (P-7)
Other names: Chimney claim(?), Hyko lode
Commodities: silver, lead

Location: sec. 29, T3S, R59E
UTM 4168380N 642780E
Production: small
History: Harrison lode claim was located June 11, 1889, and surveyed for patent in September 1889. The most recent work on the property appears to have been in the 1940s or 1950s.
Development: Workings consist of a shaft, now caved. A tram formerly transported ore from the shaft downslope to loading facilities at the canyon bottom. No equipment remains on the property.
Geology: Mine workings expose a silicified replacement zone in limestone formed at or just below the contact of the limestone with an overlying, massive, white quartzite unit. The strike of the zone is approximately N60°W, with a dip of 20°–30°SW. Beginning from the lowest exposures, the gray limestone grades upward into a zone laced with white quartz containing vugs filled with manganese oxides, then into a jasperoid zone. The jasperoid zone is 15 to 20 feet thick; gossan zones in the jasperoid contain manganese and iron oxides, black calcite, and display minor copper-oxide staining. Cerussite crystals occur in a few of the vugs in the jasperoid.
Remarks: This may be the Chimney claim mentioned in Raymond (1870) and described as being part of the Hyko lode, lying north of the Illinois mine.
Source of information: Raymond (1870, p. 197)
Field examination: J. V. Tingley, 1987

Illinois mine (P-8)
Other names: Monmouth, Centennial, Hyko lode
Commodities: silver, lead
Location: sec. 32, R3S, R59E
UTM 4166620N 642480E
Production: moderate
History: The Illinois is one of the earliest mines to be operated in the district. Early operations were by the Valley Mill and Mining Co., and ore was treated in the mill at Hiko.
Development: Mine workings extend from top of ridge to the canyon floor, adits were driven on at least three parallel zones within a wide structure.
Geology: Workings follow a wide, N15°–20°E-striking, 50°NW-dipping shear zone in silicified limestone. Cross structures exposed at the surface strike N60°W and dip 60°SW. Thin bands of manganese- and iron-oxide-rich gossan occur on fracture surfaces within both zones. The major shear zone is 300 to 450 feet wide and contains several parallel structures; it is cut by a N70°E-trending vertical fault. Open stopes follow the major shear trend to the northeast and southwest along its strike. Bulldozer cuts east of the old workings expose lenticular zones of quartz-calcite veining along bedding in the limestone within the wide shear zone; these lenses are up to 6 inches thick and are stained with manganese oxide and iron oxide. Vein quartz collected from the dumps at this site contains clots of black sulfides; vugs contain cerussite, some anglesite, along with copper- and iron-oxide minerals.
Remarks: Bulldozer work during past year was noted when the mine was examined in 1987. The Monmouth mine was described by White (1869) as being located on a spur of the hill east of the Illinois mine.
Source of information: White (1869, p. 82–83)
Field examination: J. V. Tingley, 1987

Indiana ledge (P-9)
Other name: Hyko lode
Commodity: silver
Location: sec. 32, T3S, R59E
UTM 4167660N 642620E
Production: At least 40 tons of ore was produced in 1868.
History: White (1869) reported that the mine was active in 1868 and had shipped 40 tons of "good ore."
Development: Workings in the area consist of a large open cut with an adit extending to the northeast beyond it. A vertical shaft extends down at the mouth of the adit making access into the adit impossible. Other small cuts and prospect adits are on the hill slope above and below the main adit.
Geology: The workings follow a N10°E-striking, 70°NW-dipping fault that cuts silicified limestone. The limestone is iron-oxide stained and laced with quartz veining along the trend of the main structure. The vein is stained with yellow oxides and contains clots of iron and manganese oxides as well as spots of copper oxides.
Remarks: White (1869) reported that these workings connect with the Arab shaft, and described the Indiana as extending for about 4,000 feet along the south slopes of Peter's Hill.
Source of information: White (1869, p. 83)
Field examination: J. V. Tingley, 1988

John T. lode (P-10)
Other names: Harrison claim, John T. claim, Vera claim, Hyko lode
Commodities: silver, lead, manganese
Location: sec. 29, T3S, R59E
UTM 4168170N 642870E
Production: unknown
History: The John T. lode claim was located January 6, 1886, and surveyed for patent in November 1887.
Development: Workings seen in the area consisted of a cut and a northwest-trending drift, now caved.
Geology: The old workings explored a jasperoid and a manganese- and iron-oxide-rich gossan zone in silicified limestone; the zone strikes N20°E, dips 40°NW, and is about 30 feet thick. A quartzite horizon above the jasperoid-gossan zone is sheared and recemented with quartz and manganese and iron oxides. The quartzite is brecciated and sheared along N20°E, N70°W, and north-south structures.
Remarks: These workings are very old; large-diameter trees are growing on the dump. The manganese-oxide-rich zone extends for a long distance along the eastern crest of the ridge extending north from Silver Canyon. The hill to the west may be what was known as Peter's Hill in the 1867 State Mineralogist's report. This property may be the Soledad claim, mentioned in Raymond (1870) as being part of the Hyko lode, possibly being located north of the Illinois mine.
Source of information: Raymond (1870, p. 197)
Field examination: J. V. Tingley, 1987

Lone Pine prospect (P-11)
Commodities: silver, manganese
Location: sec. 20, T3S, R59E
UTM 4169740N 642580E
Production: unknown
History: The Lone Pine lode claim was staked in 1950 and again in 1953 by Hubert Welch of Caliente, Nevada.
Development: Major workings consist of a southwest-trending adit, 30 feet long, and cuts on the hill slope to north and south of the adit.
Geology: The lode is a massive manganese-oxide replacement of limestone; the zone contains jasperoid

and silica boxworks. The adit follows a N30°–50°E-striking, southeast-dipping shear zone which may reflect bedding. A north-striking, 50°W-dipping structure cuts the jasperoid outcrop west of the adit portal. Some pyrite is contained in clots of pyrolusite, and clear crystals (possibly cerussite) coat vugs in the jasperoid.

Remarks: The adit looks old, but the cuts probably date from 1950s period of activity. A location notice found south of the workings describes this property as being located at the head of Timber Canyon, about 1,000 feet north of Castle's patented claims, and about 2,000 feet north of the Black Prince mine.

Field examination: J. V. Tingley, 1987

Long Horne silver mine (P-12)

Commodities: silver, lead

Location: sec. 33, T3S, R59E
UTM 4167740N 644580E

Production: unknown

Development: Workings consist of two shafts, about 100 feet apart, and a series of pits between the shafts. The western shaft is 20 feet deep and the eastern shaft is 30 feet deep; the 30-foot shaft has a drift extending from the shaft bottom.

Geology: The pits and shafts expose a N65°E-striking, nearly vertical shear structure that cuts thin-bedded, gray limestone; the limestone is in contact with blocky, white quartzite which crops out downslope from the shafts. The limestone strikes N65°E and dips 50°–60°NW, and is silicified in the walls of the structure. The shear zone is about 3 feet wide and contains clots and dendrites of manganese oxide and clots of iron oxide; an apple-green oxide mineral and a sooty black mineral (possibly silver sulfide) coat fracture surfaces along the shear. Brecciated limestone along the structure is cemented with dark quartz and some black calcite. The mine workings are entirely within the limestone.

Field examination: J. V. Tingley, 1987

Queen of the Hill lode (P-13)

Commodities: silver, lead

Location: sec. 7, T4S, R59E
UTM 4164670N 641930E

Production: unknown

History: The Queen of the Hill lode was located January 1, 1887 and, along with the adjacent Edna and Edna No. 2 lodes, was surveyed for patent in May 1905.

Development: Several prospect pits and cuts were seen within the area of these claims.

Geology: The prospect pits expose a N55°W-striking, 70°NE-dipping fault zone cutting medium- to thin-bedded gray limestone; limestone bedding strikes N50°W and dips 10°SW. A quartz vein, up to 2 feet thick, occupies the fault zone. The vein is banded with manganese oxide, contains black sulfide points, and displays minor copper-oxide staining; vugs in the vein are lined with calcite, cerussite and, possibly, minor anglesite.

Remarks: There are three patented claims in this area: Queen of the Hill, Edna, and Edna No. 2. These workings are probably on the Queen of the Hill claim. Many other small pits and prospect shafts are found in the low hills southeast of the Queen of the Hill lode, and two fairly prominent workings are found to the northeast; the northeastern workings are probably on the Edna claims.

Field examination: J. V. Tingley, 1987

Rosey #3 lode claim (P-14)

Commodity: silver

Location: sec. 1, T4S, R58E
UTM 4165680N 639470E

Production: unknown

History: Staked by Rosario Arcuri, December 19, 1925.

Development: Prospect shaft, inclined at 80° and estimated to be 50 to 60 feet deep; the shaft collar, constructed of round timber is now mainly fallen away. Ladders, also constructed with round timber, are visible a set below the collar. The timbering probably dates from 1920s to 1930s activity.

Geology: The shaft was sunk on a N65°W-striking, 80°NW-dipping replacement lens formed along a fault zone. The wall rock is a slightly bleached, marbleized gray limestone. Rock on the dump is silicified limestone containing clots of limonitic gossan and some green copper-oxide minerals (including malachite and chrysocolla). The wall rock is flooded and stained with limonite. Limestone bedding strikes N65°W and displays a flat to gentle southeastern dip.

Remarks: The entire area, including this old claim site, is now included within the large C.I.M. claim block, staked May 11, 1990 by Walker Lane Joint Venture (BHP-Utah International).

Field examination: J. V. Tingley, 1990

Rosey mine (P-15)

Other names: Rosie mine, Tate property, Rosario Arcuri mine, List mine, Moonshiner claim, Crescent mine(?)

Commodities: silver, lead

Location: sec. 1,2, T4S, R58E
UTM 4165760N 639700E

Production: In 1867, ore milled at $80 per ton; in 1868, 50 tons yielded $1,920 in silver. The Alameda and Crescent Mining Co. had extracted about $20,000 of bullion by 1868.

History: This mine is one of the oldest in the district; the property was worked in 1867 and 1868, and ore was milled at the Crescent mill on the west side of the district. Rosario Arcuri staked lode claims to the south of the main workings in December 1925.

Development: Several shafts, adits, and open stopes are visible at the property. Buildings, but no equipment, remain at the adit portal.

Geology: Open stopes follow a N60°W-striking, vertical fault zone that cuts silicified limestone. The fault zone is occupied by a quartz vein containing clots of galena, tetrahedrite(?), azurite, malachite, and points of manganese oxide. The fault zone is 3 to 6 feet wide and is exposed for several hundred feet along strike. Wall rock in the mine area is thin-bedded limestone striking N80°W and dipping 15°–20°NE. Mineralized structures, striking N40°W and N15°W with dips ranging from vertical to 70°SW, are exposed in old shafts across the canyon to the northwest of the adit; these workings explore gossan zones formed along bedding where the steeply dipping structures crosscut the limestone.

Remarks: The Ulrich Dahlgren mine (Browne, 1868, p. 427; Raymond, 1869, p. 114) may have been located adjacent to this property.

Source of information: White (1869, p. 81)

Field examination: J. V. Tingley, 1987

Sanderson Canyon shaft (P-16)

Commodities: silver, lead

Location: sec. 5, T4S, R59E
UTM 4166270N 642080E

Production: unknown
Development: Workings consist of a vertical shaft, 50 to 60 feet deep, and several cuts.
Geology: The shaft was sunk on a N65°E-striking, 85°SE-dipping shear zone in limestone; the shear is 4 to 6 feet wide, as exposed at the shaft collar. A silicified zone along the shear structure contains manganese- and iron-oxide gossan and displays minor copper-oxide staining. The limestone wall rock strikes N50°W, and dips 5°NE; the rock is flaggy and is webbed with quartz and calcite veins.
Remarks: The shaft is located in upper Sanderson Canyon, east of the inferred position of the Fifth of July mine.
Field examination: J. V. Tingley, 1987

Silver Prince mine (P-17)
Other names: Gilman/Webster property; Red Top claims
Commodities: silver, lead
Location: sec. 5, T4S, R59E
UTM 4165760N 642900E
Production: small
History: This claim group was located in 1917 and 1920 and was surveyed for patent in March 1923; the claims were owned at that time by the Silver Prince Consolidated Mining and Smelting Co.
Development: Workings consist of a shaft, caved at its collar, and open stopes extending for about 700 feet to the northeast of the shaft.
Geology: The old mine workings expose a N65°E, near-vertical fault zone that cuts gray limestone. The limestone is marbleized and laced with hairline calcite and quartz veinlets. Numerous other mineralized fractures, parallel to the main structure, also cut the limestone in the shaft area. These other fractures range from hairline up to 4 feet thick. Veins within the structures are composed of white quartz and calcite stained by manganese, iron, and copper oxides. The main vein, exposed in the open stopes, is about 4 feet thick and dips 85°SE. This vein has a 1- to 3-inch-thick silicified zone on its footwall, a 1-foot-thick iron-oxide-stained zone on its hanging wall, and contains cerussite as fracture coatings and vug fillings in breccia along its footwall.
Remarks: The main workings are located on the Red Top patented claim; adjacent claims are the McCurty and Utah claims. The Little Boy Blue, Vermont, Centennial, and Silver Leaf patented claims lie to the north.
Field examination: J. V. Tingley, 1987

South Paw mine (P-18)
Other name: Steward-Bush property
Commodity: manganese
Location: sec. 19,20, T3S, R59E
UTM 4170680N 642240E
Production: Recorded production at this property is $630,000 between 1950 and 1958.
History: The property was originally prospected for silver in the 1860s. Manganese production began in 1950 and ore was shipped to the U.S. Government stockpile; no production is recorded after 1958.
Development: Old cuts and adits on the east side of the canyon are attributed to the 1860s silver activity. Manganese workings on the west side of the canyon consist of numerous cuts, an open pit, an inclined shaft collared from a drift opening into the pit, and drifts and stopes connected to the shaft. An ore bin remains at the surface. Two old buildings dating from the 1950s-era camp also remain. The mine workings are open, and appear to be accessible.
Geology: Old silver workings on the east side of the canyon explore a N50°E-striking, 60°SE-dipping jasperoid lens formed along bedding in silicified limestone; the jasperoid contains heavy concentrations of manganese oxide and is flooded with silica. Clear quartz crystals line vugs in the jasperoid. At the South Paw manganese mine, on the west side of the canyon, manganese deposits have formed as bedding replacement deposits and as replacement mineralization along fault zones that cut bedding in Ordovician Ely Springs dolomite immediately above its contact with underlying Ordovician Eureka Quartzite. Limestone bedding exposed in the open pit strikes east-west and dips about 30°N. The major structure exposed in the pit is a N45°W-striking, 75°NE-dipping fault that cuts the west wall. The adit on the south side of the open cut bears S60°W; at about 30 feet from the portal, an underground shaft has been sunk on a band of manganese oxides formed along a steeply dipping fault zone. At the drift level, the fault strikes N80°W and dips 75°SW; the fault, however, rolls to the southeast below the shaft collar and flattens with depth. Mining has followed the structure down-dip at least 100 feet. The band of manganese oxide in this structure is only 1 to 2 inches thick at the shaft collar.
Source of information: Tschanz and Pampeyan (1970, p. 152)
Field examination: J. V. Tingley, 1987

Tom Blunder shaft (P-19)
Other name: Hiko Bell Mining & Milling Co. property
Commodities: silver, lead
Location: sec. 32, T3S, R59E
UTM 4168000N 642620E
Production: unknown
History: The Tom Blunder lode was located January 1, 1896, amended May 20, 1905, and patented June 15, 1913.
Development: Inclined shaft, sunk at -25°, N20°E; the shaft is lagged over at a depth of about 30 feet, but some timber is missing. The shaft appears to be open below this point for at least an additional 100 feet; a large chamber has been excavated above the point of slope change, possibly stoping or a space for hoisting equipment.
Geology: The shaft follows an east-striking, 25°N-dipping replacement zone of sugary, ribbon-like quartz veining about 3 feet thick that follows bedding in limestone. Vein-replacement material contains clots of limonite and some galena. Limestone in the footwall of the zone is brownish black, and medium bedded; the hanging wall limestone is lighter in color, but may be the same formation that has been bleached. Thin bands of green copper-oxide staining occur along the replacement horizon. Some cockscomb structure can be seen in the replacement horizon, along with layers of galena, some cerussite, and hematite-after-pyrite pseudomorphs. A major shear structure can be seen to cut both quartzite and limestone where exposed in the steep ledges above the shaft. The structure strikes N20°–30°E, dips 75°–80°SE, and crops out as a massive ledge of quartz-cemented breccia. Manganese oxide occurs in the breccia matrix on the east side of the zone, but no manganese oxide is seen on the west side. The breccia outcrop is about 1,500 to 2,000 feet wide. The Tom Blunder workings are in limestone below the breccia zone. Limestone in the slopes east and south of the shaft, toward the old drill tripod, displays silica webbing and is recrystallized.

Locally, lenses of gossan and irregular pods of quartz with boxworks and some clots of galena are present.

