NEVADA BUREAU OF MINES AND GEOLOGY 1999

NBMG OPEN-FILE REPORT 99-12

MINERAL REPORT

Pah Rah Plan Amendment Area

Washoe County, Nevada

PREPARED FOR

Bureau of Land Management
Carson City Field Office
Carson City, Nevada

Joseph V. Tingley
Larry J. Garside

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

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SUMMARY

In February 1998 the Carson City District Office, Bureau of Land Management, contracted with the Nevada Bureau of Mines and Geology to assess the mineral and energy resource potential of the Pah Rah Plan Amendment Area (Pah Rah project area). The assessment covers approximately 21,969 acres of public land managed by the Bureau of Land Management in the Pah Rah Range of Washoe County, Nevada.

The assessment program consisted of a review of available data on geologic setting, metallic and industrial minerals, uranium, geothermal resources, and petroleum resources. Mine and prospect sites found within the area were examined and samples of mineralized material were collected and analyzed. Metallic mineral samples were analyzed for 40 metallic and trace elements. From these data, areas of mineral potential were defined and estimates were made of the types of known and undiscovered mineral resources that may be present within the project area and the favorability for their occurrence.

No identified mineral resources commercially exploitable at the present time were found within the Pah Rah project area.

Examination of data collected during the assessment program did, however, define areas of potential for the discovery of mineral resources. These areas are shown on figures 5-1 and 5-2 are summarized in table S-1. Figure S-1 is a summary of the areas of moderate mineral potential within the Pah Rah project area.

Table S-1. Summary of mineral potential, Pah Rah project area.

Resource Potential	Certainty Level	Mineral Resource	Area	Figure	Comments
<u>**Energy Mineral Resources**</u>					
<u>*Petroleum Resources*</u>					
No potential	D	petroleum resources	all of project area	none	absence of source rocks
<u>*Geothermal Resources*</u>					
No potential	D	geothermal resources	all of project area	none	absence of heat source, no known thermal wells or springs
<u>**Metallic Mineral Resources**</u>					
Moderate	C	Au, Ag	Big Mouth Canyon	5-1	defined by geology, prospect data, sample data
Moderate	C	Au, Ag	Stud Horse Canyon	5-1	defined by geology, prospect data, sample data
Moderate	C	Au, Ag	Fort Defiance Creek	5-1	defined by geology, prospect data, sample data
Low	B	Au, Ag	see fig. 5-1	5-1	defined by geology, prospects, sample data
<u>**Uranium Resources**</u>					
Low	C	U	all of project area	none	defined by geology, sample data
<u>**Industrial Mineral Resources**</u>					
Moderate	B	crushed stone	see fig. 5-2	5-2	defined by geology
Low	B	crushed stone	see fig. 5-2	5-2	defined by geology
Low	B	sand and gravel	see fig. 5-2	5-2	defined by geology

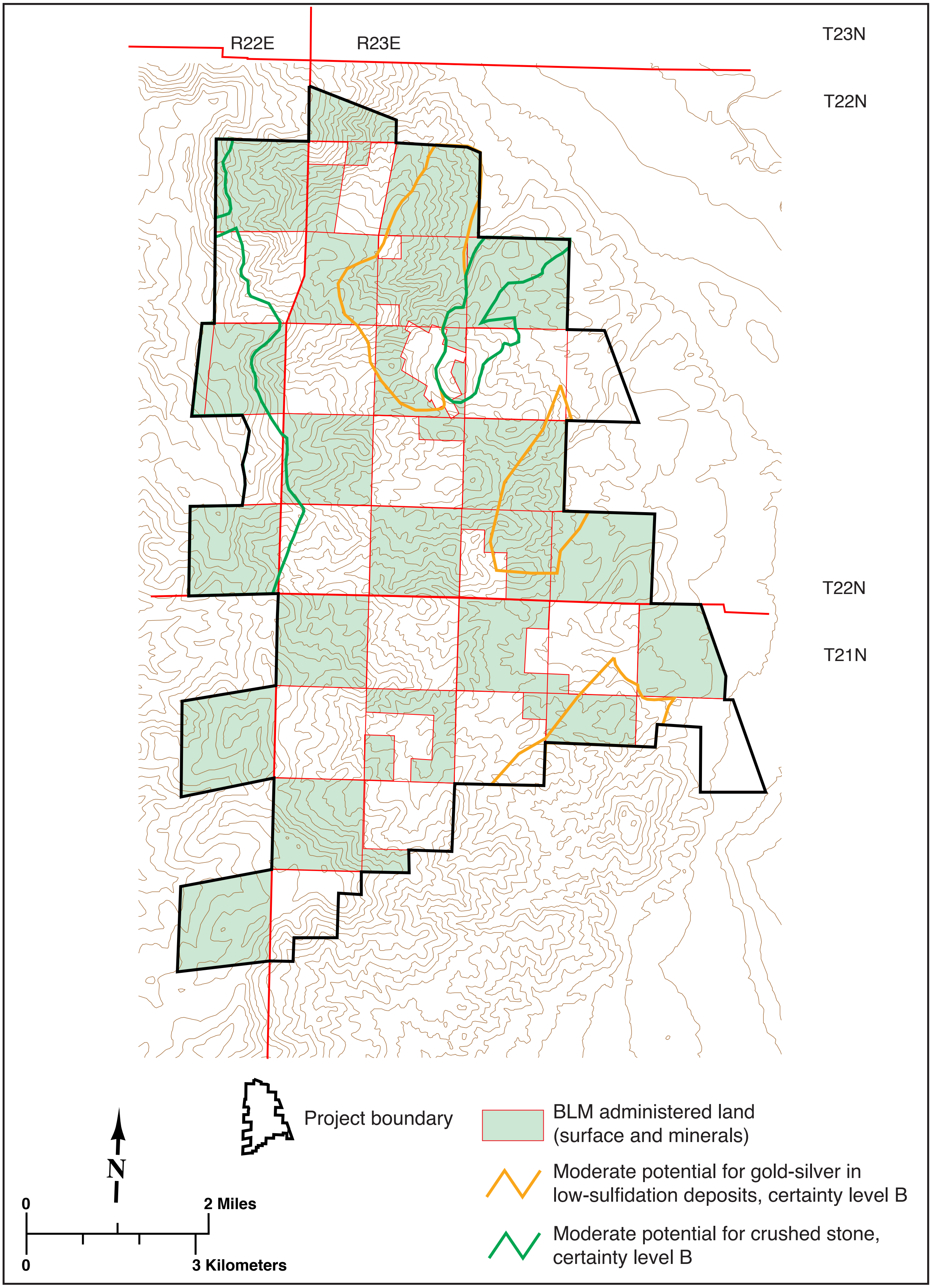


Figure S-1. Areas of moderate mineral potential in the Pah Rah project area.

1 INTRODUCTION

1.1 Purpose and scope

The purpose of the investigation summarized in this report was to conduct a survey and provide an assessment of all energy and mineral resources on public land administered by the Bureau of Land Management within the Pah Rah Plan Amendment Area (Pah Rah project area), Washoe County, Nevada (fig. 1-1). Preliminary work on the project began in the summer of 1998, field work was carried out in the late spring of 1999, and the project was completed in June 1999.

The assessment program consisted of a review of available data on geologic setting, oil and gas resources, geothermal resources, metallic and industrial minerals, and uranium resources of the project area. Mines and prospects within the area were examined and samples of mineralized material were collected and analyzed.

From these data, areas of mineral potential were defined and estimates were made of the types of known and undiscovered mineral resources that may be present within the project area and of the favorability for their occurrence. Levels of mineral resource potential and certainty of assessment (table 1-1) were assigned using the system described by Goudarzi (1984, p. 23–24). This information has been assembled in a mineral potential report which follows, with some modification, the formats outlined by Goudarzi (1984) and in Section 3060.13 of the BLM Manual.

1.2 Location

The Pah Rah project area is located in the southeastern Pah Rah Range about 15 km north-northwest of the community of Wadsworth, Washoe County, Nevada. The area is lies on the eastern slope of the Pah Rah Range and extends from White Horse Canyon on the south to Coal Creek on the north (fig 1-1). The study area includes 21,969 acres of public land in the Carson City BLM District (fig. 1-2).

There are three mining districts in the Pah Rah Range: the Pyramid district, on the northwest side of the range; the McClellan district along the western slope of the range; and the Olinghouse district on the south end of the range (fig. 1-3). Most of the Pah Rah project area is within the Olinghouse district, but a small strip of land along the western border of the district falls within the adjacent McClellan district. The productive, and presently active, part of the Olinghouse district is south of the project boundary.

1.3 History of mining

The Olinghouse district was first prospected in 1860, locations were made in Fort Defiance Canyon in 1864, and the Green Mountain Mines at Olinghouse were located in 1874 (Hill, 1911). Prior to 1900, placer deposits situated in several ravines tributary to Olinghouse Canyon were extensively worked by Wadsworth residents (Overton, 1947). The period between 1901 and 1903 witnessed the greatest activity in lode mining in the district, with three mills running most of the time (Hill, 1911). In 1906, a railroad was constructed between Olinghouse and Wadsworth, connecting the camp with a 50-stamp mill located on the Truckee River; the mill ran for only three months and the operation failed due to lack of ore. The railroad was dismantled in 1909 and the track was sold to the Nevada Copper Belt Railroad, then under construction near Yerington (Myrick, 1962). After the failure of the railroad, company operations at Olinghouse ceased and the mines were turned over to lessees (Bonham, 1969). Only intermittent mining activity occurred at Olinghouse until 1986 when Western Goldfields Co. secured land in the eastern part of the district and conducted a limited drilling program. Encouraging gold mineralization was encountered in the drilling but, unable expand their land position, the company ceased its program. Phelps Dodge Corp. began work in 1991 and, by 1993, had developed a substantial gold resource in the central part of the old district. Alta Gold Co. acquired Phelps Dodge's interest in 1994. Alta defined ore reserves of 12.2 million tons grading 0.042 ounces per ton gold and, in September 1998, placed the Olinghouse Mine in production.

Production is recorded from the Olinghouse district beginning in 1898 and, through 1966, about $1 million, mainly in gold and silver, was produced from the district (Bonham, 1969). The new Olinghouse Mine, scheduled to produce 100,000 ounces of gold per year beginning in 1999, will add substantially to the total district production.

Mining activity in the Pyramid district, northwest of the Pah Rah project area, began around 1860 when prospectors noticed prominent ledge outcroppings, and that district was organized in 1866 (Overton, 1947).

There is very little information on the history of mining activity in the portion of the northern Olinghouse district that is included in the Pah Rah project area. The northern Pah Rah Range may have been included in the Pyramid District prior to the formation of the White Horse (Olinghouse) District, and prospecting in the Big Mouth Canyon area dates back to 1860 (Overton, 1947). Fort Defiance Canyon (mentioned above) is within the project area and prospecting was apparently underway there in 1864. Patent records, however, show that claims now included in the Bay State-Morning Star Group were not staked until the period of 1905 to 1914. In 1875, there was a short-lived "coal" rush in the drainage of what is now called Coal Creek in the northern part of the project area. Up to a dozen 320-acre claims were staked on what was reputed in the local papers to be good-grade coal (D. Davis, personal commun., 1999). No coal is present in the area, and nothing came of the ill-conceived staking flurry although traces of the old location monuments can be found today. There are no extensive mine workings within the Pah Rah project area, and the most recent activity appears to have been in the 1930s if not earlier. Several companies have undertaken exploration projects in the area in the last two decades: Dennison Mines (U.S.) Inc. and Bristlecone Mining Co. explored the unpatented Paiute Claim group in Big Mouth Canyon between 1981 and about 1987; Meridian Minerals Corp. was active in the Stud Horse Canyon and Big Mouth Canyon areas in 1998; and Brancote U.S, Inc., as of

1998, was maintaining the Moongold group of unpatented claims in the area of Stud Horse Canyon.

Overton (1947) reported that a few small shipments of gold-silver ore were made from the Big Mouth Canyon area, but there is no official record of this or any other production from within the Pah Rah project area.

Table 1-1. Definitions of mineral resource potential and certainty of assessment.*

Definitions of Mineral Resource Potential

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

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

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

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

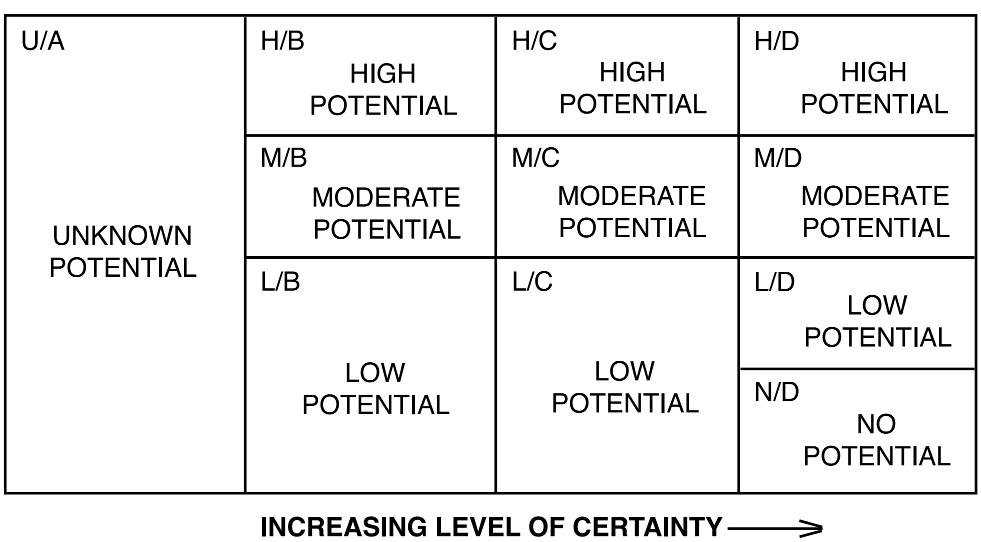
NO (N) mineral resource potential is a category reserved for a specific type of resource in a well-defined area.

Definitions of Level of Certainty

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

*Modified from Goudarzi 1984.

Relationships between levels of resource potential and certainty



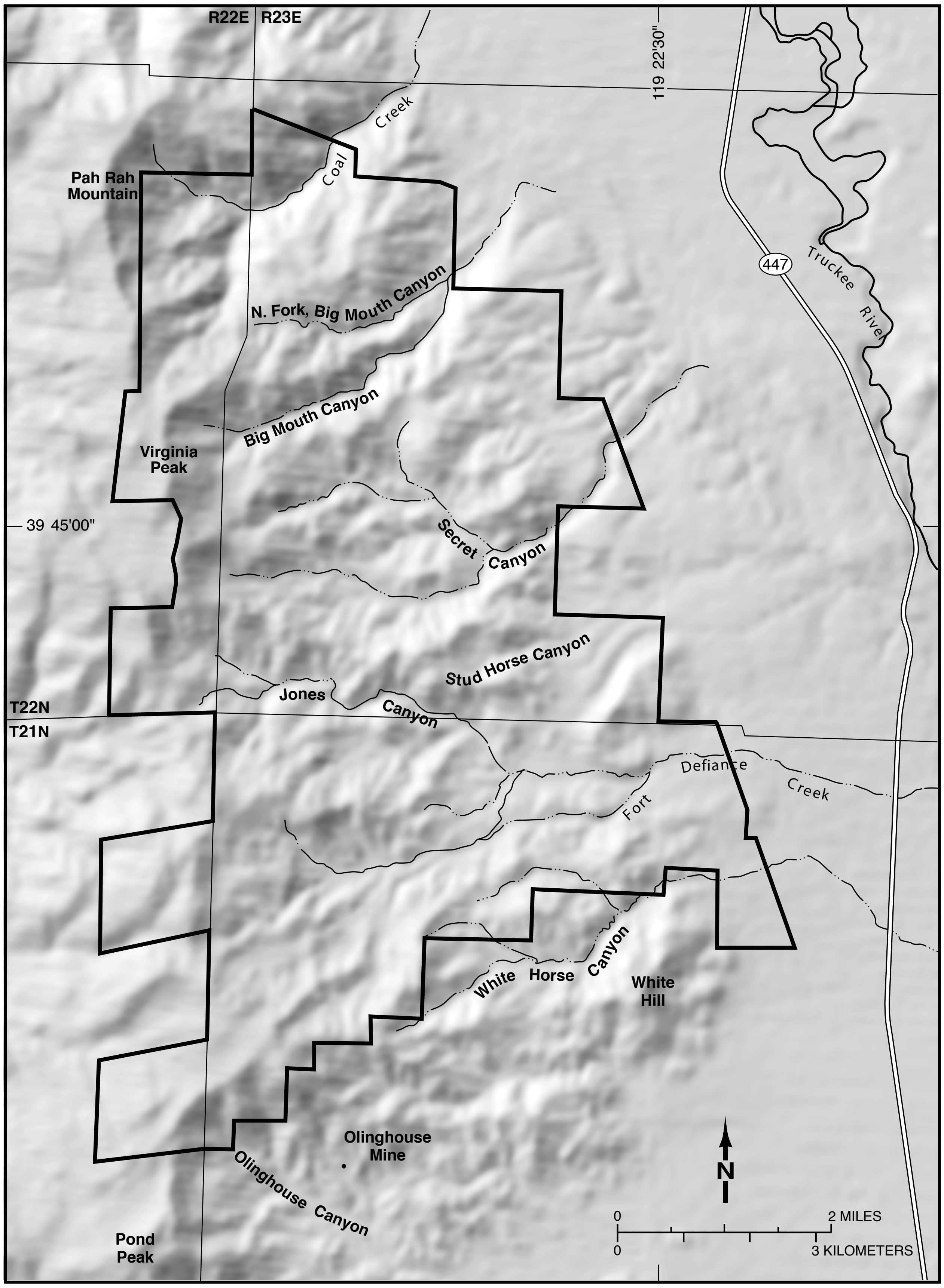


Figure 1-1. Location map of the Pah Rah project area.