Remarks: Timbers at the collar of the deep shaft are hand-hewn and contain square nails. About 700 feet to the southeast, a north-trending adit is collared into the hillslope; the workings are probably extensive, but the collar is partially caved closed. The large dump on the south side of the canyon probably originated from this adit, and the adit workings may have connected with the bottom of the Tom Blunder shaft. The adit is probably located on the Elephant patented claim.

Field examination: J. V. Tingley, 1990

QUEEN CITY MINING DISTRICT

The Queen City mining district is in the low hills on the southwest end of the Quinn Canyon Range, near the eastern border of Nye County. The mines and prospects in the district are located north and south of State Highway 375 in the vicinity of Queen City Summit.

Mercury was discovered in this area in 1929 by J. Mellan, and about 80 flasks of mercury were produced, mainly from the Black Hawk mine, between 1930 and the late 1960s (Bailey and others, in prep.). Claims were staked on manganese occurrences south of Queen City Summit in 1935. Extensive trenching was done in the area, but no manganese production is reported (Cornwall, 1972, p. 40). In 1938 silver-mercury deposits were prospected at the Oswald mine, located outside of the quadrangle to the west, and about 14 flasks of mercury are reported to have been produced from the property (Bailey and others, in prep). In 1983, a large part of the district was staked as a disseminated gold target, and considerable exploration drilling was done (Tingley, 1984, p. BH-1). Exploration for precious metals has continued intermittently in the area and most of the eastern part of the district, in the vicinity of the old mercury mines, was restaked in early 1990 by Kennecott Exploration Co.

Paleozoic sedimentary rocks crop out on the west side of Queen City Summit, and underlie the western portion of the district. These rocks consist of limestone of the Cambrian Nopah Formation which is overlain on the east near the summit by quartzitic sandstone. East of the Paleozoic outcrops, the remainder of the district is underlain by rhyolitic ash-flow tuffs of Pliocene age (Cornwall, 1972, pl. 1). The volcanic rocks may be outflow units related to the postulated Quinn Canyon volcanic center, about 25 miles to the northeast in the Quinn Canyon Range (Stewart and Carlson, 1976; Kleinhampl and Ziony, 1985, p. 146–147), or they may have originated in an unnamed volcanic center immediately northeast of the district. The presence of this center could be indicated by a group of magnetic higns depicted on the magnetic anomaly map of the area (Hildenbrand and Kucks, 1988).

Mineral occurrences in the Queen City district are found in both Paleozoic carbonate rocks and Tertiary volcanic units. At the Black Hawk and Fallini mercury deposits, mineralization occurs associated with pipe-like, silicified quartz-breccia/jasperoid bodies formed along steep structures cutting Paleozoic rocks. At the Fallini property, blocks of tuff occur in the breccia and, in places, tuff forms the breccia matrix. The steep structures may parallel the axis of a northeast-trending anticlinal structure which has deformed the Paleozoic rocks. North of the highway at Queen City Summit, these silicified structures generally strike north-south and follow the eastern front of the range. Further north, however, east of the Black Hawk mine, the structures assume a northeasterly strike. In places, parallel faults and fractures widen the zone; locally, silica replacement extends into the limestone up-dip from intersections with steep fractures, and forms extensive masses of iron-oxide-stained jasperoid that appear to cap the east-dipping face of the range. South of the highway, the structures curve to the southeast and possibly extend into the Queen City property where a lenticular replacement deposit of manganese, associated with garnet and other silicate minerals, occurs in Paleozoic rocks along a prominent N55°E-striking shear zone. Mercury mineralization at the Redwing prospect, on the east edge of the district, occurs along a steep fault zone cutting silicified, welded ash-flow tuff. Blocks of silicified, veined quartzite occur, along with other lithic fragments, in the tuff unit.

Black Hawk mine (QCi-1)

Other names: Mellan mine, Mellan and Reid mine, Mercury claims, Producer claim, Red Mercury claims, Little Mercury claims, Red Dog claims(?)

Commodity: mercury

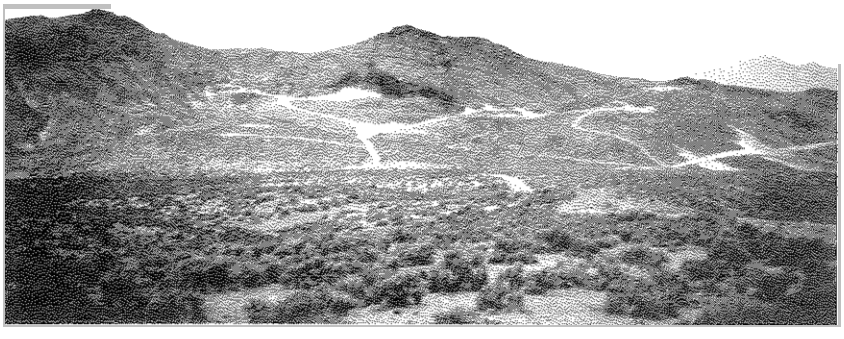
Location: sec. 13, T2S, R53E
UTM 4180860N 591120E

Production: 80 flasks mercury, 1929 to 1956

History: Originally located in 1929 by J. Mellan, the property had major production from 1930 through 1935. The mine was active 1936–1943, 1955–1957, and possibly in the 1960s.

Development: Workings consist of a 100-foot, vertical shaft sunk in the saddle at the crest of the low range of hills, an upper adit that connects with some stopes and the shaft, an adit driven west from the canyon below for 115 feet into the hill, and several prospect pits. The remains of pipe retort can be seen in the canyon east of the adit. The amount of burned rock at the retort site indicates that this property was probably the largest producer in the district.

Geology: The shaft is collared in medium-bedded, gray limestone of the Cambrian Windfall Formation that strikes N70°E and dips 25°NW. A pipe-like, silicified



Black Hawk mine area, northern Queen City mining district. Black Hawk workings are in the canyon on the left, and extend to the saddle on the skyline; the Fallini property is beyond the low ridge at the extreme right of the photo. The rugged, dark patches along the ridge and in the central foreground are outcrops of iron-oxide-stained jasperoid breccia

quartz breccia-jasperoid body crops out north of the shaft. The quartz-cemented breccia is vuggy, and clear euhedral quartz crystals line the vugs. Cinnabar, along with some limonite and jarosite, is present as thin coatings on fracture surfaces, as globules in vugs, and as minute crystals in silicified limestone and quartz veins. The breccia-jasperoid mass contains slickensided surfaces that strike N40°E and dip 70°SW, or strike north and dip 70°W. At the shaft, the breccia is 10 to 15 feet wide and extends about 100 feet north. More breccia cropping out north of the shaft trends N25°E, then appears to curve to the east to assume a strike of N50°–60°E. Several other similar breccia masses can be seen capping the low hills to the northeast, in the vicinity of the Fallini property. Along the ridge extending east from the Black Hawk workings, the limestone strike changes to N75°W with a 20°NE dip, then to N35°W with a 30°NE dip, indicating that the carbonate rocks are folded into an anticline with a northeast axial trace; the breccia lenses all follow a N10°–20°E strike, and may be following shearing parallel to the axis of the anticline. The easternmost outcrops of breccia are composed of silicified limestone, quartzite, and jasperoid fragments in a matrix of rhyolite tuff. The rhyolite is fine grained, contains smoky quartz phenocrysts, and is altered. In this area, the prominent fractures trend N45°E and dip 75°NW. Both the Black Hawk workings, and the Fallini workings to the north, appear to occur in fractured rock along the anticlinal axis.

Remarks: The silicified breccias appear to have formed along steep, northeast-trending anticlinal structures; most of the silicified rock appears to originally have been quartzite that was brecciated then silicified. Below the silicified outcrops, where the steep structures can be seen cutting carbonate rocks, they are not pronounced and appear to dissipate into a network of interconnected fractures.

Source of information: Bailey and Phoenix (1944, p. 154–155); Bailey and others (in prep.); Kral (1951, p. 92); Cornwall (1972, p. 39); Norberg (1977, p. 73)

Field examination: J. V. Tingley, 1988

End of Trail #2 claim (QCi-2)

Other name: Queen City claims

Commodities: gold, mercury(?)

Location: sec. 26, T2S, R53E
UTM 4177670N 590260E

Production: none

Development: 4-foot by 4-foot by 6-foot-deep prospect pit

Geology: The prospect pit exposes a N60°E-striking, 70°SE-dipping shear zone cutting kaolinized latite. The shear zone is cemented with clear quartz and open spaces are lined with amber-stained, acicular quartz crystals. Brick-red hematite and cinnamon-brown limonite films coat fracture surfaces within the shear zone. The latite host-rock strikes northwest and dips about 10°W; iron-oxide films also coat joint and fracture surfaces in the wall rocks.

Field examination: J. V. Tingley, 1989

Fallini property (QCi-3)

Other names: Mercurey claims; Mercury No. 2, Deep Mine, Sun, Red Hill, Red Nugget, and Producer claims

Commodity: mercury

Location: sec. 13, T2S, R53E
UTM 4181540N 591300E

Production: small

History: This property was probably active about the same time as the nearby Black Hawk mine.

Development: Mine workings consist of an east-trending adit connecting with a stope that opens to surface, and a second, short adit near the top of the hill. The remains of a 2-pipe retort were found in the wash north of the mine, but no evidence of any burned rock was seen to indicate that mercury ore had been treated in the retort.

Geology: The adit cuts a breccia mass in limestone; the breccia is silicified and vuggy, and the vugs are filled with soft limonite. The breccia appears to be pipe-like, and has formed in an area of fracture intersections within the enclosing limestone host. Cinnabar, along with jarosite, occurs in fractures that cut the breccia in a generally east-west direction. The limestone does not appear to be altered, but near the breccias it is laced with quartz veinlets. The veinlet surfaces are heavily coated with desert varnish.

The breccia mass southeast of the mine workings has tuff both as matrix and as brecciated fragments carried within the matrix. Limestone cropping out northwest of the mine strikes N60°–70°W and dips 20°NE; in this area, the limestone is overlain by what appears to be a brecciated, silicified quartzite unit. This is the only place seen in the district where the silicified unit appears to be a bedded unit rather than a steeply dipping silicified lode. At the mine, the limestone strikes N20°E and dips 20°SE; this attitude does not define an anticlinal structure, as seen to the south at the Black Hawk mine, but may indicate rotation across steeply dipping, northeast-trending faults which are now generally occupied by the silicified lodes.

Remarks: Kral (1951) reported that cinnabar at this property occurred as nuggets in, and as coatings on, limestone and quartzite gravel in a limestone cave.

Source of information: Bailey and Phoenix (1944, p. 155); Kral (1951, p. 92); Bailey and others (in prep.)

Field examination: J. V. Tingley, 1988

Queen City manganese prospect (QCi-4)

Other names: Queen City claims; Queen City Mines claims

Commodity: manganese

Location: sec. 26, T2S, R53E
UTM 4178100N 589750E

Production: none

History: The Queen City claims were staked in 1935.

Development: Workings consist of at least five trenches, a long cut perpendicular to the trenches, and several small pits. The deepest trench is about 20 feet deep; two others have shallow adits and inclines leading from the trench bottoms. The trenches appear to have been dug with a cable-operated slusher bucket, and they are only about 4 feet wide at their bottoms; two deep, narrow trenches have timber stulls and resemble open stopes.

Geology: The workings expose vein-like replacement lenses of manganese oxide which have formed along N55°E-striking, near-vertical fractures and shears in limestone of the Cambrian Nopah Formation. At least five separate replacement zones are exposed over a width of about 200 feet; only about 100 feet of strike length is exposed in the pediment surface of the basin. The replacement zones are irregular and consist of up to 10 feet of crumbly, amorphous manganese oxides, fragments of white, black, and some red opaline quartz, calcite, and siderite. The vein mass appears to flow around large blocks of limestone with rounded, corroded surfaces. Some fragments of highly altered

Remains of a 2-pipe Rossi-type retort, Fallini property, northern Queen City mining district.

material in the shear zone may be volcanic rock, possibly indicating the presence of dikes along the shear zone. Strands of the veins interconnect with each other, and the area between veins is cut by parallel fractures with coatings of manganese oxide and quartz. The structural zone can be traced in marbleized limestone in both directions along strike. According to Hewett and others (1968), the principal minerals that make up the veins are gibbsite, lithiophorite, pyrolusite, and goethite, and the minor accessory minerals, barite, alunite, and opal. The limestone that hosts the veins shows sporadic alteration to garnet, idocrase, K-feldspar, prehnite, sericite, and quartz. The veins, as exposed in the trenches, display a crude zoning of the principal minerals. In the outer part of the principal vein, adjacent to the walls, pale-brown (iron-rich) gibbsite is the most abundant mineral and manganese oxide minerals are sparse. This zone merges inward to a zone that is 10 feet or more thick and composed largely of white gibbsite along with a mixture of gibbsite and lithiophorite; this zone contains patches of goethite but no pyrolusite. The central part of the principal vein is composed of several feet of nearly pure pyrolusite (Hewett and others, 1968).

Remarks: The manganese deposit has not been worked recently. The prospect is, however, within a large claim block currently (1989) being explored for precious metals.

Source of information: Cornwall (1972, p. 40); Hewett and others (1968, p. 360)

Field examination: J. V. Tingley, 1989

Queen City prospect 1 (QCi-5)

Other name: Queen City claims

Commodities: gold, mercury(?)

Location: sec. 25, T2S, R53E
UTM 4178345N 591625E

Production: none

History: Prospect workings appear to date from 1920s; recent claim staking activity is evident in the area.

Development: Workings consist of a vertical shaft, timbered with round logs, 20 feet deep, and 5 feet by 5 feet at the collar.

Geology: The shaft was sunk in medium- to coarse-grained quartz latite tuff on a N60°E-striking, near-vertical shear zone; zone is about 2 feet wide as exposed in the shaft. The wall rock is brecciated, kaolinized, and silicified along the structure. Fracture surfaces are coated with clots and films of cinnamon-brown and brick-red iron-oxide minerals; some films show purple diffraction-screen play of colors, falsely resembling bornite.

Remarks: This shaft is within the Queen City claim block.

Field examination: J. V. Tingley, 1989

Queen City prospect 2 (QCi-6)

Other name: Queen City claims

Commodities: gold, mercury(?)

Location: sec. 27, T2S, R53E
UTM 4176960N 588160E

Production: none

History: Timber-work at the shaft appears to date from the 1930s.

Development: Workings at this location consist of a 4-foot by 8-foot by 40-foot-deep shaft with a set of round timber at the collar, and two prospect pits.

Geology: A N75°E-striking, vertical, sheeted zone in rhyolite tuff is exposed in the shaft. The zone is about 4 feet wide and can be projected to connect with a similar exposure in a small pit about 50 feet southwest. White vein quartz with fish-scale texture (lammelar quartz-after-calcite) occurs along the zone. A white crystalline mineral, possibly barite, also occurs in open spaces along the shear zone. Some dark, fine-grained sulfide minerals are present. The wall rock is bleached, kaolinized, moderately silicified, and displays abundant iron-oxide staining. The vein-sheeted zone can be traced to the southwest for about 500 feet and there are two other workings (small cuts) on it in addition to the shaft; one 50 feet to the southwest, and another about 150 feet to the southwest. At this last exposure, the shear zone is about 8 feet wide and dips about 70°SW. There is abundant white, crystalline material in the shear zone here (barite?).

Field examination: J. V. Tingley, 1989

Queen City prospect 3 (QCi-7)

Other name: Queen City claims

Commodities: gold, mercury(?)

Location: sec. 25, T2S, R53E
UTM 4178200N 591195E

Timbered, open trench, Queen City manganese prospect, southern Queen City district. Trench follows replacement lens of manganese oxide (dark rock along the right side of photo) formed in limestone.

Production: none
Development: Workings at this location consist of an old 4-foot by 10-foot by 6-foot-deep prospect pit and a recently constructed drill site.
Geology: In the pit, bleached, kaolinized rhyolite tuff is cut by a N65°E-striking, near-vertical shear zone. The zone is about 3 feet wide and extends as a silicified rib in outcrop for about 100 feet northeast of the pit. Quartz vein material occurs along the shear and drusy, fine-grained quartz crystals coat fracture surfaces. The fractures and adjacent rock are flooded with iron oxide. Slickensided surfaces can be seen in clay along the shear zone. This shear zone-vein outcrop aligns with all others in this part of the district, and helps define a major districtwide structure.
Field examination: J. V. Tingley, 1989

Red Wing prospect (QCi-8)

Other names: Red Wing and Almaden claims; QCR claim, Beta claims
Commodity: mercury
Location: sec. 19, T2S, R54E
UTM 4179160N 592850E
Production: small
History: The remains of pipe retort and camp building foundations appear to be 1930s vintage.
Development: Workings consist of one inclined shaft, 45 feet deep, with workings at about 20 feet and at the bottom; underground workings are reported to total about 160 feet. The shaft is inclined 70°N and the underground workings trend east-west. The upper workings connect with a small stope which extends to surface east of the shaft. Cuts and trenches explore exposed structures to the east and west of the shaft.
Geology: Mine workings follow a N75°W- to N75°E-striking, near-vertical shear zone that intersects a generally north-south trending silicified rib in a welded ash-flow tuff. The east-west shear zone is about 6 feet wide and rock along it is brecciated and silicified. Vugs in the breccia are coated with clear quartz crystals which, in turn, are coated with hematite and limonite. Clots of cinnabar rest on the quartz crystals along with the iron oxide and some vugs contain sparse barite crystals. The ash-flow tuff contains lithic fragments (black shale and limestone), and blocks of quartzite were seen on the mine dump. In outcrop, the silicified rib extends along a N20°W strike for about 1,500 feet and, where other N50°–75°W-trending cross-fracture zones intersect it north of the mine, wider silicified knobs form along the main rib. Along with exotic quartzite blocks, the tuff contains blocks of earlier-formed tuff within it.
Remarks: This property is within a claim block staked in 1982–1983(?) by U.S. Minerals Exploration. Several shallow rotary holes have been drilled near the old shaft. In 1989 there were no signs of activity on the property but this property and the surrounding area, extending to the Black Hawk mine to the west, are included in the Beta claim block staked by Kennecott Exploration in April 1990.
Source of information: Holmes (1959, p. 1–5); Kral (1951, p. 92); Bailey and others (in prep.)
Field examination: J. V. Tingley, 1988, 1989

QUINN CANYON MINING DISTRICT

Since this district is mainly a fluorite district, it is described in the section on nonmetallic occurrences.

Crystal contact prospect (QCa-1)

Other names: Cotton Top claim, Quartz claim
Commodities: silver, lead(?)
Location: sec. 5, T1N, R56E
UTM 4204540N 613720E
Production: none
Development: Trenching with the blade of a small bulldozer constructed a prospect pit 6 feet by 20 feet by 2 feet deep.
Geology: A ledge of light gray, fossiliferous limestone is exposed in the pit. The limestone is covered by alluvium upslope and by caliche downslope; the limestone strikes N20°W and dips about 20°SW. A lens of black manganese-oxide-rich gossan and jasperoid is exposed beneath the outcropping limestone ledge. The gossan displays a white sulfate-like efflorescence and could be a lens of weathered skarn; skarn formation could be related to the contact of the nearby quartz breccia with Paleozoic carbonate rocks. Gossan specimens from the dump are rubbly, high in manganese oxide, and laced with clear silica veinlets.
Remarks: Early work on this prospect may have been in 1941 when the Cotton Top claim, a few hundred feet north, was staked. Fresh sample tags on the gossan outcrop indicate that the area has been sampled the past summer (1988).
Field examination: J. V. Tingley. 1989

SEAMAN RANGE MINING AREA

The Seaman Range lies between Coal Valley and White River Valley in Lincoln and Nye Counties. Most of the prospects in this area are located north of Timber Mountain, on the northern tip of the range. The two largest properties, the Red Head claims and the FNB claims, are north of the Timpahute Range Quadrangle, in Nye County, but recently, prospecting activity has extended south along the western border of the range into Lincoln County.

Very little mining activity is in evidence in the Seaman Range. The Red Head claims, on the west side of the range, have been held by the Davies family since 1939 and, during the 1940s and 1950s, 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 1920s or 1930s, but there has been no activity there for many years.

In 1955, Lincoln Uranium Co. was working on the Lucky Strike 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 1960s 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 1980s, and several large claim blocks were staked along the western edge of the range, south of the northern boundary of the Timpahute Range Quadrangle. 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.

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 about 45°W, and is apparently offset by several later faults (Tschanz and Pampeyan, 1970, p. 95). Most of the prospecting activity along the west side of the Seaman Range, within the Timpahute Range Quadrangle, has been carried out on large ledges of jasperoid which have formed in the carbonate rocks along these fault zones.

CV and Ora claims (S-1)

Other name: Lost Shepherd claims
Commodities: gold, silver
Location: sec. 33,34, T2N, R61E
UTM 4206200N 664400E
Production: none
Development: numerous pits and trenches
Geology: Silicified carbonate rocks (jasperoid bodies) crop out along a north-trending, prevolcanic normal fault that separates Mississippian from Devonian sedimentary rocks. Many of the jasperoid outcrops are brecciated and are stained with hematite and limonite; some areas display quartz veining and secondary calcite veining. Boxworks structures of jasperoid, chalcedony, and epidote were noted in some locations within the claim group. Some altered areas in black, fissile shale contain chalcedony and are capped by jasperoid. At one locality in section 33 minor amounts of chalcopyrite and bornite were reported present in rocks from a dump.
Remarks: The Lost Shepherd claims may overlap these claims from the west.
Source of information: Gese and Harris (1985, p. 50)

Lost Shepherd claims (S-2)

Other name: CV and Ora claims
Commodity: gold
Location: sec. 32, T2N, R61E
UTM 4206340N 662780E
Production: none
History: The earliest generation of claim posts seen in the property area is pre-1970 age; the present claim block was staked in July 1988.
Development: None; several location pits in the area were dug in alluvium, and date from the 1970-era claims.
Geology: Silicification and a wide jasper ledge occur along a N70°E-trending to east-trending shear zone in Mississippian Joana Limestone. The brick-red to cinnamon-brown, mottled, jasperoid mass is about 200 feet wide and extends for 300 to 400 feet along strike; it is laced with veins and veinlets of white and clear chalcedonic quartz. Open spaces in the jasperoid are lined with botryoidal chalcedony. The jasperoid has replaced limestone, and some shaly lenses and large lenses of dark green, unreplaced wall rock are included within it. The rock has undergone several periods of silicification and brecciation. The silicified zone extends to the east under alluvium and crops out again on the next hill slope to the east.
Remarks: The CV and Ora claims bound these claims to the east and northeast, and probably overlap them (the CV and Ora, however, may no longer be valid).
Field examination: J. V. Tingley, 1989

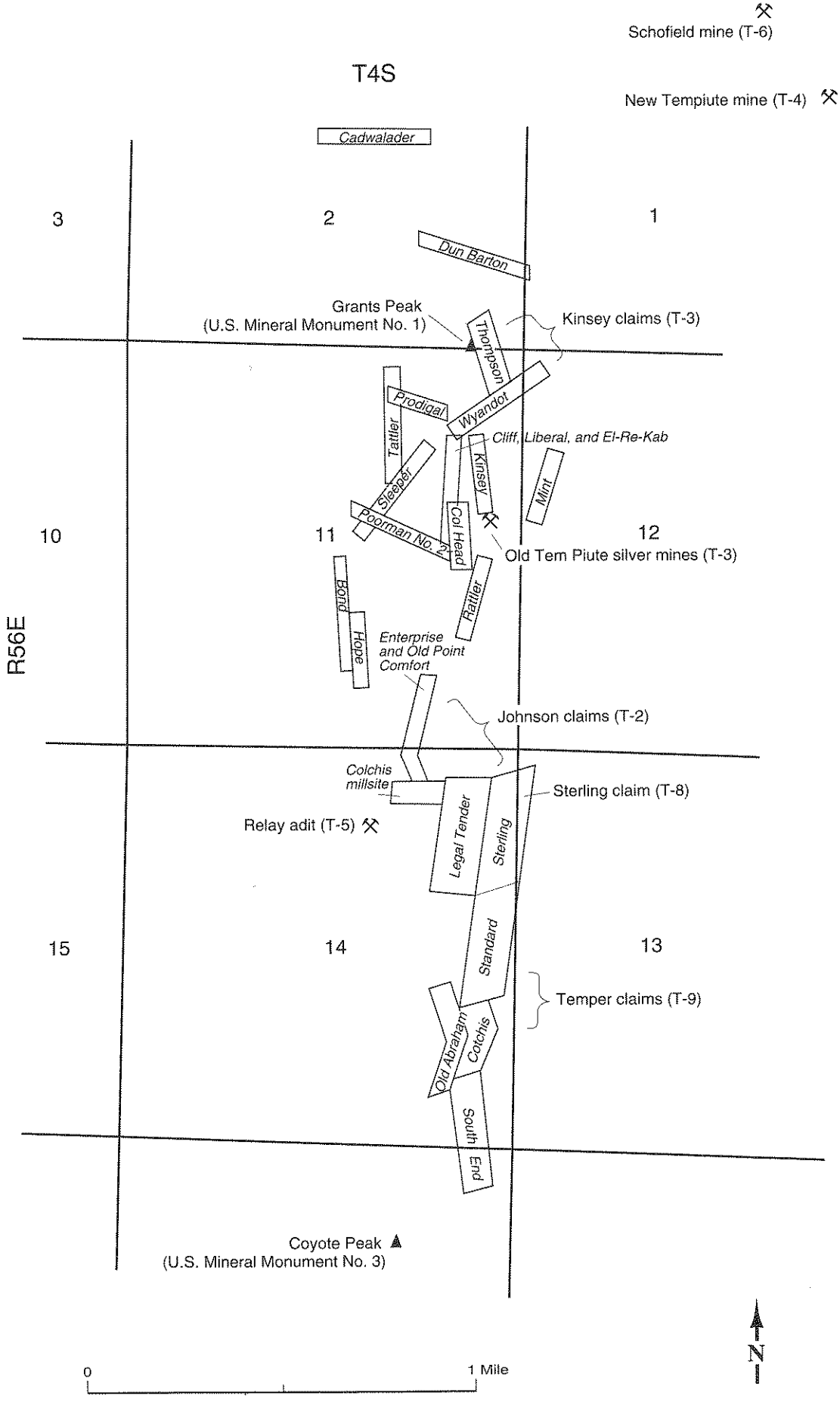
Section 33 prospect (S-3)

Commodities: gold, silver
Location: sec. 33, T1N, R62E
UTM 4196300N 674300E
Production: none
Development: One prospect pit.
Geology: Weakly mineralized, silicified ash-flow tuff is exposed in the prospect pit.
Remarks: The prospect is located ½ mile northeast of White Rock Spring, ¾ mile northwest on a jeep trail from State Highway 38. A sample collected by DuBray and others (1987) from the prospect was anomalous in lanthanum and molybdenum.
Source of information: DuBray and others (1987, p. 7)

TEM PIUTE MINING DISTRICT

The Tem Piute district, in northwestern Lincoln County, is on Tempiute Mountain, a north-trending spur range on the west end of the Tempiute Range. The town site of old Tempiute and the 1868-era silver properties are located in the southwestern part of the district, south of Grant's Peak. The tungsten properties are in the northern part of the district, on the north end of Tempiute Mountain.

According to Whitehill (1873, p. 113), a district named *Tem Pah-Ute* was organized here in 1865. White (1869, p. 85; 1871, p. 99), however, writes that the district was discovered in the winter of 1867–1868 and was first



Locations of patented claims, mines, and prospects in the central part of the Tem Piute mining district.

known as the Sheridan district. In January 1869, the district was properly organized as the Tem-Piute district (White, 1871, p. 99–100), and rich silver chloride ores were mined from numerous properties, such as the Wyandot, Inca, Rattler, and Balbec. The ore was shipped to Tybo and Eureka, as well as to Crescent in the nearby Pahranagat district, for treatment (Whitehill, 1879, p. 79).

After an initial period of activity that extended through the 1870s, the district was generally inactive until 1916 when tungsten occurrences were discovered north of the old silver properties. Claims were staked to cover the scheelite deposits, but the end of World War I triggered a collapse of the tungsten market and no tungsten was mined. Except for small amounts of silver ore produced for a few years following 1924, the district remained generally inactive until 1936 when the tungsten market improved and prospecting for that metal resumed. Tungsten production began in 1940 and continued until 1957 when depressed tungsten prices caused operations to cease. Tungsten mining was first carried out by Lincoln Mines, Inc., followed by the Atolia Mining Co. and Wah Chang Mining Corp. In 1968, Union Carbide Corp. became active in the Tem Piute district and leased most of the old tungsten properties. Large tungsten ore reserves were developed and mining operations resumed in 1977 only to again come to a close in 1982 with the occurrence of another worldwide depression in the tungsten market. The district has been inactive since that time.

The Tem Piute district is credited with gold-silver-copper-lead-zinc production of about $198,600, during 1869 through 1958, and with tungsten production, from 1936 through 1958, of about $14,680,000 (Tschanz and Pampeyan, 1970, p. 144). Total tungsten production from the district, 1937 through 1982, is estimated at about 500,000 units of WO_3 (Stager and Tingley, 1988, p. 107). Much of the historic base and precious metal production is credited to the Inca and Sterling mines (Couch and Carpenter, 1943, p. 88; Tschanz and Pampeyan, 1970, p. 145). The major tungsten properties in the district are the Lincoln mine and the Schofield mine. The Lincoln mine has been the larger producer, and during the last period of operation, Union Carbide Corp. consolidated both properties and operated them as the Emerson mine.

Tempiute Mountain is underlain by steeply east-dipping Paleozoic sedimentary rocks which have been intruded on the north by two small granitic stocks. The Paleozioc sequence is more than 7,000 feet thick and includes rocks of Ordovician, Silurian, Devonian, and Carboniferous ages. Structurally, the main part of the range appears to be a north-striking homocline, with the older beds on the west side, and younger ones on the east. At the north end of the range, the beds steepen and overturn along strike, a dip reversal possibly brought about by eastward overthrusting (Wyant and Lemmon, 1951, p. 1–3). The two granite stocks, which cut through the thrust plate, have been dated at about 92 Ma (Kruger and Schilling, 1971, p. 12).

Two types of mineral deposits occur in the Tem Piute district; silver-bearing veins which follow faults in limestone and dolomite, and tungsten-bearing skarns associated with intrusive contact zones.

The massive, silver-bearing quartz veins, found mainly on the southwestern tip of Tempiute Mountain, commonly have wide brecciated zones along their walls and occupy bedding plane faults in steeply dipping Paleozoic carbonate rocks. The wall rocks show silicification which decreases in intensity away from the mineralized structures. Ore minerals present include sphalerite, galena, tetrahedrite, chalcopyrite, and pyrite. The breccia zones are cemented with sulfide-bearing quartz and cavities in the veins are lined with euhedral quartz. Near-surface oxidized ores contain hemimorphite, cerussite, malachite, and azurite, and outcrops are commonly stained with iron-, manganese-, and copper-oxide minerals.

The skarn tungsten deposits occur mainly in the contact aureole of the southern of the two granite stocks that crop out in the northern portion of Tempiute Mountain. Skarn is present along the west half of the southern stock for more than 6,000 feet. At the contact is a continuous band of skarn 15 to 110 feet thick, with occasional remnants of limestone along the west side. A belt of platy hornfels up to 110 feet wide adjoins the skarn on its west, and large masses of skarn lie west of the hornfels, extending as far as 450 feet from the granite contact. Scheelite is the only mineral found in commercial amounts in the skarn deposits. Most of the scheelite occurs in garnet skarn, but some rich ore was found in small masses of calcite-fluorite-sphalerite rock in marble remnants adjoining skarn bodies. Other minerals commonly present in the skarn occurrences include quartz, actinolite, pyrite, pyrrhotite, hematite, epidote, and molybdenite.

Emerson mine (T-1)

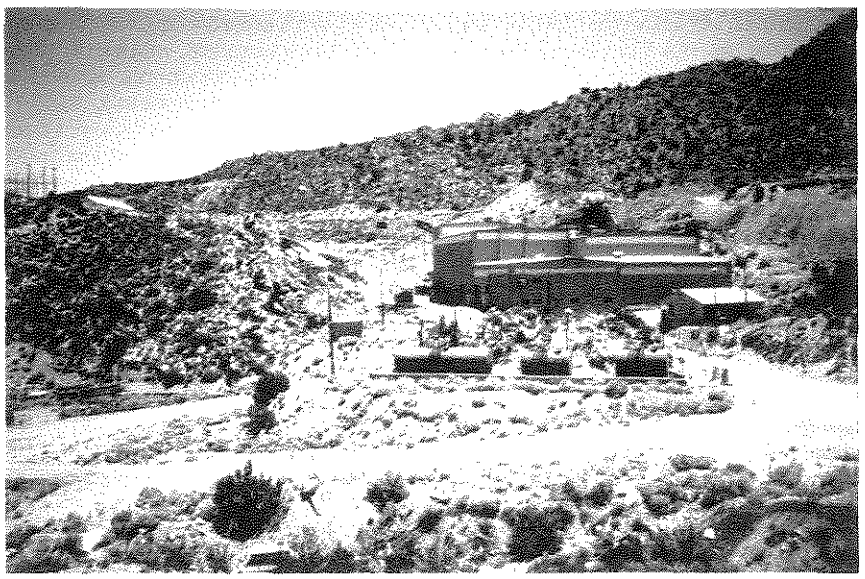
Other names: Lincoln mine, Tempiute tungsten mine

Commodities: tungsten, molybdenum, zinc, fluorspar

Location: sec. 36, T3S, R56E
UTM 4166850N 620850E

Production: Estimated 500,000 units of WO_3, 1938 to 1957 and 1977 to 1982.