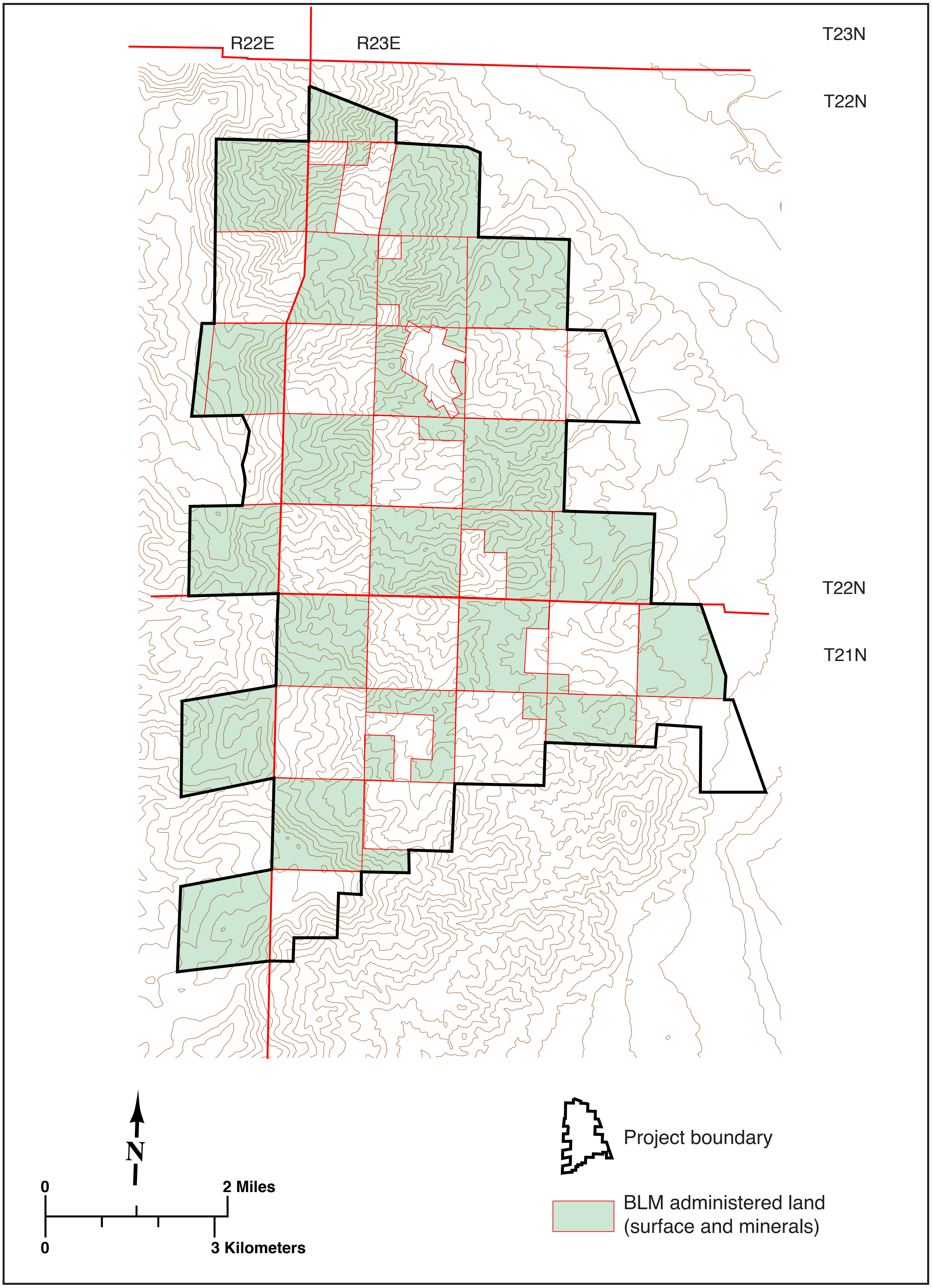


Figure 1-2. Land status map of the Pah Rah project area.

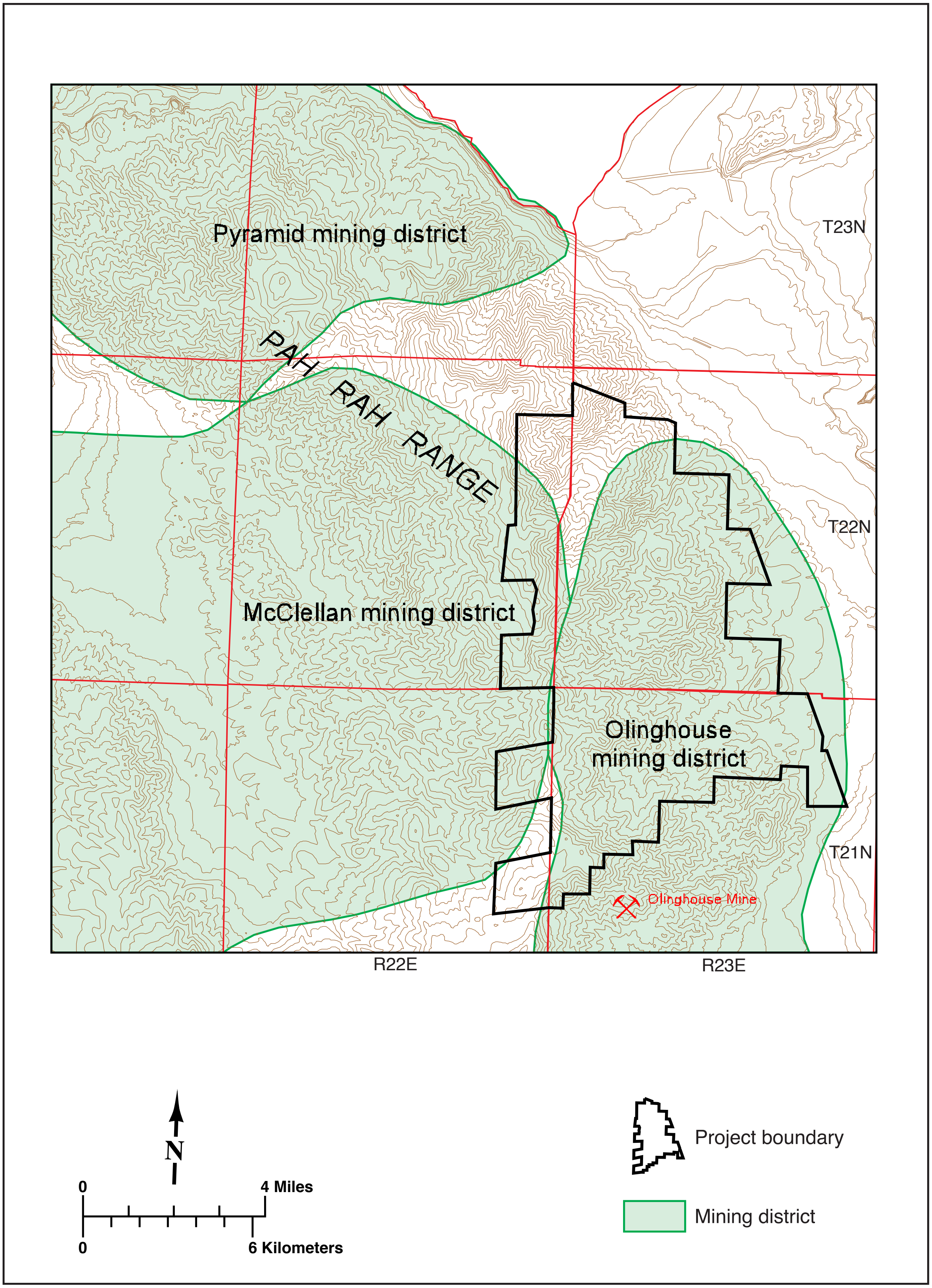


Figure 1-3. Mining districts in the Pah Rah project area.

2 GEOLOGIC SETTING

2.1 Structural geology

The Pah Rah Range is located within the northern part of the Walker Lane belt, a northwest-striking zone of right-lateral strike-slip faulting and diverse topography that separates the Sierra Nevada to the west from the generally north-northeast-striking basin-range topography to the east (Stewart, 1988). The Walker Lane belt has been proposed to accommodate at least a part of the right-lateral component of plate motion between the Pacific and North American plates that is not taken up by the San Andreas fault system (Atwater, 1970; Stewart and Crowell, 1992; Cashman and others, 1996). It is predominantly a Cenozoic feature, although some faults in certain segments may be reactivated Mesozoic faults (Stewart, 1988).

Major faults of the Pah Rah Range are predominantly northwest striking, with a component of right-lateral offset (fig. 2-1). Offset on the Pyramid Lake part of the Walker Lane belt has been estimated at 32 km by Bonham (1969), based on the apparent offset of the northern extent of the Oligocene to early Miocene ash-flow tuffs. At the southern end of the Pah Rah Range the predominate faults strike northeast. These faults, a part of the Olinghouse fault zone, are believed to have predominately left-lateral motion. Faults of the Olinghouse zone are mineralized in the main Olinghouse district.

2.2 Stratigraphy

The Pah Rah Range consists of Mesozoic basement rocks overlain by an approximately 31-21 Ma silicic ash-flow tuff sequence, which is in turn overlain by a thick group of intermediate, or locally mafic, lavas. Younger mafic lavas and small-volume rhyolite domes and flows make up the youngest volcanic rocks of the area.

Within the Pah Rah project area, the oldest Tertiary unit is the Pah Rah Formation of Bonham (1969). This unit, found in a single exposure in the canyon of Coal Creek in the northern part of the project area, is a lahar that presumably overlies Mesozoic basement rocks (fig. 2-1). The lahar is composed of poorly sorted silt- to boulder-sized fragments of andesite along with clasts of the underlying Mesozoic rocks. The base of this formation is not exposed, and the top is an erosional unconformity; about 60 m of the unit are exposed in Coal Creek and it has been found nowhere else in the Pah Rah Range (Bonham, 1969). The top of this unit is not well exposed, but there is locally a thin (1.5- 5-meter-thick) arkosic wacke and mudstone unit between the lahar and the overlying ash-flow tuffs. Sparse, scattered carbonized limb and leaf casts found in this thin sedimentary layer are the probable source of the name "Coal Canyon."

In all other areas within the Pah Rah Range, regionally extensive silicic ash-flow tuffs of Oligocene to Miocene age directly overlie an erosion surface, apparently with some relief, cut on Mesozoic granitic and metamorphic rocks. This relationship can be seen in outcrop to the south in the Truckee River Canyon and presumably similar Mesozoic rocks underlie the Pah Rah project area as well.

The oldest of the Oligocene to early Miocene ash-flow tuffs, informally referred to as the tuffs of Whiskey Spring in the Pah Rah Range, as well as thicker sequences of coeval(?) ash-flow tuffs of similar composition in the central Pah Rah Range, are found throughout that range (e.g., Garside and Bonham, 1992). Lying above these oldest welded tuffs in the Pah Rah Range and to the west is a sequence of ash-flow tuffs that range in age to at least as young as 24.9 Ma tuff of Chimney Spring (fig. 2-1). Recent geologic mapping in the Pyramid mining district (S. Castor and L. Garside, unpub. data, 1998) suggests that a dacitic ash-flow tuff and comagmatic(?) dacite plugs and flows overlie the 24.9 Ma tuff of Chimney Spring there; a caldera source may be centered on the district. If this tuff is similar in age to the dacite flows and plugs, it would be about 21-20 Ma, based on K-Ar age determinations reported by Wallace (1975).

Approximately 1,200 m of ash-flow tuffs are exposed in Big Mouth Canyon, and similar tuffs in Secret Canyon to the south underlie the tuff of Chimney Spring. These tuffs have compositional and probable cooling breaks within them, which is not common in typical intracaldera tuffs. However, the great thicknesses of compositionally similar rock are suggestive of a nearby source area. One or more 31- to 29-Ma calderas may thus be present in the Pah Rah Range.

Lying above the Oligocene and early Miocene ash-flow tuffs, particularly in the southern Pah Rah Range, is a group of intermediate composition calc-alkaline lava flows, domes, lahars, and pyroclastic rocks which includes the Alta Formation (ca. 20-17 Ma) and the overlying Kate Peak Formation (commonly 16 to 12 Ma in the Virginia City area, but as young as 10 Ma in the eastern Virginia Range). Rocks similar to the Kate Peak Formation are as young as 8.3 ± 0.6 Ma in the Olinghouse mining district (E.H. McKee, written commun., 1994).

Beginning at about 17 Ma, the northern Great Basin and the Columbia Plateau are characterized by widespread, voluminous basaltic volcanism associated with less volumetrically significant andesites and rhyolites, commonly referred to as a bimodal suite. This predominantly basaltic, bimodal volcanism is probably related to the widespread crustal extension that began at about this time. It is represented in the Pah Rah Range by the 15 to 12 Ma Pyramid sequence, which consists predominantly of flows of olivine-bearing basaltic andesite and minor interbedded dark shales and white tuffs.

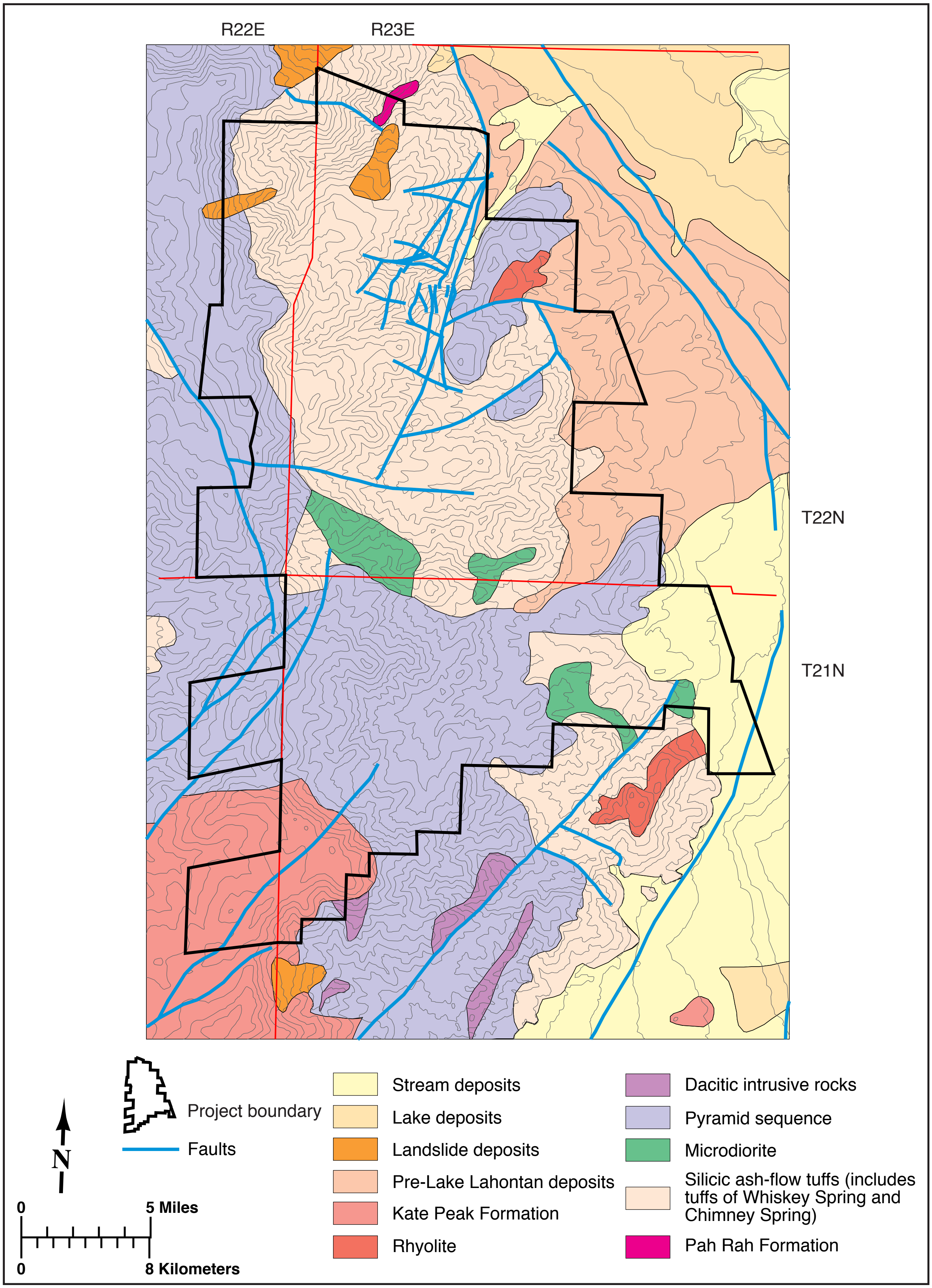


Figure 2-1. Generalized geologic map of the Pah Rah project area (From Bonham, 1969; H.F. Bonham and L.J. Garside, unpub. geologic mapping, 1989–1992; and Dennison Mines (U.S.) inc., unpub. geologic mapping, 1981–1985.

3 GEOCHEMISTRY

3.1 National Uranium Resource Evaluation (NURE) program

Geochemical data collected in the Pah Rah project area as part of the National Uranium Resource Evaluation (NURE) program were examined. Data for this program were collected in the 1975–80 period and consist of analyses of stream sediment and soil samples. Each sample was analyzed for uranium and for as many as 58 other elements. Only one sample was collected within the present project area, and only nine other sites were near the Pah Rah project area (fig 3-1). NURE sample analyses are listed in appendix A1.

3.2 Mine site sampling

Composite rock samples were collected at mines, prospects, and mineralized outcrops within the project area (fig. 3-2). These samples were collected to provide trace-element information on mineralization present at each site. Individual samples were high-graded from material found on old mine dumps (the best-looking mineralized material was collected for analysis) or collected from altered, discolored, or mineralized outcrops.

Two sets of mine site samples are included in this report: samples collected by the Nevada Bureau of Mines and Geology and the U.S. Geological Survey as part of an earlier project that included the Pah Rah project area (Tingley, 1990), and samples collected by the Nevada Bureau of Mines and Geology specifically for the current project. These data sets are included separately as appendix A2 (sample descriptions), and appendices A3 and A4 (sample analyses).

All mine site samples collected for the current project (appendix A3) were analyzed for 40 elements using geochemical analysis techniques. Analyses were carried out by organic extraction inductively coupled plasma-emission spectroscopy (ICP) and graphite-furnace atomic absorption (GFAA) methods by U.S. Mineral Laboratories, Inc., Auburn, California, and Acme Analytical Laboratories, Ltd., Vancouver, B.C. Sample descriptions, locations, and analyses are listed in appendix A. Discussions of sample results are included in descriptions of individual mines and prospects in Section 4.2.2.

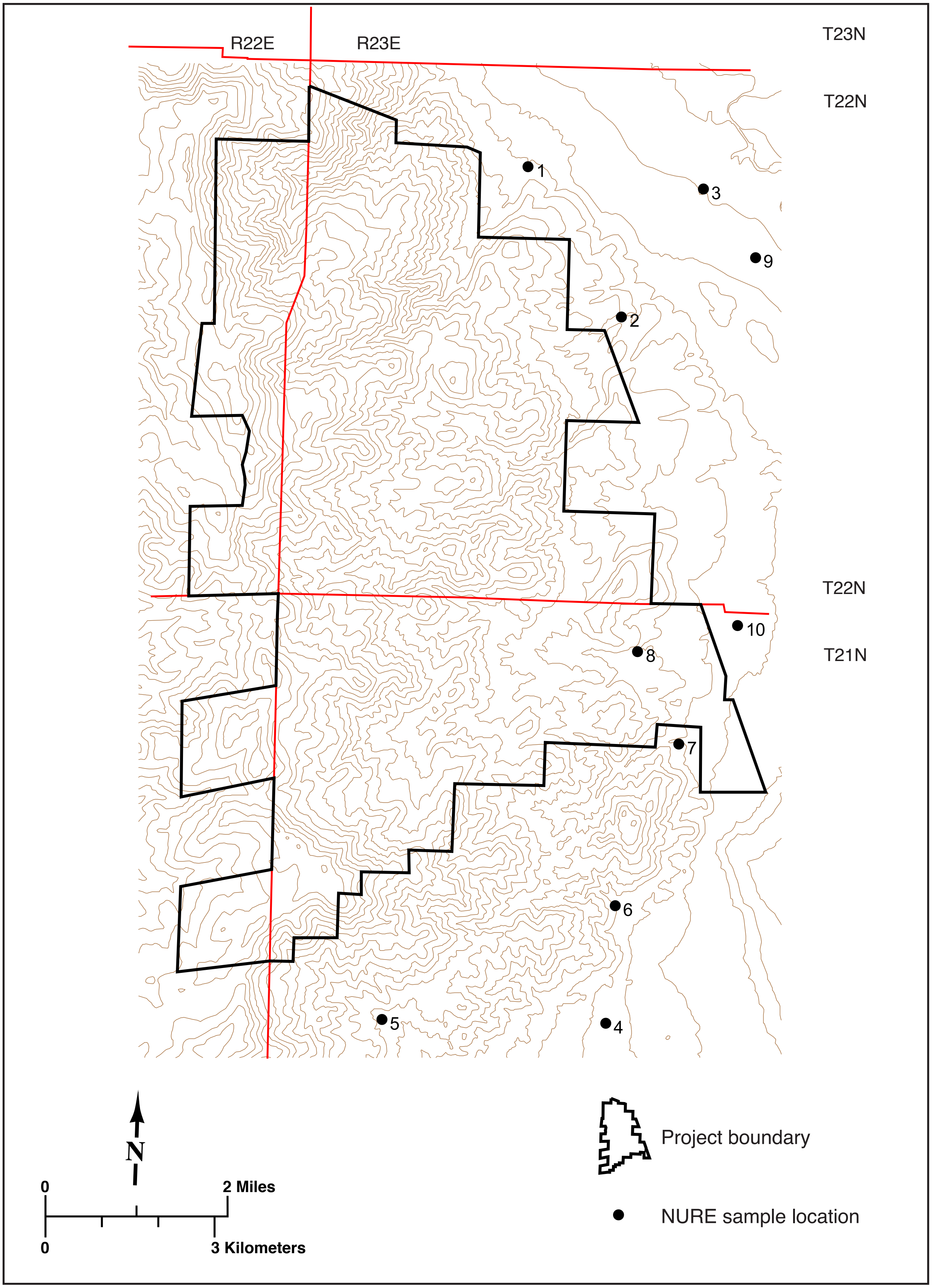


Figure 3-1. NURE sample locations in the Pah Rah project area.