History: Tungsten was discovered in this area by the Millick brothers in 1916, but no mining occurred at that time. In 1936, Wesley Koyen located two claims on the principal outcrop, and 16 more claims were located in 1937 by Koyen, G. W. Thiriot, D. F. Thiriot, and W. Green. A small milling plant was built at Black Rock, 15 miles west of the mine, and about 250 tons of ore was treated. In 1938, C.L. Baker and A.K. McFarlane leased the property. The lease was assigned to J.G. Berry who transferred it to D.B. Fegles. Fegles built a 40-ton mill and commenced operations in 1940 under the name of Lincoln Mines, Inc.; the capacity of the mill was increased to 75 tons/day in 1941. The Atolia Mining Co. acquired the property in June 1945, rehabilitated the mining and milling plant during 1946, and resumed operations in 1947. Operations continued until 1948 when Atolia surrendered the lease to the Koyens and the Theriots who carried out small-scale, intermittent operations until 1951. In 1951, the property was acquired by the Wah Chang Mining Corp. Wah Chang constructed a 700-ton/day mill and began operations in 1953. Milling capacity was eventually increased to 1,000 tons/day, and the property was actively mined until operations ceased in the fall of 1956 when the worldwide tungsten market collapsed. Shortly thereafter, the surface plant, camp houses, and all mining and milling equipment were sold at auction. Union Carbide became interested in the area and, in about 1968, leased the property and did extensive drilling to explore the ore zones. Union Carbide succeeded in proving sufficient ore reserves to proceed with the construction of a new 1,000-ton/day mill on the property. Renamed the Emerson mine and mill complex by Union Carbide, mining operations resumed on the old Lincoln Mines property in June, 1977. Operations continued until 1982, when falling tungsten prices caused the mine and mill to be placed on a standby basis. The property is now controlled by Umetco, Inc., a successor to Union Carbide, Metals Division.



Emerson mill, Tem Piute mining district.

Development: The mine is developed by more than 5 miles of underground workings on 6 levels, the 100, 200, 300, 500, 700, and 900 levels, with adits on the 100, 300, and 700 levels and an inclined shaft from the surface to the 900 level. Mining was by shrinkage stopes. Surface workings consist of one major open pit and numerous cuts, trenches, and pits. The mine office complex, change rooms, shops, mill, and camp facilities remain on the site.

Geology: Rocks exposed in the mine area are limestone, hornfels, and quartzite of late Paleozoic age, that have been folded, faulted, and intruded by two small granitic stocks. The mine is on the northwest flank of the southern stock. Hornfels is in contact with the granite for more than half of the stock perimeter, but in the mine area the rock in contact with granite is a dense, gray limestone.

Contact metamorphism has formed a thick layer of scheelite-bearing garnet and sulfide skarn about 6,200 feet long and averaging 40 feet thick between the limestone and the stock. This skarn layer is locally known as the Moody ore zone. Orebodies within the Moody zone range from 60 to 300 feet long and from a few feet to 40 feet wide, and have been stoped for more than 400 feet up the dip; most of the production of the district prior to 1948 came from scheelite-rich calcite-fluorite-sphalerite rock in the small Moody ore shoot found in this zone in the Lincoln mine.

A second major scheelite-bearing skarn layer, known as the Grubstake ore zone, occurs above the Moody zone. The Grubstake zone is about 2,000 feet long and averages about 30 feet thick; it is separated from the Moody zone by 100 to 200 feet of white, platy hornfels and two thin skarn layers. Orebodies within the Grubstake zone range from 80 to 300 feet long and from a few feet to 20 feet wide, and have been stoped for as much as 200 feet up the dip.

These orebodies range from 0.2% to 2.5% WO_3 but average about 0.4% WO_3. The skarn between orebodies averages between 0.1% and 0.2% WO_3.

Faulting offsets many of the sedimentary beds on the property and appears, in many places, to have been an important control in the formation of the orebodies. Locally, faults contain rich seams of scheelite, fluorite, and sphalerite.

Scheelite is the principal ore mineral in both ore zones, and most occurs as small, disseminated crystals scattered throughout the skarn. Rich seams of scheelite, however, can occur along fractures cutting the skarn and adjacent wall rocks. Pyrrhotite and pyrite, along with sphalerite and fluorite, are the major gangue minerals in the Moody zone. Garnet, quartz, actinolite, calcite, diopside, chlorite, and clinozoisite are major gangue minerals in the Grubstake zone, and are minor gangue minerals in the Moody zone. Molybdenite occurs locally along the hornfels-skarn contact, and to a lesser extent, within the skarn. The molybdenite is commonly associated with quartz veins and lenses, and is sometimes partially altered to powellite. Chalcopyrite is widespread in the district, but is less abundant than either pyrite or pyrrhotite. Other minerals present in minor to trace amounts in parts of the skarn deposits include magnetite, marcasite, galena, hematite, galenobismutite, cosalite, bismuthinite, and native bismuth. Autunite has been reported to occur along a fault zone cutting diopside-garnet skarn in the 600-level workings on the Moody ore zone (Garside, 1973).

Source of information: Wyant and Lemmon (1951); Binyon and others (1950); Stager and Tingley (1988, p. 109–110); Buseck (1967, p. 340–346); Garside (1973, p. 73)

Field examination: P. Smith, J. Bentz, 1983

Johnson claims (T-2)

Commodities: silver, lead, copper

Location: sec. 14, T4S, R56E
UTM 4162650N 619750E

Production: unknown

Development: Workings consist of several adits and numerous surface cuts.

Geology: Host rock is brownish-gray, massive dolomite, which has been highly fractured and sheared. Finely disseminated, oxidized pyrite occurs in a limestone-calcite breccia; the host rock appears to dip south but outcrops are generally too fractured to allow true

attitudes to be determined. Some interbeds of sandstone and quartzite are present within the carbonate section. Rock remaining on the mine dumps consists mainly of gray dolomite with barite and calcite in veins and pods, and with minor iron- and copper-oxide staining; this material is probably not ore.

Remarks: The mine site shows evidence of several stages of production. The mine was active in 1983, and several new trucks and new mine rails were on site; the property appeared to be in an early production or development stage. However, the mine appeared to be abandoned when visited in 1988.

Field examination: P. Smith, J. Bentz, 1983; J. V. Tingley, 1988

Kinsey claims (T-3)

Other names: Old Tem Piute silver mine; Wyandot, Col Head, Sleeper, Rattler, El-Re-Kab, Kinsey, Poorman, Thompson, Cliff, Liberal, Balbec, Inca claims

Commodities: silver, lead, copper

Location: sec. 11,12, T4S, R56E
UTM 4163900N 619840E

Production: Small; ore was hauled to Pahranagat and Tybo for milling.

History: Mineralization was discovered in 1868; there was considerable activity in the 1860s to the 1880s, but there has been no recorded production.

Development: There are several hundred feet of old mine workings in the area; these have now been mostly obliterated by recent surface exploration work. The area has been extensively bulldozed and drilled. The remains of the old townsite of Tempiute are in the canyon to the west, below the mines.

Geology: Host rocks in the area of the old mines are medium to dark gray, very fine-grained, crystalline limestone and dolomite of Silurian-Devonian age that contain massive to saccharoidal quartz veins following bedding plane faults. The most important mineralized structure is a silicified breccia zone with quartz filling up to 4 feet wide along a fault zone; wall rocks are silicified but silicification decreases away from the central mineralized structure.

At the site of the adit, in the northern part of the property, a fault zone strikes N20°–25°E, and dips 55°SE; the footwall of the zone is not exposed. A zone of veining along the fault has been excavated and the old workings are filled with water. At this site, argentiferous sulfides are disseminated in breccia and quartz vein material. Ore minerals include pyrite, chalcopyrite, galena, tetrahedrite, sphalerite, hemimorphite, cerussite, malachite, and azurite, along with iron-, manganese-, and antimony-oxide minerals. The fault zone continues northward but no workings were noted along it. Post-mineralization silica, along with dendritic pyrolusite, coats rocks within the structure. The fault zone outcrops prominently along the drill road leading toward the shaft site on the southern margin of the property. Quartz veins exposed along this road are up to 2 feet wide and breccia zones adjacent to the veins are up to 7 feet wide.

At the southern site, a vertical shaft was sunk in dark gray, silicified limestone-dolomite to follow a north-striking, 70°E-dipping fault. The carbonate rocks are cemented with sulfide-bearing quartz; the fault plane is curved and a breccia zone associated with the fault is up to 7 feet wide. Late-stage silica coats the rocks, abundant copper staining is present, and cavities in the breccia are lined with quartz crystals. Mineralization here is generally the same as exposed to the north at the adit site.

Remarks: This area is probably one of the two oldest mine sites in the district, and many old stone cabin ruins are present in the canyon near the mines. The names of the old mines could not be recovered and matched with the existing workings, but mines mentioned in historical accounts include the Kinsey, Balbec, Inca, Savage, Bagdad, Cliff, Silver Peak, Blue Bell, and Wyandot.

Source of information: Tschanz and Pampeyan (1970, p. 140–147)

Field examination: P. Smith, J. Bentz, 1983

New Tempiute mine (T-4)

Other names: Emerson mine; Phylis, Rae Ella claims(?)

Commodities: tungsten, molybdenum, silver, zinc

Location: sec. 6,1, T4S, R57E,56E
UTM 4165525N 621050E

Production: Small, some ore was mined in the period 1977 to 1982.

History: The area was controlled by the North Tem Piute Mining and Milling Co. in the 1930s.

Development: Workings consist of two open pits: the main pit to the west and a small, narrow, deep pit to the east.

Geology: Mining has been done on a skarn zone formed along the contact of a Cretaceous granitic body with Mississippian carbonate beds. The Mississippian limestone unit is dark gray, coarsely crystalline, massive to thick bedded, and generally strikes north-south. Only minor remnants of the skarn zone remain along benches in the western pit. On the east and west sides of this pit tongues of the granite body extend into the limestone unit and are argillically altered, bleached, and heavily iron-oxide stained. Skarn minerals present include garnet, wollastonite, calcite, and very fine tremolite crystals which are intergrown in the limestone. Massive (up to several feet wide) veins and clots of calcite-siderite-manganosiderite rock occur in the limestone. Scheelite occurs in the skarn zone accompanied by pyrite, bismuthinite(?), pyrrhotite, chalcopyrite, sphalerite, and fluorite. The iron-rich sulfides are altered to a greenish clay material resembling nontronite. The western edge of the skarn zone is gossany, and massive white quartz veins cut both the skarn zone and limestone beyond the skarn. The veins contain abundant open spaces carrying oxidized pyrite grains and ghosts. Locally, the limestone is silicified in the vicinity of these quartz veins.

Source of information: Tschanz and Pampeyan (1970, p. 140–147)

Field examination: P. Smith, J. Bentz, 1983

Relay adit (T-5)

Commodity: silver

Location: sec. 14, T4S, R56E
UTM 4162480N 619360E

Production: unknown

Development: Workings consist of adits and cuts on southwest slope of a ridge.

Geology: The main adit follows a N40°E-striking, 35°NE-dipping fault zone in silicified limestone; the structure appears to follow bedding in massive, gray limestone. A 3-foot-wide jasperoid zone in the hanging wall of the fault contains clots of yellow-green oxides, cerussite, and minor amounts of tetrahedrite; the mineralized zone includes a 6-inch- to 1-foot-thick, sheared and recemented quartz vein that follows the footwall of the jasperoid.

Remarks: The drift crosscuts the mineralized structure at the portal, then turns to follow the structure.

Field examination: J. V. Tingley, 1988

Schofield mine (T-6)

Other names: North Tempiute mine; Y-Z claims; Phylis, Rae Ella, Rae Ella No's 2 and 3 claims

Commodities: tungsten, molybdenum, zinc

Location: sec. 1, T4S, R56E
UTM 4165800N 621000E

Production: Recorded production totals 1,856 units of WO_3, produced in 1943, 1951 to 1955, and 1980.

History: The original claims on this property were located by the Schofield brothers in 1928. The North Tem Piute Mining and Development Co. was organized in 1937, and the first production from the property was recorded in 1943. In 1946, the property was leased to the Atolia Mining Co. The mine was leased to Y-Z Mining Co. in 1954 and additional production was recorded in 1954 and 1955. The property was operated by Union Carbide from 1978 through 1982, and is now controlled by Umetco.

Development: Mine workings consist of ten adits, about 2,000 feet of underground crosscuts and drifts, numerous sample trenches, and several diamond drill holes from both surface and underground locations.

Geology: The mine is in the Moody skarn zone along the south contact of the southernmost of two granite stocks exposed in the district. Host rocks are carbonate rocks of the Devonian Pilot Shale. Ore occurs in parallel bands and isolated pods adjacent to the granite contact. A single band of skarn, up to 125 feet thick, is present on the west side of the granite, and a narrower band occurs on the east side. Scheelite is widespread in the skarn, but ore shoots occur only in the west band, along the limestone side of the skarn. Here, at least four ore shoots occur in a strike distance of 600 feet. These shoots are 15 to 200 feet long and 4 to 9 feet thick. They plunge 45° to 50°S and extend to at least 200 feet in depth—probably to 400 feet. The ore shoots contain 0.3% to 0.7% WO_3, and probably average about 0.4% WO_3. Local enrichments contain as much as 1.5% WO_3, but they are too erratic in distribution to be mined separately. The skarn between ore shoots probably averages 0.2% WO_3, and much of the skarn from the ore shoots east of the granite contact ranges from 0.1% to 0.2% WO_3. Minerals present in the skarn include garnet, actinolite, calcite, fluorite, pyrite, pyrrhotite, diopside, sphalerite, epidote, molybdenite, and powellite as well as scheelite.

Source of information: Stager and Tingley (1988, p. 110–111); Tschanz and Pampeyan (1970, p. 146–147); Johnson and Benson (1963, p. 68–70)

Field examination: P. Smith, J. Bentz, 1983

Section 9 shaft (T-7)

Commodities: unknown

Location: sec. 9, T4S, R56E
UTM 4162930N 616570E

Production: none

Development: Single vertical shaft, approximately 30 feet deep, and the remains of foundations of several buildings are found at this location; the shaft may be a well and not a mineral location.

Geology: The single vertical shaft, located in a drainage directly down slope from the original Tem Piute silver mines, is sunk in fragment-rich, bleached, and altered ash-flow tuff. The tuff is moderately welded, quartz-rich, and contains pumice and glassy fragments. Tuff crops out prominently along both sides of the drainage and is locally fractured but displays little, if any, structure. Greenish-yellow surface alteration is present, along with very minor iron- and manganese-oxide staining.

Field examination: P. Smith, J. Bentz, 1983

Sterling claim (T-8)

Other name: Johnson claims

Commodity: silver

Location: sec. 14, T4S, R56E
UTM 4162500N 620050E

Production: Sixty-five carloads of ore, valued at $65,600, were reported to have been mined from the Sterling claim in the 1930s (Tschanz and Pampeyan, p. 145).

History: The Sterling claim was patented in 1882.

Development: Workings consist of an open stope, 8 feet high, 150 feet long and extending down-dip 50 feet, then connecting with a narrow winze leading to a lower level.

Geology: The stope follows a wide fracture zone, striking N40°E and dipping 35°SE, that is laced with narrow, white quartz and calcite veinlets. The limestone wall rock is silicified; silicification generally follows limestone bedding. As seen from the hill slope to the north, the structure is 20 to 30 feet thick and is composed of breccia laced with white quartz veinlets. The structure crosscuts bedding; bedding is not distinct but generally strikes north-south.

Remarks: This adit is east of the site described in this report as the Johnson claims.

Field examination: J. V. Tingley, 1988

Temper claims (T-9)

Other names: Standard, Colchis, Old Abraham, South End mines

Commodities: silver, lead

Location: sec. 14, T4S, R56E
UTM 4161920N 620050E

Production: small

Development: Workings consist of several shafts and adits, on two levels connected by stoping, related to several stages of exploration. Drilling has been done from the saddle above the old workings.

Geology: Mine workings are along a prominent, vertical, N25°W-striking shear zone that follows the western slope of the canyon. The shear zone cuts limestone and limestone breccia that dips steeply to the west; the eastern slope of the canyon is underlain by silty shale containing abundant brachiopods. The ore consists of greenish limestone breccia containing abundant calcite veins; minor manganese- and iron-oxide staining is present.

Remarks: This is probably the location of the South End, Colchis, and Old Abraham mines mentioned by Angel (1881).

Source of information: Angel (1881, p. 486)

Field examination: P. Smith, J. Bentz, 1983

Wash shaft (T-10)

Commodity: silver

Location: sec. 23, T4S, R56E
UTM 4159730N 618800E

Production: none

Development: A single prospect shaft, 8 by 10 by 25 feet deep.

Geology: The shaft is sunk alongside a N25°E-striking, near vertical fault zone in marbleized limestone. Rock along the structure is brecciated and recemented with calcite; fractures are coated with cinnamon-brown and yellow-brown iron oxides. A manganese-oxide-rich

breccia is exposed in the northwest wall of the shaft, and an iron-oxide-rich zone can be seen on the northeast and southwest walls; no obvious silver or copper oxide minerals were noted.

Remarks: Work at this site appears to date from the 1920s or 1930s.

Field examination: J. V. Tingley, 1988

NONMETALLIC OCCURRENCES

PAHRANAGAT MINING DISTRICT

This district is described in the section on metallic occurrences.

Tricia claims (P-1)

Commodity: water-laid tuffite

Location: sec. 17, T3S, R59E
UTM 4162000N 643300E

Production: none

Geology: Deposit of water-laid tuff interbedded with Tertiary ash-flow tuff sequence.

Remarks: The deposit has a high aluminum content, making it ideal for use as a supplement in the manufacture of a lightweight concrete block as well as mortar mix and stucco. It is also being tested for use in the manufacture of roofing material. Nevada Lite Weight Concrete and Block, Inc. plans to mine the deposit by open-pit methods, segregate the various colors of material for different uses, and haul to a mill site claim located near Highway 318, or to a mill located on private property near Crystal Springs for further processing. Processed material would be shipped to markets in the Las Vegas area.

Source of information: Robison (1990)

QUINN CANYON MINING DISTRICT

The Quinn Canyon district, Lincoln and Nye Counties, is on the southeast side of the Quinn Canyon Range and extends from the vicinity of Adaven, near the mouth of Cherry Creek, westward to the drainage of Quinn Canyon. This district is primarily a fluorite district, but several small lead-silver-zinc properties east of Adaven are included within it. All of the known fluorite properties in the district, as well as the base-metal properties, are located in Nye County, north of the border of the Timpahute Range Quadrangle. The Quinn Canyon district is sometimes included in the Willow Creek district of Nye County.

Fluorite was discovered west of Cherry Creek in 1934. Other fluorite deposits were discovered to west, near Quinn Canyon in 1941, and deposits to the south, in the Lincoln County part of the district, were staked in the early 1950s (Papke, 1979, p. 48). While only about 29,500 tons of fluorspar have been produced from the Quinn Canyon fluorite district, it contains the largest concentration of fluorspar deposits in Nevada (Papke, 1979, p. 48).

The portion of the Quinn Canyon district included within the Timpahute Range Quadrangle consists mainly of thick sections of Tertiary rhyolitic and latitic ash-flow tuff. Locally, these volcanic rocks display propylitic and silicic alteration, as well as broad zones of brecciation where they are cut by northeast- to east-trending dikes. Two small outcrops of Devonian carbonate rocks occur in the area, one east of the range front in the valley between the Quinn Canyon Range and the Worthington Mountains, and another about five miles northwest on the northern border of the quadrangle (Tschanz and Pampeyan, 1970, pl. 2). The two known prospects in this area are associated with a northeast-trending zone of brecciation and silicification in volcanic rocks northwest of McCutchen Spring. Most of the prospecting activity appears to have been for optical quartz, but the area has, no doubt, also been examined for fluorite. One of the prospects exposes a small area of skarn(?); this property is described in the section on metallic occurrences.

Cotton Top claim (QCa-1)

Other name: Quartz claim

Commodity: optical quartz

Location: sec. 32, T2N, R56E
UTM 4204800N 613750E

Production: none

History: Old claim notices found on the site were dated 1941, the activity was probably related to World War II interest in optical-quality quartz.

Development: The only development seen was evidence of hand-digging and blasting of some outcrops of quartz-crystal breccia.

Geology: A northeast-trending, silicified breccia mass in rhyolite welded tuff forms the crest of a prominent ridge. The breccia is composed of rhyolitic tuff, rhyolite, and masses of quartz crystals. The breccia mass strikes about N15°E, and forms an outcrop about 1,500 feet long by 150 feet wide. Large cavities in the breccia are partially filled with vitreous white and clear, euhedral quartz crystal masses. The crystal-filled cavities are up to 1 foot across but most are in the range of 3 to 6 inches across. Individual crystals within the cavities are up to several inches long and show good single terminations, although many are broken. The breccia mass is silicified and rock fragments within it are slightly bleached on the margins of the crystal-filled cavities.

Remarks: Although it appears that work at this location has been concentrated in the areas of vuggy quartz, the area may also have been prospected or fluorite. The Shannon Queen prospect, the southernmost property in the Quinn Canyon fluorite district (Papke, 1979, p. 58–59), is only about 1 mile north of the Cotton Top prospect (½ mile north of the quadrangle boundary). However, x-ray defraction analysis of a sample of altered breccia matrix from the Cotton Top claim failed to detect the presence of fluorite (S. Castor, personal commun., 1991).

Field examination: J. V. Tingley, 1989

SOUTH PAHROC RANGE MINING AREA

The South Pahroc Range, Lincoln County, is south of U.S. Highway 93, in the southeastern corner of the Timpahute Range Quadrangle. The Mackie perlite mine is on the eastern side of the range, about 5 miles south of Highway 93. Several other perlite prospects are located north and south of the Mackie mine, along the lower range front.

The Mackie mine has been operating intermittently on a small scale since the 1940s and has produced about 108,000 tons of high-expansion perlite; ore from the deposit continues to maintain a small foothold in the perlite market due to its exceptional expansion properties (Neumann, 1986, p. 13; Moring and others, 1988, p. 3).

Rocks exposed in the portion of the South Pahroc Range included within the boundary of the Timpahute Range Quadrangle consist of a slightly west-dipping sequence of partially to densely welded ash-flow tuffs. The tuffs are dacitic to rhyolitic in composition, and range in age from 14 to 25 Ma. Rhyolite and andesite flows and volcaniclastic

sedimentary rocks are intercalated with the ash-flow sheets, and the rhyolite flows commonly have been hydrated to perlite (Moring and others, 1988, p. 5).

The Mackie perlite mine and several other small perlite prospects occur in bands of perlite that represent hydrated portions of glassy rhyolite flows. The perlite occurs at the base of the exposed volcanic section along the eastern front of the Pahroc Range.

Blue Ridge claims (SP-1)

Commodity: perlite
Location: sec. 22, T4S, R62E
UTM 4161480N 675920E
Production: small
Development: A single trench, 40 feet long, 8 feet wide, and 10 feet deep.
Geology: Steeply dipping bands of dark-gray, vitreous perlite, striking N20°W to north-south, are exposed in the trench. The perlite-rich layer is approximately 75 feet thick; individual bands are 2 to 3 feet thick and are separated by shaly-looking tuff. Some perlite bands contain blebs of obsidian (Apache tears) up to 1 inch in diameter. The perlite is greenish and displays columnar jointing within the individual bands; spherulitic texture is well developed.
Remarks: Several small piles of material mined from the trench remain on the property; it does not appear that much, if any, perlite has been shipped. One sample, taken by the U.S. Geological Survey, is reported to have an expanded density of 3.56 pounds per cubic foot, suitable for "lighter weight" end uses such as filter aid, cryogenics, and soil conditioning.
Source of information: Moring and others (1988, p. 8)
Field examination: J. V. Tingley, 1988

Doe claims (SP-2)

Commodity: perlite
Location: sec. 23, T4S, R62E
UTM 4162100N 676100E
Production: none
Development: One bulldozer trench, 90 by 10 by 6 feet deep; follows a down-dip extension of a perlite layer.
Geology: Perlite occurs in an overturned block of tuff. A 28-foot-thick section of onion-skin perlite strikes N35°W, and dips 35°–90°NE. Parts of the perlite sequence are contaminated by narrow bands of rhyodacite.
Remarks: One chip sample, taken on the property by the U.S. Geological Survey, had an expanded density of 2.73 pounds per cubic foot.
Source of information: Moring and others (1988, p. 8)

Flat No. 1 and 2 claims (SP-3)

Commodity: perlite
Location: sec. 11, T4S, R62E
UTM 4163660N 676400E
Production: none
Development: One bulldozer trench, 75 feet long and 30 feet wide.
Geology: Onion-skin perlite is partially exposed near a tuff unit. The perlite bed strikes N45°E and dips 5°NW. The perlite contains Apache tears (marekanites).
Remarks: Optical petrographic examination of one sample by the U.S. Geological Survey verified the presence of perlite.
Source of information: Moring and others (1988, p. 8)

Mackie mine (SP-4)

Other names: Barbarba claims, Delamar perlite mine, Kopenite mine
Commodity: perlite
Location: sec. 34, T4S, R62E
UTM 4157600N 675250E
Production: The mine has produced 108,000 tons of perlite since the late 1940s; production has been intermittent.
Development: Workings consist of two adits, 525 feet and 300 feet long. The east adit was abandoned because of falling rock. The west adit has been stoped upward, creating a glory hole on the surface.
Geology: A perlite flow, averaging 20 feet thick and capped by tuff, is exposed on the property. Onion-skin perlite strikes north-northeast, dips 10°–38°NW.
Remarks: Two chip samples, taken by the U.S. Geological Survey, both contained commercial-grade perlite; one had an expanded density of 1.63 pounds per cubic foot. The U.S. Bureau of Mines has estimated reserves within the claim boundaries at 1 million tons.
Source of information: Moring and others (1988, p. 8)

Saphire No. 1 and 2 claims (SP-5)

Commodity: perlite
Location: sec. 10, T5S, R62E
UTM 4155460N 675420E
Production: none
Development: one small prospect pit
Geology: Thin bands of perlite are exposed in drainages.
Remarks: One sample taken by the U.S. Geological Survey had an expanded density of 4.56 pounds per cubic foot.
Source of information: Moring and others (1988, p. 8)

GEOTHERMAL OCCURRENCES

PAHRANAGAT VALLEY

Several hot springs occur within a distance of about 12 miles along the east edge of Pahranagat Valley. The springs extend from the vicinity of Hiko to Ash Springs, a few miles south of the quadrangle boundary. J. Ross Browne (1868, p. 427) commented on these springs in 1867 as "natural curiosities, from the amounts of water they pour forth . . . and the peculiarity of their high temperature." Indians living in the upper Pahranagat Valley used these spring waters to help cultivate crops of squash, from which is reputedly the source of the name Pahranagat, "squash-eaters" (White, 1869, p. 80). White settlers were also attracted by the springs, and the first settlements within the boundaries of the present Timpahute Range Quadrangle were at Crystal Springs and at Hiko, about 5 miles to the north.

Crystal Springs (1)

Location: sec. 10, T5S, R60E
UTM 4155100N 456140E
Temperature: 81° to 90°F
Remarks: Flow rates range from 2,680 to 9,000 gallons per minute. There are at least two springs; one flows from an orifice in limestone bedrock. The water has been used for irrigation and domestic purposes.
Source of information: Garside and Schilling (1979, p. 45)

Hiko Spring (2)

Location: sec. 14, T4S, R60E
UTM 4162550N 657620E

Temperature: 80° to 90°F

Remarks: Flow rates range from 538 to 2,400 gallons per minute. The water issues from a contact between alluvium and dolomite; the water is used for irrigation and domestic purposes.

Source of information: Garside and Schilling (1979, p. 45)

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Jasperoid outcrop, Lost Shepherd claims, Seaman Range, Lincoln County.

APPENDIX A.—*Sample Descriptions*

District/area	Occurrence (no.)	Sample no.	UTM		Description
Don Dale	Andies mine (D-1)	0581	4157550	611100	Kaolinized, silicified, welded rhyolitic ash-flow tuff with smokey quartz phenocrysts. Wall rock is fractured and flooded with dull red and brown iron-oxide staining. Hematite-mica breccia cuts rock; breccia fragments contain pyrite and are cemented in matrix of quartz and pyrite.
		1467	4157650	610800	Argillically altered, bleached rhyolitic ash, remnant smokey quartz; muscovite crystals; fine grains and stringers of crystalline cinnabar; surfaces stained with iron and manganese oxides and unidentified yellow oxides(?)
		3000	4157570	610620	Highly altered, iron-oxide-stained volcanic breccia; possible mercury mineralization.
	April Fool Spring trench (D-3)	3001	4154600	611480	Highly altered, limonite-stained volcanic tuff; sample taken from an outcrop near well in drainage.
	Axis vein (D-4)	3053	4155000	607750	Quartz vein containing iron oxide and unidentified sulfides.
	Big Red prospect (D-5)	3052	4154600	607750	Limonite-stained quartz breccia in vein.
	Big Red prospect NW (D-6)	3050	4154700	607530	Manganese- and iron-oxide-stained vein quartz; vein contains pyrite and an unidentified sulfide mineral.
	Big Red prospect W (D-7)	3051	4154550	607650	Partly brecciated gossan outcrop, flooded with quartz and containing gray pyrite and other sulfides.
	Blue Streak prospect (D-8)	3049	4155100	608040	Vein quartz containing minor amounts of iron and manganese oxides.
	Don Dale mine (D-9)	1468	4156450	608450	Reddish-brown quartzite, heavily limonite stained; sprays of malachite; slightly gossany, irridescent oxides; fractured quartz porphyry with disseminated copper and iron oxides.
		1469	4156450	608250	White to gray quartzite; fractures iron- and manganese-oxide stained, contains crystalline chalcopyite and pyrite and disseminated sulfides in quartz crystals; vugs are lined with euhedral quartz crystals; very fine quartz crystals coat surfaces of fractures.
		3020	4156450	608450	Selected from dump near SW-trending adit; iron-oxide-stained vein material in shale and quartzite; rock is brecciated and contains copper-oxide minerals.
	East Section 34 prospect (D-10)	1470	4157000	608570	Gossany, sheared, fractured, brecciated quartz vein in quartzite; heavily manganese- and iron-oxide stained.
	North Section 34 prospect (D-11)	3060	4157400	607860	Selected from three dumps associated with old shafts; vein quartz containing galena, tetrahedrite, copper sulfides, and iron oxides.
	Outcrop north of radar site (D-12)	3021	4155850	608550	Partly brecciated, strongly iron-oxide-stained vein quartz; along fault in quartzite.
	Ridge vein (D-13)	3059	4156100	607850	Manganese-oxide-rich, brecciated quartz vein.
	Sidewinder prospect (D-14)	3048	4155150	608070	Chipped from vein and selected from dump. Vein material consists of quartz breccia containing minor amounts of fine-grained sulfide minerals.

continued

APPENDIX A.—*Sample Descriptions (continued)*

District/area	Occurrence (no.)	Sample no.	UTM		Description
Freiberg	Felsite shaft (F-1)	3287	4199520	623140	Weak skarn; pale garnet with massive pyrite and sphalerite, hemimorphite(?) crystals on fracture surfaces, some manganese-oxide staining.
	Freiberg mine (F-2)	1764	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 tungsten prospect (F-3)	1767	4201950	622060	Light-green, epidote-calcite skarn and white marble; skarn contains coarse crystals of scheelite and powellite.
	New Freiberg mine (F-6)	1765	4200600	624290	Dense, pink (rhodochrosite?)-brown, marly, recrystallized, replaced dolomite and dolomitic limestone; rock coated, replaced, veined by iron oxides (mainly hematite); contains veins and pods of galena and pyrite in addition to minor surface coatings of cerussite, copper oxides, and minor chalcopyrite. Replacement ore has gossany appearance and displays rings of yellow oxide mineral, possibly an alteration product of galena.
		1766	4200600	624290	Random grab sample taken from stockpile ore; consists of a mixture of altered, earthy to marly yellow-brown limestone cut by veinlets of calcite with hematitic gossan and boxworks; minor copper oxides are present. Rock is heavy, possibly due to disseminated galena, is silicified, and contains clots of oxidized pyrite.
	Section 20/21 adit (F-10)	1763	4199600	624400	Dense, light-green, banded to marly calc-silicate; earthy hematitic gossan and calcite-veined limestone. The calc-silicate contains minor fine-grained scheelite and is coated by abundant iron and manganese oxides and minor copper oxides. The gossan is mostly iron oxides and cerussite, but unoxidized cores of galena still remain. Siliceous veinlets and blue, opaline coatings are present on most rocks.
	Smelter shaft (F-11)	1761	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.
		1762	4197970	624410	Iron-oxide-stained jasperoid and silicified limestone. Original rock is bleached to tan color, and coated by hematite, limonite, and manganese-oxide minerals.
		3288	4197790	624410	Siliceous gossan, pale brown limonite and reddish hematite clots, botryoidal pale green mineral (arsenic mineral ?) on fracture surfaces.
Golden Gate Range	Golden Gate Range prospect (G-1)	3200	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.
Pahranagat	Arab shaft (P-1)	3285	4167770	642680	White, vuggy vein quartz with clots of copper oxide formed from oxidizing tetrahedrite; contains dark manganese-oxide clots; a soft, gray mineral coats fractures and fills cavities in the vein.
	Black Prince lode (P-2)	3264	4168640	642950	Jasperoid with manganese-oxide-rich gossan, pyrolusite crystals, clear silica coating vugs and fracture surfaces.
	Castle property (P-3)	4385	4169330	642210	Clots of manganese oxides, films and coatings of iron oxides in silicified quartzite-jasperoid lens.