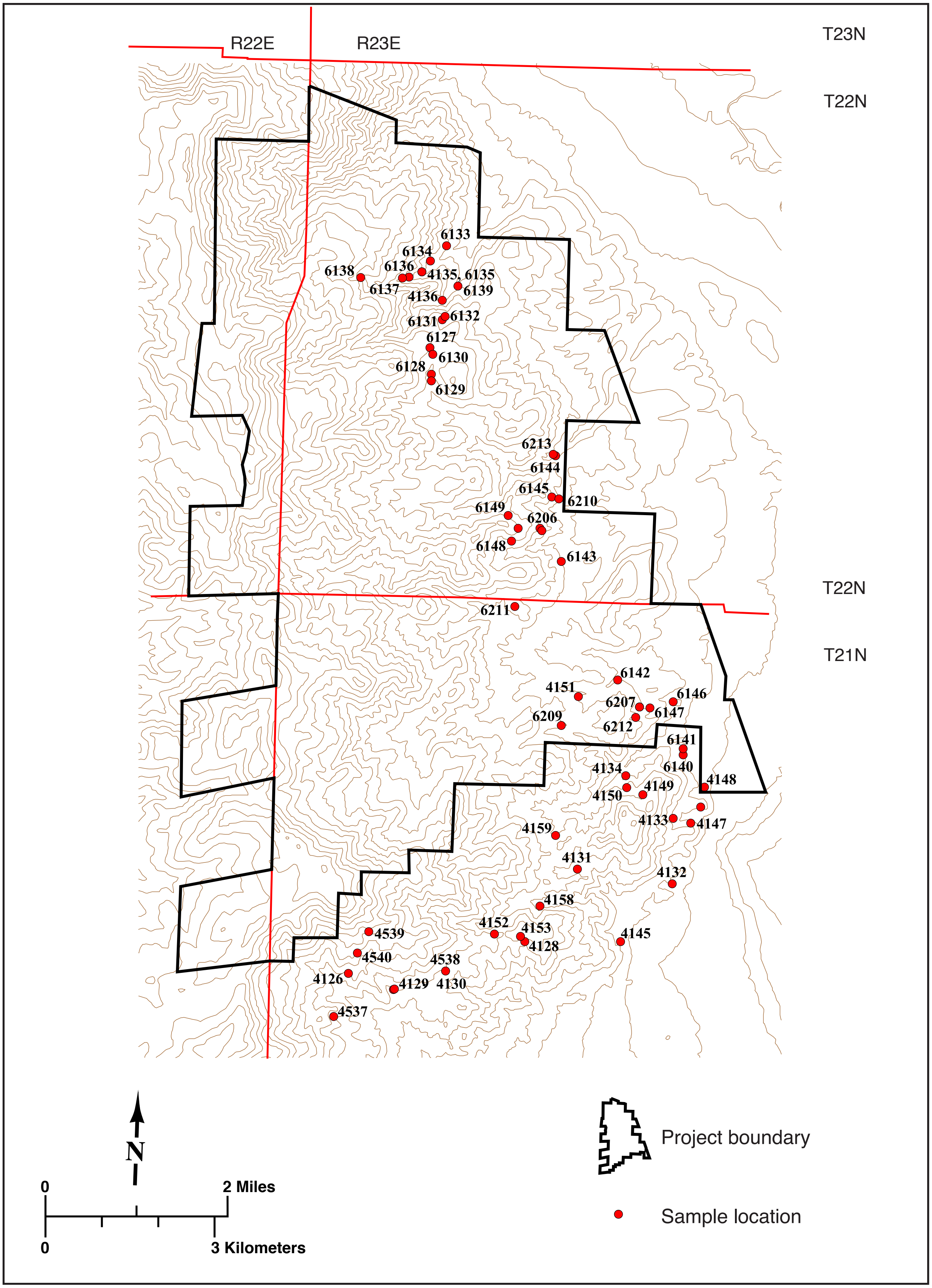


Figure 3-2. Mine-site sample locations in the Pah Rah project area.

4 DESCRIPTION OF ENERGY AND MINERAL RESOURCES

4.1 Known mineral deposits

No known energy resource, metallic, or industrial mineral deposits are located within the Pah Rah project area.

4.2 Known prospects, mineral occurrences, and mineralized areas

4.2.1 Energy resource occurrences

4.2.1.1 Petroleum resources

There have been no petroleum exploration wells drilled in the Pah Rah Range (Garside and others, 1988; Nevada Bureau of Mines and Geology, unpub. data, 1999). The closest nearby exploration wells are about 50 km distant. Two exploration wells were drilled west of Reno, 50 km to the southwest, nearly 90 years ago, based on a much more limited understanding of the occurrence of hydrocarbons (Tingley and others, 1999). The oil and gas shows originally reported from one of these wells are now believed unlikely (Tingley and others, 1999). Petroleum exploration wells were also drilled 50–70 km to the southeast of the Pah Rah Range, in the Carson Sink area of Churchill County, mainly during speculative booms of the 1920s and 1960s (Garside and others, 1988, p. 8). Hydrocarbon shows in some of these wells are predominantly methane, although at least two wells yielded small percentages of ethane and higher hydrocarbons (Morrison, 1964). Data from a significant exploration test of the deepest part of the Carson Sink basin (Standard Oil Co. Standard-Amoco-S.P. Land Co. No.1) and other studies indicate that temperatures have not been high enough in that part of the basin to generate significant amounts of oil (Hastings, 1979; Garside and others, 1988). However, the possibility exists that petroleum could have been generated elsewhere in the Carson Sink basin by heating associated with geothermal fluids.

Flammable gas was reported in 1920 from a water well in Honey Lake Valley (Moody, 1985, p. 43) about 50 km north of the Pah Rah Range, and biogenic methane has been reported from shallow drill holes in Pleistocene and Holocene sediments near Pyramid Lake (Prokopovich, 1978, 1983). Brady (1984) also reports natural gas (probably methane) from several wells in western Churchill County and northeastern Lyon County. The closest of these is located between Fernley and Hazen, about 30 km southeast of the Pah Rah Range. Probably all of these nearby gas occurrences are related to shallow biogenic processes and do not indicate that appreciable quantities of natural gas have been generated and preserved in any sediments of the valleys in the vicinity of the Pah Rah Range.

4.2.1.2 Geothermal resources

No thermal springs or wells (commonly those having temperatures 10°C or greater than the mean air temperature at the surface, and increasing by 25°C or more per kilometer with depth; Garside, 1994) are known from the Pah Rah project area. Garside and Schilling (1979) reported springs that may have somewhat anomalous temperatures about 5 km to the southeast and 6 km to the northwest of the study area; however, there is some doubt that these springs are correctly located or thermally anomalous (L. Garside, unpub. data, 1999). The closest confirmed warm spring is on Anahoe Island in Pyramid Lake, about 11 km from the north boundary of the study area. This spring, and others nearby (Garside and Schilling, 1979) at The Pyramid and The Needle Rocks (north end of Pyramid Lake) are probably associated with a strand of the Walker Lane, a major northwest-striking right-lateral strike slip fault zone which is located somewhat east of the study area.

4.2.1.3 Coal resources

Coal was first reported from near Pyramid Lake in 1875; a vein 4 ft in width was described, and numerous mining claims were reportedly staked (Nevada State Journal, 1875; Garside and others, 1980) A sample of the coal was said to be on display in a local Reno store. The mining claims were apparently staked in the area of Coal Creek, based on the Washoe County mining claim records; (D. Davis, oral commun., 1999; Bonham, 1969, p. 22–23) also reported that along Coal Creek, sedimentary beds of lignitic mudstone containing poorly preserved fossil leaves underlie Tertiary rhyolitic ash-flow tuffs and overlie Tertiary andesitic lahars.

The area of outcrop of lignitic sedimentary rocks in Coal Canyon was examined during this study. The andesite lahar unit contains a few cobbles of granitic rock and Mesozoic limestone, slate, and quartzite (Bonham, 1969), suggesting that these rocks were exposed nearby at the time of deposition of the lahar unit. Thus, the lahar unit (Pah Rah Formation of Bonham, 1969) may lie on preTertiary basement at not too great a depth below the level of exposure. The rhyolitic ash-flow tuffs which lie above the lignitic unit are similar to units dated by Ar 39- Ar 40 methods elsewhere to be as old as about 31 Ma (Garside and Niles, 1998; John and others, 1999). Thus, the lignitic sedimentary rocks and fossil leaves are believed to be middle Oligocene in age. Bonham (1969) reported 8–15 ft of arkosic wacke and lignitic mudstone between the lahar unit and the ash-flow tuffs. During our examination of this contact area along Coal Creek, we found the unit exposed only at the west end of the area of lahar outcrop, where one or two meters of poorly exposed volcaniclastic sedimentary rock were observed. There, a few coalified fossil leaves and small (commonly less than 1 cm diameter) limb fragments were noted in dark, volcaniclastic mudstone. Somewhat larger coalified limb fragments were noted in one piece of float in the canyon bottom downstream from the outcrop. We could not find enough material to make a good collection of the fossil leaves; certainly no significant amount of coal is present here along Coal Creek.