APPENDIX A.—*Sample Descriptions (continued)*

District/area	Occurrence (no.)	Sample no.	UTM		Description
Pahranagat *(continued)*	Edna lode (P-4)	4386	4164760	842080	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-brown and seal-brown gossan material, some pale-green copper-oxide staining, manganese dendrites and spots.
	Fifth of July mine (P-5)	3273	4166220	642420	White vein quartz, siliceous, iron-oxide-stained gossan, blue and green copper-oxide staining.
	Gentry prospect (P-6)	3266	4170240	642860	Manganese-oxide replacement lens in limestone, jasperoid with minor iron-oxide stain, white botryoidal silica coating fracture surfaces.
	Harrison mine (P-7)	3262	4168380	642710	Manganese- and iron-oxide gossan in silicified limestone, copper-oxide staining, some black calcite, cerrusite in vugs.
	Illinois mine (P-8)	3272	4166620	642480	Silicified limestone and white vein quartz containing clots of black sulfides; vugs contain cerrusite, some spots of manganese and iron oxides, possibly some anglesite.
	Indiana ledge (P-9)	3286	4167680	642620	White vein quartz with minor copper-oxide staining; dendrites of manganese oxide coat fracture surfaces; chrysocolla cements brecciated vein material.
	John T. lode (P-10)	3263	4168170	642870	Manganese- and iron-oxide gossan in silicified limestone, some jasperoid.
	Lone Pine prospect (P-11)	3265	4169740	642580	Jasperoid lense, massive replacement by manganese oxide, silica boxworks, minor iron-oxide minerals, some pyrite in pyrolusite clots, clear crystals coat vugs (possibly cerrusite).
	Long Horne silver mine (P-12)	3261	4167740	644580	Silicified limestone, gossan along shear zones with clots and lenses of sooty manganese oxides; possible silver sulfides present.
	Queen of the Hill lode (P-13)	3270	4164670	641930	White vein quartz containing spots of black lead/silver sulfides, some malachite and azurite staining, cerrusite and anglesite in vugs and coating sulfide clots.
	Rosey #3 lode claim (P-14)	4384	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 oxide; cerussite crystals in vugs.
	Rosey mine (P-15)	3269	4165760	639700	Silicified limestone with white vein quartz containing clots of galena, sphalerite, possibly tetrahedrite, malachite and azurite clots, minor manganese-oxide staining.
	Sanderson Canyon shaft (P-16)	3274	4166270	642080	Siliceous gossan, iron and manganese oxides in vugs, trace copper-oxide staining.
	Silver Prince mine (P-17)	3271	4165760	642900	Calcite-quartz vein with manganese oxide, black sulfides, minor copper- and iron-oxide stainings and coatings, some cerussite.
	South Paw mine (east) (P-18)	3268	4170640	642300	Silicified limestone, jasperoid with clots and lenses of pyrolusite, some iron-oxide minerals, vugs lined with clear quartz crystals and massive pyrolusite.
	South Paw mine (P-18)	3267	4170680	642240	Massive, soft pyrolusite; some silica; open spaces coated with sooty, botryoidal pyrolusite.
	Tom Blunder shaft (P-19)	4383	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.

continued

APPENDIX A.—*Sample Descriptions (continued)*

District/area	Occurrence (no.)	Sample no.	UTM		Description
Queen City	Black Hawk mine (QCi-1)	3198	4180860	591050	Cinnabar coatings on fracture surfaces in silicified limestone breccia; some fine-grained pyrite with quartz occurs in breccia matrix; jarosite crystals and limonite coat fractures.
	End of Trail #2 claim (QCi-2)	3463	4177670	590260	Kaolinized, brecciated latite cemented with quartz; quartz vuggy, with acicular crystals lining vugs; brick-red hematite films, some jarosite crystals on fractures and in vugs.
	Fallini property (QCi-3)	3199	4181540	591300	Sparse cinnabar clots and coatings on fracture surfaces cutting quartz-cemented, silicified breccia. Breccia is vuggy, quartz crystals coat vugs, cinnabar coats surfaces of mammillary quartz incrustations in vugs.
	Queen City manganese prospect (QCi-4)	3471	4178120	589820	Siliceous, manganese-oxide-rich gossan along N55E shear zone with replacement pods in dolomite; heavy but cellular mass of black amorphous and crystalline manganese oxide, massive siderite, and calcite with clots and boytroidal masses of white gibbsite.
	Queen City prospect 1 (QCi-5)	3462	4178345	591625	Iron-oxide-stained latite with limonite and hematite films; iridescent hematite; fine-grained jarosite and drusy quartz crystals in vugs; wall rock kaolinized, silicified.
	Queen City prospect 2 (QCi-6)	3464	4176960	588160	White vein quartz, some massive, fish-scale texture (quartz-after-calcite); cinnamon-brown limonite staining; barite with quartz; fine-grained black mineral (Mnox?, sulfides?); barite crystals in vugs—most of "fish scale" is barite; rhyolite wall rock is kaolinized, silicified.
	Queen City prospect 3 (QCi-7)	3465	4178200	591195	Drusy, fine-grained quartz coating fractures in kaolinized, silicified rhyolite; films and points of limonite.
	Red Wing prospect (QCi-8)	1471	4179160	592850	Silicified, bleached, argillically altered rhyolite; sugary quartz vein; surface coatings and discrete grains of crystalline cinnabar and metacinnabar; very finely disseminated pyrite and other unidentified sulfides in pods, veinlets, and clots; crystalline barite lining vugs; jarosite; several stages of silica flooding, abundant drusy quartz; heavy iron- and manganese-oxide stains.
		3197	4179160	592850	Silicified rhyolite breccia; vuggy, white quartz masses and veinlets cut breccia; vugs are lined with stubby, euhedral quartz crystals, globs of cinnabar rest on quartz crystals, sparse barite crystals occur in some vugs; botryoidal silica coats fracture and vug surfaces.
Quinn Canyon	Crystal contact prospect (QCa-1)	3469	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.
Seaman Range	Lost Shepherd claims (S-2)	3470	4206340	662780	Massive jasperoid breccia laced with chalcedonic silica stringers and veinlets; some lenses of iron-oxide gossan along fractures.
Tem Piute	Emerson mine (6700-foot level) (T-1)	1458A	4166350	620750	Pyrrhotite skarn with quartz clots, clots of scheelite, and minor pyrite; garnet skarn shows very fine scheelite, minor epidote.
		1458B	4166350	620750	Fine-grained garnet-epidote skarn with disseminated clots of scheelite, pyrite, and molybdenite; massive white quartz vein with clots of calcite and rhodochrosite, some molybdenite, pyrite, chalcopyrite, sphalerite.
	Emerson mine (Grubstake-Moody zone) (T-1)	1459	4166850	620850	Fine-grained garnet epidote-skarn with pyrite, chalcopyrite, purple fluorite; fractured hornfelsic material, abundant manganese oxides, minor scheelite, sphalerite.

APPENDIX A.—*Sample Descriptions (continued)*

District/area	Occurrence (no.)	Sample no.	UTM		Description
Tem Piute *(continued)*	Emerson mine (Grubstake-Moody zone (T-1)	1460	4166850	620850	Sulfide-rich skarn, pyrite, pyrrhotite, sphalerite, chalcopyrite, fine to coarse scheelite.
	Emerson mine (Wah Chang pit) (T-1)	1457A	4166900	621200	Garnet skarn with euhedral brownish-red garnets, fibrous tremolite, very fine-grained pyrite, pyrrhotite, dendritic pyrolusite, minor scheelite and clots of molybdenite
		1457B	4166900	621200	Massive to sacchroidal, white vein quartz with euhedral to anhedral pyrite clots, grains, and fine stringers; minor scheelite grains intergrown with pyrite; vugs are limonite coated; minor late-stage chalcedony on surfaces; dark zones in vein suggest the presence of disseminated sulfides.
	Johnson claims (T-2)	1465	4162620	619730	Gray iron-oxide-stained limestone/dolomite with crystalline barite nodules; cerrusite coats limestone; minor copper stains; some crystalline calcite.
	Kinsey claims (T-3)	1462	4164240	619900	White subhedral to anhedral vein quartz carrying fresh and oxidized sulfides (pyrite, chalcopyrite, tetrahedrite(?), galena, sphalerite); alteration minerals include malachite, azurite, bronchantite, Fe-Mn-Sb oxides; minerals occur as distinct grains, clots, veinlets, and along surface where quartz meets in center of vein, also as dark gray bands of disseminated minerals; country rock dark-gray, grainy, limestone, locally silicified.
		1463	4164000	619840	White to gray, vuggy quartz vein; boxwork after sulfides (pyrite, galena, tetrahedrite, sphalerite, chalcopyrite); gossany ore contains intergrown cerussite and malachite crystals, jarosite.
		1464	4163700	619950	Quartz vein, white to gray, fractured, with pyrite, chalcopyrite, tetrahedrite(?); gossany zones with abundant copper-oxide staining, yellow oxides, jarosite, and manganese oxides.
	New Tempiute mine (T-4)	1452	4165350	621250	Skarn with pyrrhotite, pyrite, chalcopyrite, bismuthinite, and iron-rich sphalerite; both massive and crystalline sulfides occur in white vein quartz. Oxidized portions of the vein contain minor gossan zones.
		1453	4165520	621050	Crumbly, heavy, limonite-hematite-manganese-oxide gossan with abundant calcite; calcite crystals line vugs and cavities in the gossan.
		1454	4165520	621050	Argillically altered quartz monzonite with abundant iron- and manganese-oxide staining; pegmatitic quartz-muscovite veins cut the quartz monzonite.
	Relay adit (T-5)	3289	4162480	619360	Clots of cerussite, some tetrahedrite, blue and green copper oxides in sheared, recemented white vein quartz, yellow oxide staining on fracture surfaces; veinlets of chrysocolla.
	Schofield mine (T-6)	1455	4165770	621350	Skarn with massive sulfides; pyrite, chalcopyrite, bornite, sphalerite, and pyrrhotite intergrown with anhedral quartz. Fine sprays of powellitic scheelite occur locally.
		1456	4165800	621000	Garnet-epidote skarn, finely to coarsely crystalline, with subhedral to anhedral pyrite, chalcopyrite, bornite, sphalerite, and massive quartz; contains disseminated, fine-grained scheelite intergrown with powellite.
	Section 9 shaft (T-7)	1461	4162930	616570	White (bleached), punky, argillically altered volcanic ash; ash contains vitreous grains and pumice fragments; very minor iron-oxide staining and yellowish-green surface alteration.
	Temper claims (T-9)	1466	4161920	620050	Crystalline, dark-gray limestone, highly fractured and brecciated, with minor pods oxidized sulfides(?); white crystalline barite; limestone is locally silicified with minor iron-oxide stains; blue-white fluorescence on stringers and grains (scheelite?).

APPENDIX B.—*Sample Analyses*

District/area	Occurrence (no.)	Sample no.	Ca	Fe	Mg	Na	P	Ti	Ag	As	Au	B	Ba	Be	Bi	Cd	Co	Cr	Cu	Ga	Ge	La	Mn	Mo
Don Dale	Andies mine (D-1)	0581	0.15	5	0.02	–	–	0.05	< 0.5	N200	N10	20	500	2	N10	N20	N5	N10	10	–	–	20	< 10	7
		1467	0.05	20	0.5	–	–	0.2	7	N200	N10	50	1500	2	N10	N20	N5	N10	15	–	–	70	50	N5
		3000	0.1	5	< 0.02	–	–	0.03	N0.5	N200	N10	10	700	1.5	N10	N20	N5	N10	7	–	–	30	50	5
	April Fool Spring trench (D-3)	3001	0.1	0.7	0.05	–	–	0.1	N0.5	N200	N10	50	1500	1	N10	N20	N5	N10	5	–	–	50	50	N5
	Axis vein (D-4)	3053	N0.05	0.7	0.02	–	–	0.05	1.5	< 200	N10	15	150	1	N10	N20	N5	N10	10	–	–	< 50	150	N5
	Big Red prospect (D-5)	3052	< 0.05	1.5	< 0.02	–	–	0.02	1.5	500	N10	< 10	1500	< 1	N10	N20	N5	< 10	5	–	–	< 50	20	N5
	Big Red prospect, NW (D-6)	3050	< 0.05	3	< 0.02	–	–	0.5	150	300	N10	10	300	< 1	15	N20	N5	20	500	–	–	50	20	150
	Big Red prospect, W (D-7)	3051	N0.05	1	N0.02	–	–	0.07	100	500	N10	< 10	5000	N1	10	N20	N5	< 10	200	–	–	50	10	200
	Blue Streak prospect (D-8)	3049	N0.05	1	0.05	–	–	0.07	2	< 200	N10	15	70	< 1	N10	N20	7	20	20	–	–	< 50	300	N5
	Don Dale mine (D-9)	1468	0.05	10	0.3	–	–	0.2	7	< 200	N10	50	500	2	20	N20	N5	10	2000	–	–	50	200	< 5
		1469	< 0.05	5	0.05	–	–	0.07	7	200	N10	20	150	10	N10	N20	N5	N10	30	–	–	50	200	10
		3020	N0.05	5	0.03	–	–	0.05	7	N200	N10	15	300	< 1	N10	N20	N5	10	2000	–	–	20	10	N5
	East Section 34 prospect (D-10)	1470	0.05	5	0.05	–	–	0.02	5	< 200	N10	20	150	3	N10	N20	< 5	N10	20	–	–	50	2000	N5
	North Section 34 prospect (D-11)	3060	0.05	1.5	0.02	–	–	0.03	200	200	N10	< 10	50	< 1	15	< 20	7	< 10	3000	–	–	< 50	1000	5
	Outcrop north of radar site (D-12)	3021	< 0.05	1	0.02	–	–	0.05	1	N200	N10	< 10	100	< 1	N10	N20	N5	< 10	15	–	–	20	50	< 5
	Ridge vein (D-13)	3059	0.05	2	0.02	–	–	0.05	1	< 200	N10	15	700	1.5	N10	N20	5	10	10	–	–	< 50	3000	5
	Sidewinder prospect (D-14)	3048	0.05	5	0.03	–	–	0.07	1.5	200	N10	20	100	1.5	N10	N20	5	15	200	–	–	< 50	300	10
Freiberg	Felsite shaft (F-1)	3287	3	20	0.2	< 0.2	< 0.2	0.03	3	N200	N10	50	70	1	N10	N20	300	< 10	2000	70	N10	50	700	7
	Freiberg mine (F-2)	1764	20	10	0.7	–	–	0.05	20	N200	N10	10	< 20	2	300	> 500	100	N10	150	–	–	50	> 5000	N5
	Freiberg tungsten prospect (F-3)	1767	20	10	5	–	–	0.5	2	200	N10	500	700	< 1	70	20	10	30	150	–	–	50	3000	150
	New Freiberg mine (F-6)	1765	20	10	10	–	–	0.005	100	< 200	N10	10	< 20	N1	10	300	N5	N10	1500	–	–	50	2000	N5
		1766	10	10	1	–	–	0.05	30	5000	N10	20	500	< 1	10	200	N5	20	> 20000	–	–	50	2000	< 5
	Section 20/21 adit (F-10)	1763	20	10	5	–	–	0.02	150	N200	N10	200	50	< 1	200	200	< 5	N10	7000	–	–	50	2000	N5
	Smelter shaft (F-11)	1761	2	10	0.1	–	–	0.05	100	> 10000	N10	20	100	< 1	50	200	N5	≤ 10	> 20000	–	–	50	500	50
		1762	1	3	0.2	–	–	0.15	1	500	N10	50	300	1	N10	N20	N5	< 10	200	–	–	50	20	50
		3288	3	10	0.07	< 0.2	0.2	0.03	200	> 10000	N10	15	100	1	100	> 500	N10	< 10	> 20000	20	N10	N50	500	50
Golden Gate Range	Golden Gate Range prospect (G-1)	3200	2	15	0.15	< 0.2	< 0.2	0.05	N0.5	500	N10	70	100	< 1	N10	N20	< 10	2000	50	50	N10	< 50	70	7
Pahranagat	Arab shaft (P-1)	3285	5	2	1.5	< 0.2	0.2	0.015	> 5000	1500	N10	< 10	N20	1	10	20	< 10	10	20000	10	N10	N50	2000	< 5
	Black Prince lode (P-2)	3264	20	0.15	0.7	< 0.2	N0.2	0.05	5	N200	N10	< 10	1000	< 1	N10	N20	N10	50	10	N5	N10	N50	> 5000	5
	Castle property (P-3)	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
	Edna lode (P-4)	4386	5	2	1.5	N0.2	0.2	0.02	1500	10000	N10	< 10	150	< 1	1000	150	N10	15	> 2000	30	N10	N50	3000	N5
	Fifth of July mine (P-5)	3273	5	0.7	0.7	< 0.2	N0.2	0.05	2000	300	N10	10	100	N1	10	N20	N10	30	7000	20	N10	N50	> 5000	< 5
	Gentry prospect (P-6)	3266	7	0.5	1	< 0.2	< 0.2	0.003	100	300	N10	N10	5000	< 1	N10	N20	N10	100	50	N5	N10	N50	> 5000	10
	Harrison mine (P-7)	3262	5	10	3	> 5	< 0.2	0.002	150	700	N10	150	30	< 1	100	100	N10	< 10	1500	15	N10	N50	> 5000	7
	Illinois mine (P-8)	3272	3	1	0.1	< 0.2	N0.2	0.07	2000	700	N10	10	100	N1	20	N20	N10	20	15000	50	N10	< 50	> 5000	< 5
	Indiana ledge (P-9)	3286	0.07	0.1	0.07	< 0.2	< 0.2	0.03	5000	700	N10	10	70	1	N10	N20	< 10	< 10	3000	5	N10	N50	500	< 5
	John T. lode (P-10)	3263	0.15	5	0.03	< 0.2	N0.2	0.005	150	1500	N10	50	200	3	700	N20	N10	20	1000	< 5	N10	N50	> 5000	5
	Lone Pine prospect (P-11)	3265	3	0.7	1	< 0.2	0.2	0.03	500	300	N10	N10	1000	N1	N10	N20	N10	100	500	N5	N10	N50	> 5000	5
	Long Horne silver mine (P-12)	3261	2	0.15	0.07	< 0.2	< 0.2	0.03	500	N200	N10	< 10	300	1	N10	N20	N10	50	300	50	N10	50	> 5000	15
	Queen of the Hill lode (P-13)	3270	7	0.07	2	< 0.2	N0.2	0.015	700	3000	N10	N10	30	N1	1000	N20	N10	10	5000	50	N10	N50	> 5000	10
	Rosey #3 lode claim (P-14)	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
	Rosey mine (P-15)	3269	2	1	0.03	< 0.2	N0.2	0.01	700	5000	N10	10	100	N1	200	N20	N10	15	20000	20	N10	N50	3000	200
	Sanderson Canyon shaft (P-16)	3274	0.3	10	0.07	< 0.2	N0.2	0.05	1000	5000	N10	50	100	N1	100	N20	N10	20	2000	10	N10	< 50	> 5000	< 5
	Silver Prince mine (P-17)	3271	0.15	5	0.03	< 0.2	N0.2	< 0.002	700	3000	N10	20	150	N1	N10	N20	N10	50	15000	30	N10	< 50	5000	150
	South Paw mine (east) (P-18)	3268	2	1.5	0.7	< 0.2	< 0.2	0.02	30	N200	N10	< 10	500	< 1	N10	N20	N10	150	15	N5	N10	N50	> 5000	5
	South Paw mine (P-18)	3267	5	0.2	0.7	0.2	< 0.2	0.005	150	N200	N10	N10	150	N1	N10	N20	N10	100	20	N5	N10	N50	> 5000	< 5
	Tom Blunder shaft (P-19)	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
Queen City	Black Hawk mine (QCi-1)	3198	< 0.05	0.3	0.03	< 0.2	0.2	0.05	2	200	N10	< 10	300	< 1	N10	N20	< 10	10	10	< 5	N10	N50	50	20
	End of Trail #2 claim (QCi-2)	3463	0.1	3	0.3	< 0.2	< 0.2	0.3	N0.5	< 200	N10	30	500	1.5	N10	N20	< 10	< 10	30	30	N10	< 50	150	< 5
	Fallini property (QCi-3)	3199	1.5	2	0.05	< 0.2	0.3	0.03	.7	< 200	N10	10	50	< 1	N10	N20	< 10	< 10	10	< 5	N10	N50	100	10
	Queen City manganese prospect (QCi-4)	3471	1.5	3	0.070	N0.2	N0.2	0.003	2	2000	N10	20	1500	15	N10	N20	700	N10	15	< 5	N10	N50	> 5000	15
	Queen City prospect 1 (QCi-5)	3462	0.15	3	0.1	N0.2	< 0.2	0.3	0.5	300	N10	20	1000	1.5	N10	N20	< 10	10	50	20	N10	< 50	200	5
	Queen City prospect 2 (QCi-6)	3464	0.07	1.5	0.15	N0.2	< 0.2	0.15	1.5	< 200	N10	15	> 5000	1	< 10	N20	N10	< 10	30	10	N10	< 50	30	N5
	Queen City prospect 3 (QCi-7)	3465	0.15	3	0.1	N0.2	N0.2	0.3	< 0.5	1000	N10	20	500	1.5	N10	N20	N10	15	15	20	N10	50	30	10
	Red Wing prospect (QCi-8)	1471	0.1	3	0.1	–	–	0.2	1	1500	N10	20	1500	2	N10	N20	N5	N10	15	–	–	50	50	< 5
		3197	< 0.05	1	0.03	< 0.2	0.2	0.2	N0.5	700	N10	< 10	1000	1	N10	N20	< 10	10	15	10	N10	50	10	10
Quinn Canyon	Crystal contact prospect (QCa-1)	3469	10	5	0.5	0.7	N0.2	0.007	N0.5	300	N10	10	3000	70	N10	N20	N10	N10	7	5	N10	< 50	> 5000	200
Seaman Range	Lost Shepherd claims (S-2)	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
Tem Piute	Emerson mine (6700-foot level) (T-1)	1458A	20	20	2	–	–	0.03	< 0.5	N200	N10	30	< 20	20	N10	N20	N5	N10	150	–	–	N50	5000	< 5
		1458B	20	10	1.5	–	–	0.1	< 0.5	N200	N10	10	100	10	< 10	N20	N5	50	100	–	–	N50	5000	> 2000
	Emerson mine (Grubstake-Moody zone) (T-1)	1459	20	10	2	–	–	0.07	3	N200	N10	10	20	20	> 1000	50	N5	20	70	–	–	N50	5000	100
		1460	5	> 20	1	–	–	0.007	< 0.5	N200	N10	20	N20	30	< 10	N20	< 5	N10	1000	–	–	50	5000	20
	Emerson mine (Wah Chang pit) (T-1)	1457A	20	20	2	–	–	0.05	2	N200	N10	50	100	30	< 10	N20	N5	N10	700	–	–	N50	5000	20
		1457B	0.2	1	0.02	–	–	0.03	2	N200	N10	10	50	< 1	N10	N20	N5	N10	100	–	–	N50	100	20
	Johnson claims (T-2)	1465	> 20	2	7	–	–	0.05	> 5000	200	N10	20	20	< 1	N10	200	N5	N10	1500	–	–	50	2000	20
	Kinsey claims (T-3)	1462	3	0.5	2	–	–	0.002	500	1000	N10	10	N20	N1	N10	150	N5	N10	5000	–	–	50	1000	N5
		1463	1	0.2	0.7	–	–	0.005	500	700	N10	10	< 20	N1	N10	150	N5	N10	5000	–	–	50	300	< 5
		1464	0.7	0.1	0.3	–	–	0.02	500	200	N10	20	< 20	< 1	N10	200	N5	N10	1000	–	–	50	300	10
	New Tempiute mine (T-4)	1452	5	20	1.5	–	–	0.01	< 0.5	N200	N10	20	< 20	10	< 10	50	20	N10	200	–	–	N50	5000	< 5
		1453	5	20	0.05	–	–	0.01	< 0.5	200	N10	20	1000	50	< 10	100	150	N10	200	–	–	N50	> 5000	300
		1454	0.5	15	0.2	–	–	0.2	1	N200	N10	100	1000	7	10	N20	N5	N10	100	–	–	N50	3000	30
	Relay adit (T-5)	3289	1	0.7	0.2	< 0.2	< 0.2	< 0.002	5000	1500	N10	70	30	< 1	N10	200	< 10	< 10	20000	100	N10	< 50	700	30
	Schofield mine (T-6)	1455	10	> 20	2	–	–	0.02	2	N200	N10	50	150	30	10	N20	50	N10	2000	–	–	N50	5000	< 5
	Schofield mine (T-6)	1456	15	20	2	–	–	0.02	2	N200	N10	20	50	30	10	N20	10	N10	1000	–	–	N50	5000	< 5
	Section 9 shaft (T-7)	1461	0.7	10	1	–	–	0.15	< 0.5	N200	N10	50	150	5	< 10	N20	N5	N10	50	–	–	50	1000	20
	Temper claims (T-9)	1466	15	2	7	–	–	0.05	1500	300	N10	50	20	N1	N10	200	< 5	< 10	200	–	–	50	1500	N5

Ca, Fe, Mg, and Ti values are in percent; all others in ppm. Spectrographic analyses (columns headed by element symbol) and atomic absorption analyses (columns headed by AA + element symbol) by the Branch of Geochemistry, U.S. Geological Survey, Denver, Colorado. > = greater than the upper quantifiable limit shown, < = detected but less than the lower quantifiable limit shown, N = not detected at the lower quantifiable limit shown, — not tested.

APPENDIX B.—*Sample Analyses (continued)*

Nb	Ni	Pb	Sb	Sc	Sn	Sr	Th	V	W	Y	Zn	Zr	AAAg	AAAs	AAAu	AABi	AACd	AACu	AAHg	AAMo	AAPb	AASb	AAZn	Sample no.
N20	N5	70	N100	< 5	N10	< 100	N100	< 10	N50	15	N200	100	–	10	N0.05	–	–	–	–	–	–	4	55	0581
20	N5	100	< 100	10	< 10	100	N100	50	N50	50	< 200	200	–	20	N0.05	–	–	–	–	–	–	6	–	1467
N20	N5	20	< 100	< 5	N10	100	N100	< 10	N50	15	N200	50	–	10	N0.05	–	–	–	> 5.0	–	–	N1	40	3000
N20	N5	20	< 100	5	N10	100	N100	< 10	N50	15	N200	100	–	N5	N0.05	–	–	–	0.10	–	–	N1	5	3001
N20	5	70	< 100	N5	N10	N100	N100	< 10	N50	< 10	N200	70	–	120	0.1	–	–	–	2.6	–	–	8	140	3053
N20	< 5	20	< 100	N5	N10	< 100	N100	10	N50	N10	N200	50	–	800	0.05	–	–	–	> 5.0	–	–	46	15	3052
N20	5	2000	2000	5	20	300	N100	< 10	N50	15	N200	1000	–	500	0.75	–	–	–	> 5.0	–	–	> 1000	80	3050
N20	< 5	15000	300	N5	< 10	200	N100	N10	N50	< 10	N200	150	–	700	1.4	–	–	–	> 5.0	–	–	380	70	3051
N20	7	150	< 100	< 5	N10	N100	N100	10	N50	< 10	N200	150	–	150	< 0.05	–	–	–	0.70	–	–	22	60	3049
20	30	7000	500	5	20	N100	N100	70	N50	10	1000	300		160	0.1	–	–	–	–	–	–	500	–	1468
20	20	200	< 100	N5	N10	N100	N100	20	N50	< 10	300	200	–	110	< 0.05	–	–	–	–	–	–	16	–	1469
N20	N5	3000	150	N5	N10	N100	N100	10	N50	< 10	300	150	–	110	N0.05	–	–	–	0.34	–	–	140	250	3020
20	10	200	N100	N5	N10	N100	N100	20	N50	< 10	300	50	–	65	0.4	–	–	–	–	–	–	6	–	1470
N20	5	10000	700	N5	30	N100	N100	< 10	N50	< 10	5000	70	–	300	0.2	–	–	–	1.2	–	–	800	> 2000	3060
N20	< 5	20	< 100	N5	N10	N100	N100	10	N50	N10	N200	50	–	50	N0.05	–	–	–	0.01	–	–	14	20	3021
N20	15	50	< 100	5	N10	N100	N100	< 10	N50	10	200	70	–	160	< 0.05	–	–	–	2.2	–	–	16	390	3059
N20	20	200	< 100	< 5	N10	N100	N100	< 10	N50	< 10	500	100	–	170	< 0.05	–	–	–	0.70	–	–	12	860	3048
N20	100	30	< 100	< 5	30	< 100	N100	20	N20	10	1000	50	–	N5	N0.05	–	–	–	–	–	–	N1	850	3287
< 20	< 5	1000	< 100	< 5	20	< 100	N100	10	N50	< 10	> 10000	100	–	5	< 0.05	–	–	–	–	–	–	2	–	1764
20	10	200	100	15	10	500	N100	50	5000	N10	1000	200	–	140	N0.05	–	–	–	–	–	–	12	–	1767
< 20	< 5	> 20000	200	N5	500	< 100	N100	50	N50	N10	> 10000	N10	–	300	N0.05	–	–	–	–	–	–	170	–	1765
< 20	< 5	20000	1000	< 5	100	100	N100	20	N50	N10	10000	50	–	> 2000	N0.05	–	–	–	–	–	–	430	–	1766
< 20	< 5	> 20000	150	N5	20	100	N100	10	N50	N10	> 10000	< 10	–	60	1.6	–	–	–	–	–	–	170	–	1763
< 20	< 5	> 20000	1500	< 5	20	100	N100	10	N50	< 10	> 10000	50	–	> 2000	0.1	–	–	–	–	–	–	> 1000	–	1761
< 20	< 5	150	< 100	N5	N10	100	N100	20	N50	< 10	500	200	–	300	< 0.05	–	–	–	–	–	–	36	–	1762
20	< 5	> 50000	1000	< 5	30	100	N100	10	N20	15	> 10000	50	–	> 2000	0.05	–	–	–	–	–	–	900	> 2000	3288
N20	70	15	< 100	< 5	20	150	N100	1500	N20	20	300	20	–	500	N0.05	–	–	–	–	–	–	2	450	3200
N20	< 5	> 20000	5000	< 5	20	100	N100	< 10	N20	N10	1000	15	–	1900	0.08	–	–	–	–	–	–	> 1000	1600	3285
N20	10	30	100	< 5	N10	3000	N100	100	N20	10	200	100	–	400	0.1	–	–	–	.82	–	–	22	300	3264
N20	15	2000	300	N5	N10	200	N100	100	N20	< 10	2000	N10	180	1700	N1.5	N6.0	11	460	–	3.9	4000	220	2400	4385
N20	< 5	> 20000	10000	N5	30	100	N100	10	N20	< 10	> 10000	10	1700	7300	N15	420	110	23000	–	14	83000	6800	23000	4386
N20	< 5	> 20000	1000	N5	N10	N100	N100	10	< 20	N10	> 10000	30	–	500	0.05	–	–	–	8.0	–	–	920	> 2000	3273
N20	< 5	300	200	N5	N10	1000	N100	200	N20	N10	< 200	N10	–	800	0.15	–	–	–	2.2	–	–	8	350	3266
N20	7	> 20000	500	5	10	< 100	N100	100	< 20	N10	> 10000	N10	–	1100	< 0.05	–	–	–	3.0	–	–	360	> 2000	3262
N20	N	> 20000	5000	N5	N10	< 100	N100	< 10	< 20	N10	> 10000	20	–	800	0.05	–	–	–	4.8	–	–	> 1000	> 2000	3272
N20	5	10000	1500	< 5	< 10	< 100	N100	150	< 20	N10	3000	70	–	800	0.15	–	–	–	–	–	–	> 1000	1900	3286
N20	< 5	> 20000	200	N5	N10	< 100	N100	500	< 20	< 10	10000	< 10	–	1600	< 0.05	–	–	–	3.4	–	–	280	> 2000	3263
N20	< 5	2000	500	N5	N10	300	N100	100	N20	N10	7000	< 10	–	600	0.1	–	–	–	26	–	–	380	> 2000	3265
N20	< 5	> 20000	1000	5	N10	N100	N100	20	< 20	< 10	200	20	–	70	0.2	–	–	–	–	–	–	420	250	3261
N20	7	> 20000	7000	N5	N10	< 100	N100	< 10	< 20	N10	> 100	< 10	–	> 2000	N0.05	–	–	–	56	–	–	> 1000	> 2000	3270
N20	5	> 20000	5000	< 5	N10	150	N100	15	N20	< 10	5000	30	440	2500	N1.5	N6.0	31	6900	–	3.5	56000	2200	4000	4384
N20	< 5	> 20000	10000	N5	N10	< 100	N100	< 10	20	N10	> 10000	N10	–	> 2000	0.05	–	–	–	16	–	–	> 1000	> 2000	3269
N20	5	20000	5000	N5	N10	N100	N100	15	< 20	10	> 10000	70	–	> 2000	N0.05	–	–	–	3.2	–	–	> 1000	> 2000	3274
N20	7	> 20000	700	N5	N10	200	N100	15	< 20	N10	> 10000	< 10	–	> 2000	< 0.05	–	–	–	4.0	–	–	400	> 2000	3271
N20	< 5	100	< 100	< 5	N10	200	N100	100	N20	N10	< 200	< 10	–	90	0.2	–	–	–	2.2	–	–	14	300	3268
N20	< 5	200	200	< 5	N10	3000	N100	200	N20	N10	300	< 10	–	80	0.15	–	–	–	48	–	–	14	300	3267
N20	< 5	> 20000	7000	N5	30	N100	N100	< 10	N20	< 10	5000	15	2000	4000	N1.5	250	57	11000	–	1.1	110000	4700	4600	4383
N20	< 5	< 10	< 100	< 5	< 10	150	N100	< 10	< 20	N10	N200	70	–	100	0.25	–	–	–	–	–	–	2	10	3198
< 20	< 5	50	N100	7	N10	200	N100	N20	N20	20	N200	100	N0.15	99	N0.05	N2.0	N0.10	3.4	–	2.1	12	8.9	23	3463
N20	5	< 10	< 100	< 5	N10	200	N100	20	N20	< 10	N200	30	–	90	0.06	–	–	–	–	–	–	2	5	3199
N20	100	15	N100	< 5	N10	200	N100	50	N20	100	1000	N10	N0.15	2700	N0.50	N2.0	3.3	12	–	22	8.0	3.8	2800	3471
< 20	< 5	30	N100	7	N10	500	N100	100	N20	20	N200	150	N0.15	280	N0.50	N2.0	N0.10	8.6	–	3.1	13	6.8	33	3462
< 20	< 5	300	N100	7	20	1000	N100	70	N20	15	N200	50	0.69	97	N0.50	N2.0	N0.10	15	–	2.3	240	21	38	3464
< 20	< 5	30	< 100	10	N10	300	N100	100	N20	20	N200	150	N0.15	910	N0.50	N2.0	N0.10	4.4	–	7.9	15	18	7.2	3465
20	N5	50	100	N5	N10	2000	N100	70	N50	10	< 200	200	–	750	0.15	–	–	–	–	–	–	50	–	1471
N20	< 5	< 10	< 100	7	N10	300	N100	70	< 20	10	N200	150	–	600	0.27	–	–	–	–	–	–	20	10	3197
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N20	30	50	N100	5	N10	1000	N100	300	N20	20	< 200	70	N0.15	520	N0.50	N2.0	0.45	66	–	8.1	13	19	120	3470
20	< 5	10	N100	< 5	200	N100	N100	100	7000	< 10	500	N10	–	N5	N0.05	–	–	–	–	–	–	N1	–	1458A
20	20	20	N100	5	50	200	N100	200	1000	< 10	500	50	–	N5	N0.05	–	–	–	–	–	–	N1	–	1458B
20	50	700	N100	5	150	100	N100	200	1000	50	5000	20	–	5	N0.05	–	–	–	–	–	–	N1	–	1459
20	< 5	10	N100	N5	20	N100	N100	200	1000	< 10	500	N10	–	N5	N0.05	–	–	–	–	–	–	N1	–	1460
20	< 5	20	N100	< 5	300	100	N100	100	5000	< 10	500	30	–	10	N0.05	–	–	–	–	–	–	N1	–	1457A
< 20	< 5	10	N100	N5	N10	N100	N100	10	N50	< 10	< 200	100	–	N5	N0.05	–	–	–	–	–	–	N1	–	1457B
< 20	50	15000	5000	N5	N10	N100	N100	50	N50	< 10	5000	N10	–	400	N0.05	–	–	–	–	–	–	> 1000	–	1465
< 20	< 5	20000	2000	N5	50	N100	N100	10	N50	< 10	10000	N10	–	300	N0.05	–	–	–	–	–