The discovery of coaly material in the canyon later called Coal Creek probably generated so much interest, and the staking of so many mining claims, because there was considerable incentive to discover coal to supply steam engines on the Central Pacific Railroad (see Townley, 1985, p. 6), which had been constructed through the area only 7 years before. There does not appear to be any further record of mining or prospecting for coal along Coal Creek, and we saw no prospect pits or mine workings in the area.

About 22 years after the Coal Creek activity, a coal discovery was reported from near the White Horse District (Mining and Scientific Press, 1897). The coal, reported to be of excellent quality, was said to be in a body 4 ft thick that was found 32 ft below the surface. The time of this reported discovery coincides with the discovery of gold in Olinghouse Canyon, following several years of activity a few miles to the north in what was then called the White Horse District, centered on White Horse Canyon. According to Townley (1985, p. 6), White Horse City, the community that developed near the White Horse Canyon prospects in 1893, was locally referred to as Coal Camp. Townley reported that the name refers to a thin seam of coal that was found above White Horse Canyon in the 1880s. Townley also reported that the deposit was limited and low grade.

Except for the four-foot width reported from both coal properties, there is little to connect the historic report of coal discovery in White Horse Canyon with the one in Coal Creek; White Horse Canyon is nearly 14 km south of Coal Creek, and the discoveries are separated by a number of years. Thus, the most logical conclusion is that the two reports describe separate coal localities. However there is little indication of coal in the vicinity of White Horse Canyon. No coal beds or lignitic material have been found in outcrops or on the dumps of mine workings in the area of White Horse Canyon (L.J. Garside, unpub. mapping, 1989-1992). Leaf fossils are found in light to dark shales intercalated with basalt flows in Pierson Canyon, about 8 km southwest of White Horse Canyon (Axelrod, 1992), indicating the possibility for coaly material in the rocks of the area. K-Ar ages of rocks near the leaf-bearing beds indicate an age of about 11-13 Ma for the unit (Stewart and others, 1994). Basalt flows and possibly some interbedded sedimentary units crop out in upper White Rock Canyon as well; however, the sedimentary units are commonly thin and discontinuous. Thus, a coal discovery in the vicinity of upper White Rock Canyon is possible, but has not been relocated in the past 100 years. Certainly no significant amounts of coal are present in the area.

4.2.2 Metallic mineral deposits

4.2.2.1 Pyramid district

The Pyramid district, located in the northern Pah Rah Range (fig. 1-3), includes high-sulfidation epithermal mineralization and a surrounding aureole of argillic and propylitic alteration on the northwest side of the range and Tertiary copper-molybdenum porphyry-style mineralization in Tom Anderson Canyon on the east side of the range. The high-sulfidation mineralization, concentrated in an area 1 to 4 km south of Mullen Pass, is about 13 km northwest of the western boundary of the Pah Rah project area. The copper-molybdenum porphyry mineralization is centered near the mouth of Tom Anderson Canyon, about 5 km north of the project's northern boundary. Neither of these types of mineralization are known to occur within the Pah Rah project area. The geology and ore deposits of the Pyramid district were summarized by Bonham (1969) and Wallace (1975, 1979). Geologic mapping at 1;24,000 scale is presently underway in the district and vicinity by S.B. Castor and L.J. Garside of the Nevada Bureau of Mines and Geology.

4.2.2.2 McClellan district

The McClellan district overlaps the western border of the Pah Rah project area by about one km and extends to the west an additional 27 km (fig. 1-3). Except for three small antimony vein occurrences in Mesozoic rocks located about 7 km west of the project boundary, most of the small prospects are scattered in the western part of the district; there are no known prospects or mineral occurrences within the portion of the district included in the Pah Rah project area.

4.2.2.3 Olinghouse district

The Olinghouse mining district is located in the southeastern part of the Pah Rah Range (fig. 1-3). It has a history of both placer and underground lode production in the late 1800s and early 1900s (Geesan, 1980; Garside and Bonham, 1992) and is the present site of an open-pit gold mine, the Olinghouse Mine, operated by Alta Gold Co. The district has been extended to include mines and prospects from Interstate 80 on the south to as far north as Big Mouth Canyon (about 12 km north of Olinghouse Canyon). Geologic mapping in the vicinity of the district includes Bonham (1969), Geesan (1980) and mapping in progress (L.J. Garside and H.F. Bonham, unpub. geologic mapping, 1989-1994). For this report, we divide the district into two segments: the main Olinghouse district to the south which includes most of the historic mines and the present Olinghouse Mine; and the Big Canyon Canyon-Fort Defiance Canyon area to the north. This northern area is referred to as the North Olinghouse district, and includes all of the Pah Rah project area (fig. 4-1). The following description of the geology of the Olinghouse district is taken mainly from Garside and Bonham (1992), and John and others (1999).

A sequence of Oligocene to Miocene silicic ash-flow tuff outflow sheets represents the oldest exposed rocks of the Olinghouse district. These rocks are interpreted to range from about 31 to 25 Ma, based on mapping and isotopic dating completed and in progress to the north and northeast by the Nevada Bureau of Mines and Geology. The lower part of this tuff section is informally referred to as the tuffs of Whiskey Spring and tuff of Coyote Spring. To the north of the main Olinghouse district, tuffs similar to Coyote and Whiskey Spring are considerably thicker in Secret and Big Mouth Canyons.

Lying above the silicic ash-flow tuffs in the Olinghouse district is a sequence of dark colored, olivine-bearing basaltic andesite flows and considerably less abundant lacustrine tuffaceous shales and silicic pyroclastic rocks, all informally called the Pyramid sequence (Bonham, 1969; Bonham and Garside, 1992). These rocks have been isotopically dated at a number of areas in the Pah Rah Range and appear to range in age from 15 to 11 Ma. In the main part of the Olinghouse district, the age range is approximately 13 to 11 Ma. South of the district and just north of Interstate 80, the Alta Formation (ca. 20-17 Ma) lies between the Pyramid sequence and the older silicic tuffs.

Near the main Olinghouse district, the Pyramid sequence is intruded by an anastomosing screen of dacitic and andesitic dikes. These dikes commonly are propylitically altered along with the enclosing Pyramid sequence. They are probably close in age to mineralization in the district, but they can be no older than 11 or 12 Ma (the upper age limit of Pyramid sequence in the district). The dikes include both andesite and basaltic andesite; a pyroxene-hornblende andesite dike on the southeast flank of Green Hill is relatively unaltered and may slightly postdate mineralization (10.39±0.08 Ma, Olinghouse andesite dike, fig. 15; C.D. Henry, written commun., 1995).

The Pyramid sequence and dacitic dikes are overlain by 8.3±0.6 Ma (E.H. McKee, written commun., 1994) dacite (approx. 66-69 weight percent $SiO2$) domes and flows. This rock closely resembles the Kate Peak Formation of the Virginia Range to the south, but it is considerably younger than most or all of that unit there (ca. 16-10 Ma), and probably should not be included within it. The dacite appears to overlie propylitically altered Pyramid sequence and dacite dikes, and an Ar40- Ar 39 age determination on vein adularia from Green Hill of 10.46±0.03 Ma (C.D. Henry, written commun., 1995) indicates that it is post mineralization.

The main part of the Olinghouse district, located north of Olinghouse Canyon in the vicinity of Green Hill, is in an area of basaltic flows of the Pyramid sequence cut by northeast-striking dacitic dikes. Many faults in this area parallel the dikes (Geesan, 1980), including faults that are mineralized. The Pyramid sequence dips 15°-20° west; underlying Oligocene to Miocene ash-flow tuffs dip west somewhat more steeply (25°-30°). The northeast-striking faults of this area are believed to have predominantly left-lateral displacement, and a fault which cuts the Quaternary alluvial fan east of the main district is the northern continuation of a Holocene fault which extends to the west-southwest parallel to the Truckee River Canyon (the Olinghouse fault of Sanders and Slemmons, 1979; Bell, 1984). To the northeast, this fault apparently is cut off by, or turns north and merges with, the Pyramid Lake fault zone, a northwest-striking right-lateral strike-slip fault which bounds the Pah Rah Range on the east. The Olinghouse district is at the juncture of the Pyramid Lake domain of predominantly northwest-striking right-lateral faults, and the Carson domain of northeast-striking left-lateral faults (Stewart, 1988). Alteration and dikes along faults parallel to the Olinghouse fault of Sanders and Slemmons (1979) indicate that these faults are at least 11 Ma.

Mineral deposits in the Olinghouse district

Epithermal precious metal deposits of the Olinghouse district occur in veins and vein swarms within northeast-trending structures related to the Olinghouse fault zone and within and adjacent to dacite porphyry intrusive bodies and dikes that follow the structures. The veins occur within a broad, northeast-trending aureole of propylitic alteration occupying several square miles, encircling the central Olinghouse district. As individual veins are approached, the intensity of groundmass alteration increases (Jones, 1998). Rocks of both the Pyramid sequence and the Oligocene-Miocene ash-flow tuffs are altered and mineralized, but the productive veins worked in the past are confined to the Pyramid sequence and to the intrusive rocks (Garside and Bonham, 1992). Adularia from vein material collected from a dump near the top of Green Hill has yielded a 10.46±0.03 Ma age, using the Ar^{40}-Ar^{39} method (C.D. Henry, written commun., 1995).

Gold occurs as small wires and free grains in generally open veins, along with quartz, calcite, goethite, epidote, stilbite, heulandite, and sparse adularia. The pyrite content is less than 2%, and is generally oxidized. Traces of chalcopyrite, galena, and sphalerite are associated with the ore, with higher base-metal concentrations within the high-grade ore shoots. Silver content seldom exceeds 0.1 ounce per ton, with most silver occurring as electrum. Arsenic, antimony, and mercury content of the ores is usually low. Telluride minerals (petzite and coloradoite) are reported from some mines (Bonham, 1969).

The historical mines of the Olinghouse district are located on Green Hill, northeast of the town of Olinghouse. The workings of the Don Dero, Gold Center, Butte, and Renegade Mines all explore the Olinghouse fault zone and subsidiary footwall branches. Brecciated vein material consisting of quartz and calcite with native gold, pyrite, and chalcocite occurs in fault breccia and gouge at these deposits. Other mines in the district, such as the Keystone Nevada Mine and the Tiger Group and Buster Mines, in the area of Tiger Canyon, are similar in setting and mineralization.

Alta Gold Co.'s new Olinghouse Mine is located on the south slope of Green Hill, and encompasses the area of several of the old mines along the Olinghouse fault zone (Wilson and others, 1999).

Mineral deposits in the North Olinghouse district

The North Olinghouse district includes all of the Pah Rah project land from Fort Defiance Creek north to the north project boundary. In the North Olinghouse district, activity has been concentrated in three locations: an area extending from Secret Canyon to Big Mouth Canyon; an area near the mouth of Stud Horse Canyon; and the area between Fort Defiance Creek and the southern project boundary (fig. 4-1).

All of the prospects examined in the North Olinghouse area expose low-sulfidation epithermal gold-silver occurrences in dacitic welded ash-flow tuffs or dacitic dike rocks that cut the older welded tuffs. The tuffs have been propylitically altered throughout the project area and local patches and bands of argillic alteration and silicification occur adjacent to veins, breccias, and silicified fault zones. Most individual quartz and quartz-carbonate veins are very narrow, ranging from a few millimeters to a few centimeters in thickness, but there is some stockwork veining, along with zones where vuggy vein quartz coats and cements rubbleized fragments of silicified wall rock in zones up to several meters wide.

***Big Mouth Canyon*—**There are two groupings of prospects in Big Mouth Canyon: several adits and cuts explore northwest-trending silicified shear zones in tuff within a group of patented claims located on the divide between the south fork of Big Mouth Canyon and Secret Canyon; and, to the north, several prospects explore silicified zones exposed in the north fork of Big Mouth Canyon (fig. 4-2).

The northern area was explored for precious metals by Dennison Mines (U.S.) Inc. between 1981and 1987 and later by Bristlecone Mining Co. (1987-89?). Most of the Dennison-Bristlecone work was within their now-abandoned Paiute claims block that adjoined the patented claims on the north, but some mapping and sampling was carried out on the patented claims as well. Geologic reports, including surface geochemical sampling results, geologic maps, and drill reports on the Paiute Project are on file at the Nevada Bureau of Mines and Geology (File 317, items 18, 24, 32, 33). Much of the data in the following summary was extracted from these reports.

The Paiute project area, and the Morning Star-Carrie/Baystate patented claims to the south, are underlain by a thick sequence of Oligocene to early Miocene ash-flow tuffs. Within the project area, the ash-flow tuffs have been divided into a lower member of welded, gray to purple, felsic lapilli tuff and lithic tuff about 200 m thick; a middle member consisting of welded, gray, crystal tuff overlain by a thin layer of purple lapilli tuff approximately 60 m thick; and an upper member of purple, welded lapilli tuffs and agglomerate with intercalations of lithic tuff. A 150-m-thick section of the upper member is exposed on the claim block. Based on mapping by Dennison Mines (1985), the lower member has undergone pervasive propylitic alteration and hosts trace amounts of gold-silver mineralization, the middle member is commonly bleached and argillized to a white siliceous rock with iron-oxide-stained fractures, and the upper member is unaltered. Unaltered basalt of the Pyramid sequence overlies the tuff sequence to the east of the Paiute Project claims. A prominent east-west-trending, sinuous zone of roughly parallel normal faults, named the Paiute fault zone (fig. 4-2), was defined by Dennison's work, and was interpreted by them to have served as the locus for gold-silver mineralization. The lithic tuffs along the fault zone have undergone variable amounts of silicification, propylitization, argillization, and quartz stockwork veining. However, other structures within the property also appear to have controlled alteration and gold-silver mineralization. Many of the individual prospects that fall within Dennison's Paiute fault zone explored N50º to 60ºW, steeply dipping shear zones that apparently cut the older east-west structure. Mapped alteration, possibly controlled by certain tuff units as proposed by Dennison, also appears to follow structural as well as stratigraphic controls. The alteration is elongate to the north northeast, roughly parallel to regional faulting as mapped by Bonham (1969). All of Dennison Mines' work, including geologic and alteration mapping and geochemical sampling, resulted in the definition of several small "anomalies" roughly aligned along the east-west-trending Paiute fault zone (fig. 4-2). In 1984, six shallow holes were drilled (holes P-84-1,2 and P-84-3,4,5,6) from two sites within what was defined as the "East Anomaly" (fig. 4-2). The East Anomaly was defined as a fairly wide zone of quartz stockwork veining within an area of anomalous arsenic and antimony values in rock chip sampling. The target of drilling was high-grade gold-silver-bearing ore shoots within the quartz stockwork veining. Drill results indicated that: the stockwork zone decreased in width with depth, and intensity of alteration also decreased. Gold values ranged from 12.68 g/mt over a thickness of 0.3 m to values such as 0.27 g/mt over 0.3 m. Dennison concluded, based on their surface mapping and sampling, and on their drill results, that although mineralized intercepts were narrow and values were erratic, the property still presented favorable targets and more exploration work was recommended. Additional surface sampling was undertaken on the property in 1986 and 1987, but there is no record of exploration after 1987.

As part of our evaluation program, we collected samples from 13 prospects and mineralized outcrops within the Big Mouth Canyon area (figs. 3-2, 4-3). Sample results were erratic and, in general, matched those reported by Dennison Mines; select dump samples contained from only trace amounts of gold (0.001 ppm) up to over one ounce per ton (35.4 ppm) in one sample (fig. 4-4). Silver ranged from 0.09 ppm up to a high of 65.7 ppm (about 2 oz per ton) in one sample (fig. 4-4). Arsenic (fig. 4-5), antimony (fig. 4-6), mercury, tellurium, and all base metals values were low. Analytical results of the sampling program are tabulated in appendix A3.

***Stud Horse Canyon*—**Prospects in this area extend from Secret Canyon to south of Stud Horse Canyon (fig. 4-7). The area includes the active Moongold claim group, held by Brancote U.S., Inc.

Rocks exposed here are mostly silicic ash-flow tuffs, but the hill northwest of the northwest endline of the Moongold claims is capped by Pyramid sequence basaltic rocks (fig. 2-1). The ash-flow tuffs are generally propylically altered, and narrow strips of argillic alteration and silicification occur locally adjacent to shear zones and bands of quartz veining. Where seen in limited outcrops and exposures in prospects, quartz veining and silicification follows N30º to 50ºW-striking, steeply-dipping shear zones. The veined zones are narrow, usually 0.5- to 1- m-thick, but only hairline veining is present in one exposure and one outcrop displays a silicified zone about 50 m wide. The gold-silver mineralization in this area is apparently older than the 10.46 Ma mineralization in the main Olinghouse district. Adularia from vein material at one prospect (sample site 6211, fig. 4-7) yielded an age of 17.8 Ma (John and others, 1999, fig. 15).

The Moongold claims, located in 1991and 1996, are currently held by Golden Peaks Resources Ltd. through a lease agreement with Brancote U.S. Inc. Brancote reports that surface sampling of silicified zones on the property returned erratic gold values ranging from 1.7 to 34 ppm gold. There is no evidence of recent activity on the property, and Golden Peaks Resources has not reported work since 1996 (Golden Peaks Resources Inc. press release, 5/9/96). Assessment work has been filed on the claims for 1999, however.

Eleven samples collected in the Stud Horse Canyon area (fig. 4-7) were analyzed for this assessment. Gold values in these samples were from 0.002 to 19.5 ppm, similar to values in samples collected Brancote, and silver ranged from 0.25 to 29.4 ppm (fig. 4-8). Arsenic and antimony values were low and, as in the samples from Big Mouth Canyon, the indicator elements did not correlate well with the gold-silver values (fig. 4-9). Mercury and tellurium values, as well as all base metal values, were low. Analytical results of the sampling program are tabulated in appendix A3.

Fort Defiance Creek—Prospects in the Fort Defiance Creek area are clustered in a small area between the canyon of Fort Defiance Creek and White Horse Canyon to the south (fig. 4-10). The prospects appear to be associated with northeast-trending faults and dacitic and rhyolite intrusive rocks that extend from the main Olinghouse district, south of the Pah Rah project boundary. Rocks exposed in the area are mainly welded ash-flow tuffs and intrusive microdiorite (fig. 2-1). The tuffs in this area are argillized and silicified and locally contain both disseminated pyrite and narrow pyrite veinlets. Quartz veinlets are present along N40º to 60ºE and some N15º to 40ºW structures.

Eight samples collected in this area were analyzed for the Pah Rah assessment, but analyses from 10 samples collected south of the project boundary for an earlier project were also available for comparison (fig. 4-10). Geochemically, this area appears to be distinct from both the Big Mouth Canyon and Stud Horse Canyon areas to the north. Gold and silver values are generally higher (fig. 4-11), and there are anomalous values in arsenic and antimony (fig. 4-12). Sample results are tabulated in appendices A3 and A4.

4.2.3 Uranium deposits

There are no reported uranium occurrences within the Pah Rah project area, although several uranium prospects are located in the southern part of the Pyramid mining district, several miles west of the project boundary. These occurrences are hosted in Oligocene to Miocene silicic ash-flow tuffs similar to those that crop out in the north central portion of the Pah Rah project area. Weak, sporadic uranium mineralization at prospects in the Pyramid district is reported to be associated with easterly striking fault zones possibly related to strike-slip faulting of the Walker Lane belt in this area.

4.2.4 Industrial mineral deposits

4.2.4.1 Construction aggregate

There are no past or present construction aggregate mining sites in the Pah Rah study area.

Sources of sand and gravel in the Pah Rah project area are confined to alluvial fan deposits in narrow canyons and along the east flank of the Pah Rah Range from Jones Canyon north to Big Mouth Canyon. There are also younger stream gravels skirting the Pah Rah Range on the eastern project boundary south of Fort Defiance Creek.