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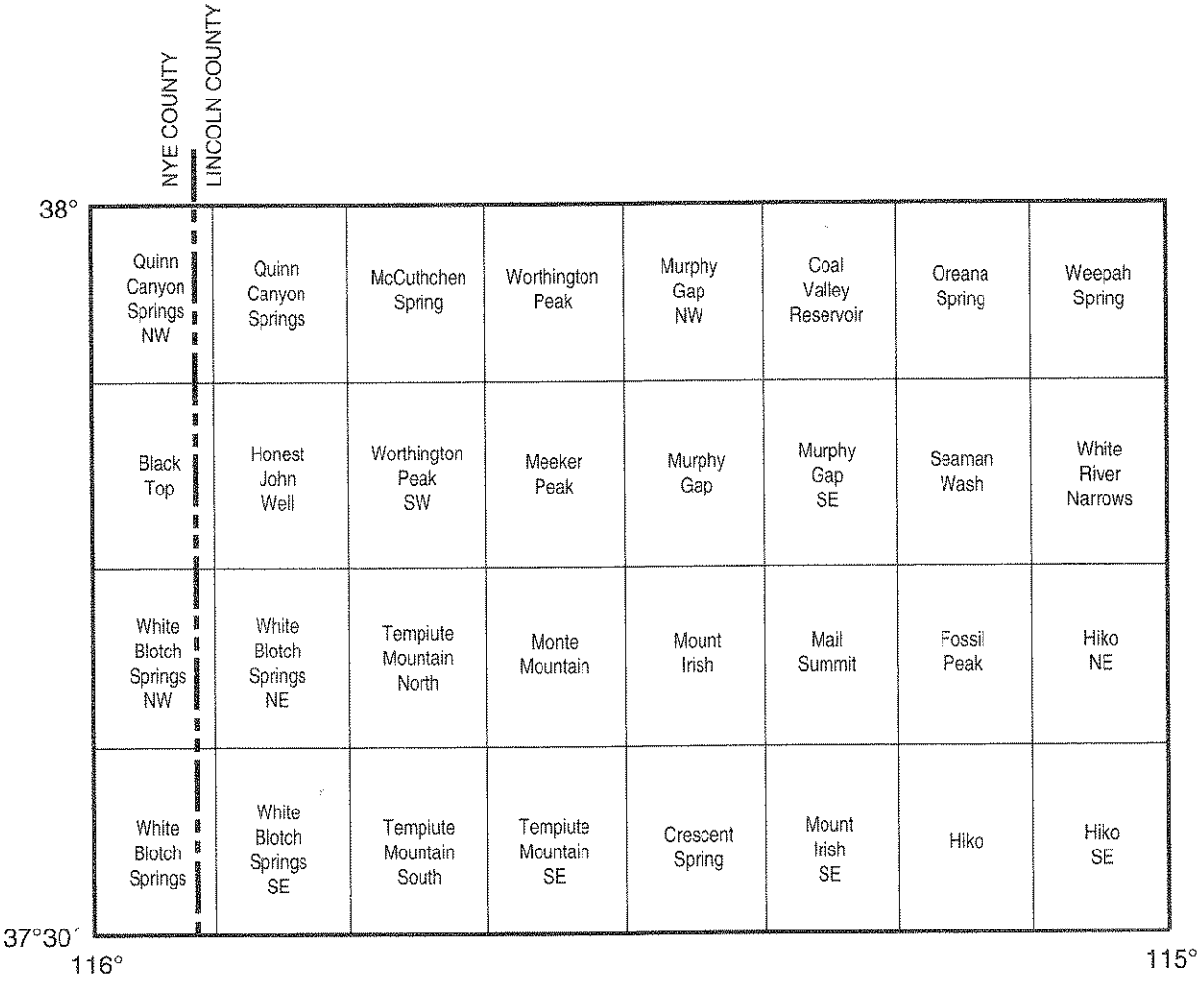

Index of USGS 7½′ and 15′ quadrangle maps within the Timpahute Range 30′ by 60′ Quadrangle.

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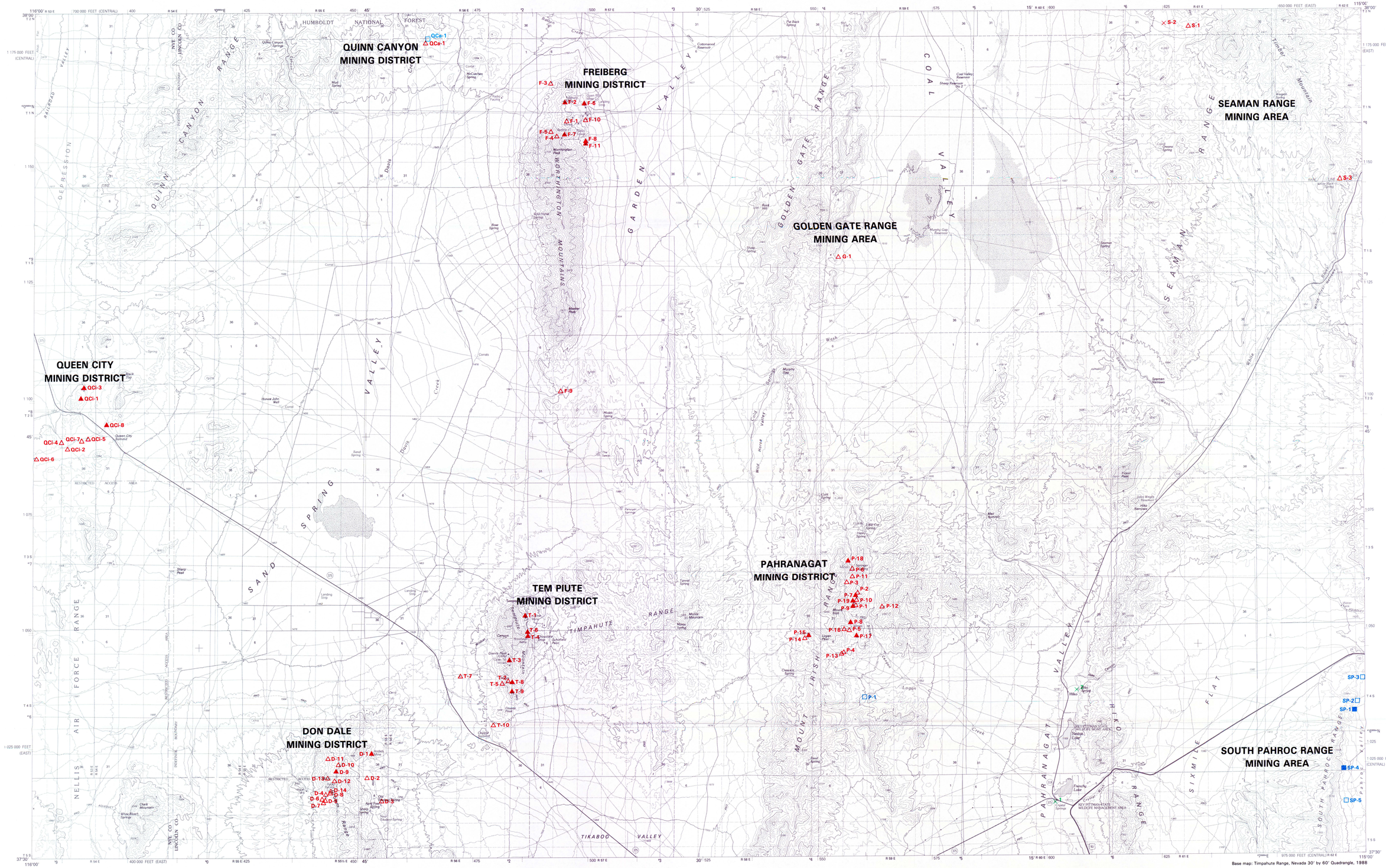

Base map: Timpahute Range, Nevada 30' by 60' Quadrangle, 1988

SCALE: 1:100,000

0 1 2 3 MILES

0 1 2 3 4 5 KILOMETERS

METALLIC OCCURRENCES
- ▲ Mine, recorded production
- △ Prospect, no known production
- × Occurrence

NONMETALLIC OCCURRENCES
- ■ Mine, recorded production
- □ Prospect, no known production
- × Occurrence

GEOTHERMAL
- ● Well, production
- ○ Well, no production
- × Hot spring or other occurrence

OIL AND GAS
- ● Well, past or present production
- ○ Well, no past or present production
- × Seep or other occurrence

METALLIC OCCURRENCES

Don Dale mining district

D-1	Andies mine	Hg
D-2	ANW claims	Hg
D-3	April Fool Spring trench	Au(?)
D-4	Axis vein	Ag, Au
D-5	Big Red prospect	Au, Ag
D-6	Big Red prospect NW	Au, Ag
D-7	Big Red prospect W	Ag, Au
D-8	Blue Streak prospect	Au, Ag
D-9	Don Dale mine	Pb, Ag, Cu
D-10	East Section 34 prospect	Ag, Au(?), Cu
D-11	North Section 34 prospect	Ag, Au
D-12	Outcrop north of radar site	Au(?)
D-13	Ridge vein	Au(?)
D-14	Sidewinder prospect	Au, Ag

Freiberg mining district

F-1	Felsite shaft	Zn, Pb
F-2	Freiberg mine	Ag, Pb, Zn, Au
F-3	Freiberg tungsten prospect	W, Mo
F-4	Mountain View claim	Ag, Pb, Zn
F-5	Mountain View No. 3 claim	Ag, Pb, Zn, Au
F-6	New Freiberg mine	Ag, Pb, Zn, Cu
F-7	Petrulas mine	Ag, Pb, Zn
F-8	Roadside property	Ag, Pb
F-9	Section 17 prospect	Ag, Pb(?)
F-10	Section 20/21 adit	Cu, Pb, Zn, Ag(?)
F-11	Smelter shaft	Ag, Zn, Pb, Cu

Golden Gate Range mining area

G-1	Golden Gate Range prospect	Pb, Ag

Pahranagat mining district

P-1	Arab shaft	Ag
P-2	Black Prince lode	Ag, Mn
P-3	Castle property	Ag
P-4	Edna lode	Ag
P-5	Fifth of July mine	Ag, Pb
P-6	Gentry prospect	Mn
P-7	Harrison mine	Ag, Pb
P-8	Illinois mine	Ag, Pb
P-9	Indiana ledge	Ag
P-10	John T. lode	Ag, Pb, Mn
P-11	Lone Pine prospect	Ag, Mn
P-12	Long Horne silver mine	Ag, Pb
P-13	Queen of the Hill lode	Ag, Pb
P-14	Rosey #3 lode claim	Ag
P-15	Rosey mine	Ag, Pb
P-16	Sanderson Canyon shaft	Ag, Pb
P-17	Silver Prince mine	Ag, Pb
P-18	South Paw mine	Mn
P-19	Tom Blunder shaft	Ag, Pb

Queen City mining district

QCi-1	Black Hawk mine	Hg
QCi-2	End of Trail #2 claim	Au, Hg(?)
QCi-3	Fallini property	Hg
QCi-4	Queen City manganese prospect	Mn
QCi-5	Queen City prospect 1	Au, Hg(?)
QCi-6	Queen City prospect 2	Au, Hg(?)
QCi-7	Queen City prospect 3	Au, Hg(?)
QCi-8	Red Wing prospect	Hg

Quinn Canyon mining district

QCa-1	Crystal contact prospect	Ag, Pb(?)

Seaman Range mining area

S-1	CV and ORA claims	Au, Ag
S-2	Lost Shepherd claims	Au
S-3	Section 33 prospect	Au, Ag

Tem Piute mining district

T-1	Emerson mine	W, Mo, Zn, fluorspar
T-2	Johnson claims	Ag, Pb, Cu
T-3	Kinsey claims	Ag, Pb, Cu
T-4	New Tempiute mine	W, Mo, Ag, Zn
T-5	Relay adit	Ag
T-6	Schofield mine	W, Mo, Zn
T-7	Section 9 shaft	unknown
T-8	Sterling claim	Ag
T-9	Temper claims	Ag, Pb
T-10	Wash shaft	Ag

NONMETALLIC OCCURRENCES

Pahranagat mining district

P-1	Tricia claims	water-laid tuffite

Quinn Canyon mining district

QCa-1	Cotton Top claim	optical quartz

South Pahroc Range mining area

SP-1	Blue Ridge claims	perlite
SP-2	Doe claims	perlite
SP-3	Flat No. 1 and 2 claims	perlite
SP-4	Mackie mine	perlite
SP-5	Saphire No. 1 and 2 claims	perlite

GEOTHERMAL OCCURRENCES

Pahranagat Valley

1	Crystal Springs	thermal water
2	Hiko Spring	thermal water

OIL AND GAS OCCURRENCES

no known occurrences

MINERAL RESOURCES OF THE TIMPAHUTE RANGE 30' BY 60' QUADRANGLE

The Nevada Bureau of Mines and Geology (NBMG) is part of the Mackay School of Mines at the University of Nevada, Reno and is the state geological survey. NBMG scientists conduct research and publish reports on mineral resources and various aspects of general, environmental, and engineering geology.

Current activities in mineral resources and general geology include detailed geologic mapping and stratigraphic studies in Nevada, comparative studies of bulk mineable precious-metal deposits, geochemical investigations of mining districts, resource assessments, igneous petrologic studies, hydrothermal experiments, research on the origin of hydrothermal platinum-group-element occurrences, and examination of the origin and distribution of borate deposits in Nevada.

Environmental, engineering, and urban geology projects include investigations of earthquake hazards and related aspects of neotectonics, examination of issues involved in siting nuclear and hazardous wastes, mapping of geomorphic features, radon hazard studies, studies of landslide hazards, and investigation of land subsidence in Las Vegas Valley.

Geologic information activities include creating and updating databases on mining districts, active mines and prospects, and geothermal and petroleum exploration and production; implementation and development of statewide geographic information systems; and maintenance of core and cuttings facilities, rock and mineral collections for research, aerial photographic imagery and maps, and extensive files on Nevada geology and resources.

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