Bedrock suitable for use as construction aggregate occurs in two areas; basalt and basaltic andesite flows of the Pyramid sequence occur in the higher portion of the range along the western project boundary, and cap a northeast-trending ridge east of Big Mouth Canyon. There are other large outcrop areas of basaltic rock in the southern half of the project area, but these rocks are variably altered along faults associated with the Olinghouse fault zone.

4.3 Mining claims

Active mining claims, as well as patented mining claims, entirely or partially within the Pah Rah project area are listed in table 4-1. Claim locations are shown on figure 4-13.

4.4 Types of mineral deposits

Ore deposit models are almost exclusively restricted in use to metallic mineral occurrences. In this report, petroleum and geothermal resources each stand as types of mineral deposits and do not require further description. Metallic mineral deposits are described using the system described by Cox and Singer (1986) and Bliss (1992). Industrial mineral deposits are described only by commodity, not by model type.

4.4.1 Metallic mineral deposits

Hydrothermal ore deposits, both known and inferred, within and adjacent to the project area fall into only one general deposit class: volcanic-hosted epithermal gold-silver deposits. Volcanic-hosted, epithermal gold-silver deposits are divided into two deposit models, low-sulfidation deposits and high-sulfidation deposits (Bonham, 1989; White and Hedinquist, 1995; Hedinquist and Lowenstern, 1994). Both types of mineralization are widespread throughout the world, and both are of major economic significance. Only low-sulfidation deposits are known to be present within the Pah Rah project area.

4.4.1.1 Low-sulfidation epithermal gold-silver deposits

Low-sulfidation epithermal deposits, also known as quartz-adularia or Comstock epithermal deposits, are typically associated with propylitic alteration, and with quartz-carbonate deposition in hydrothermal conduits. The deposits are hosted in felsic to intermediate volcanic rocks, such as andesite or rhyolite. The structural setting of the deposits include through-going fracture systems, major normal faults, and fractures related to doming and ring fracture zones. The veins are commonly banded and occur as cavity-filling veins with sharp boundaries or stockworks of small veins. Lamellar quartz-after-calcite is sometimes present. Precious metals in these deposits occur in argentite with gold or electrum, sometimes with silver sulfosalts. Base metal sulfides, such as galena, sphalerite, chalcopyrite, and arsenopyrite as well as telluride minerals and hematite can be present in sparse to moderate amounts. Gangue minerals are quartz, adularia, pyrite, sericite, and calcite.

The Comstock Lode is the world-class example of this deposit type. Deposits in many of Nevada's other well known gold-silver districts, such as Round Mountain, Rawhide, Bullfrog, Tonopah, Tuscarora, Gold Circle (Midas), and Jarbidge, are low-sulfidation epithermal gold-silver deposits.

4.4.2 Industrial mineral deposits

For most industrial mineral commodities, ore deposit models do not have the same importance as they do for the metallic commodities. Many commodities are specific to certain rock types or depositional environments, and deposits are described only by the form of the deposit.

Within the Pah Rah project area, only one industrial mineral commodity, construction aggregate, is inferred to be present. Sources of construction aggregate are likely to be confined to specific volcanic rocks within the Pah Rah Range. Only small areas along the eastern margin of the project area are underlain by alluvial fan and river gravels. According to Bryan and others (1994), basaltic volcanic rock in the area is a better potential source of high-quality aggregate than is more siliceous rock such as tuff. The basalts are younger, have been exposed to weathering for a shorter time and, in the northern part of the area, are unaffected by hydrothermal alteration. Alluvial fan gravels along the northeastern project boundary originate in bedrock areas of mainly siliceous tuff to the west; the small area of stream deposit gravels on the southeastern project border (fig. 2-1) may have source areas of more favorable rock types to the southwest, but determination of the composition of the gravel deposits was beyond the scope of this study.

4.5 Mineral economics

Commodities included in this section are restricted to those reported to occur within the Pah Rah project area, and which are discussed in the section of this report that covers mineral potential. Strategic and critical minerals are noted by a comment in the introductory paragraph in each commodity description. Strategic and critical minerals are those that fall under the definition stated in Section 12 of the Strategic and Critical Materials Stockpiling Act (P.L. 95-41, 50 U.S.C. 98 et seq.) and are listed in the National Defense Stockpiling Goals for Strategic and Critical Materials as of July 8, 1985.

4.5.1 Metallic minerals

4.5.1.1 Gold and silver

Treasured since ancient times for its beauty and permanence, gold has emerged in the late 20th century as an essential industrial metal. The oldest use of gold, and still the most important in terms of quantity used, is in jewelry. Of the industrial uses of gold, the most important is in electronic devices, especially in printed circuit boards, connectors, keyboard contacts, and miniaturized circuitry. Gold brazing alloys are used in the aerospace industry and gold is used as a reflector of infrared radiation in radiant heating and drying devices and heat-insulating windows for large buildings. In specific reference to Nevada, gold is classified as a critical mineral.

In 1998, Nevada produced 8.72 million ounces of gold from 34 major mines and supplied 65 percent of the total United States production.

Much of Nevada's gold production originates from two types of deposits: sediment-hosted gold deposits located mainly in the northeast and north-central parts of the state; and volcanic-hosted epithermal deposits in the west-central and southwest parts of the state. The sediment-hosted gold deposits have large tonnages of ore with generally low gold grades. In most of these deposits, silver is not an important component of the ore. Deposit size is usually several million up to hundreds of millions of tons with ore grades ranging from 0.02 to as high as 0.6 oz gold per ton. The deposits are mined using open-pit methods, but some mines on the Carlin Trend in Eureka County and at the Getchell Mine in Humboldt County are evolving into underground operations. The volcanic-hosted deposits are also large and are mined using open-pit methods. These deposits usually contain silver in amounts equal to or exceeding gold. Deposits range from several hundred thousand tons up to tens of millions of tons ore with grades ranging from about 0.03 to as high as 0.3 oz gold per ton. Round Mountain in Nye County, the largest of this type currently being mined in Nevada, has a proven and probable reserve of 401.3 million tons containing 0.018 oz gold per ton (Tingley and Bonham, 1998). Most of the volcanic-hosted deposits now being mined, such as Round Mountain and Bullfrog, are low-sulfidation deposits. The large gold-silver deposit at Paradise Peak in northern Nye County, and the gold deposit at Goldfield in Esmeralda County are high-sulfidation deposits.

Silver has a profile quite similar to gold. Like gold, silver is relatively scarce and, though not as scarce as gold, its durability and desirability have allowed it to retain a comparable position as a medium of exchange or monetary base. In addition, major uses for silver are in photography, sterlingware, and electrical contacts and conductors. Jewelry, arts, and crafts also account for a substantial use of silver. Silver is classified as a strategic and critical mineral.

Nevada is the nation's leading silver-producing state and, in 1998, reported production of 21.5 million ounces. Nevada silver production is likely to remain stable or decrease slightly over the next several years if silver prices remain low. A large share of Nevada's silver production is a by-product of the gold mining industry.

4.5.2 Industrial minerals

4.5.2.1 Construction aggregate

Construction aggregate consists of a variety of materials used to provide bulk and strength in portland cement concrete, asphalt concrete, fill, road base and loose road surfacing, railroad ballast, concrete block, and stucco. Mined natural materials provide most of the construction aggregate used in the United States, although recycled materials such as crushed glass and smelter slag are used as well as manufactured lightweight aggregate. Sand and gravel, crushed stone, and volcanic cinders are mined materials that are currently used for construction aggregate in Nevada.

Sand and gravel are mined from unconsolidated streamchannel, flood-plain, or terrace deposits; alluvial fan deposits; glacial or glacio-fluvial deposits; and beach deposits of lacustrine or marine origin. Sand and gravel that is ideally suitable for most construction aggregate is composed of clean, uncoated, properly shaped and sized detritus that is sound and durable. Individual sand and gravel particles must be resistant to physical stress and to chemical and physical changes. Sand and gravel that contain excessive amounts of clay, organic matter, soluble minerals, or friable altered or weathered particles, generally makes poor aggregate, although some such materials may be removed by screening and washing. Sand and gravel deposits that contain reactive rock types, such as certain siliceous volcanic rocks, may not be suitable for use in portland cement concrete without special treatment (Goldman, 1994).

Many different rock types are used in crushed stone, and the types used are determined mainly by availability and rock quality. Such rock types must meet the same, or more stringent, soundness and durability requirements for sand and gravel, and therefore must not contain reactive minerals or be weakened by alteration. However, extremely hard or abrasive rock types are generally not used in crushed stone because of high crushing and screening costs. For most uses, it is important that the rock break into more-or-less equant fragments when crushed, and platy rocks such as slate generally make poor aggregate. Certain mineral components, such as mica in some schists, are deleterious in aggregate because they cause structural weakness. Some types of crushed stone are particularly desirable for specific uses. For example, fine-grained basalt is commonly used in asphalt concrete, and crushed rhyolite is used in lightweight portland cement concrete and in concrete blocks. As is the case with sand and gravel, certain siliceous volcanic rocks, including rhyolitic ash-flow tuffs, are unsuitable for portland cement concrete aggregate because of alkali-silicate reactivity (Malisch, 1978).

Mining of all construction aggregate, whether for sand and gravel or crushed rock, is by open-pit methods. Because most sand and gravel deposits are of unconsolidated material, drilling and blasting are not required, whereas crushed stone generally is produced from quarries where excavation requires drilling and blasting.

Production of construction aggregate in Nevada has increased fairly steadily since the early 1980s, rising from about 6 million tons in 1981 to about 28 million tons in 1997 (Castor, 1998).

Reserves of natural material that can be used as construction aggregate are almost limitless. However, environmental and commercial concerns preclude mining in some areas such as in or near metropolitan areas (where most aggregate is consumed). Private land in many parts of these metropolitan areas has more value for building sites than for sand and gravel mining.

Prices for aggregate vary with quality and application. Pit run sand and gravel can generally be used for fill, but base aggregate must be screened, and in cases where abundant oversize material is present it must be crushed as well. Aggregate used in portland cement concrete must generally be screened and washed, and is therefore more costly.

Table 4-1. Active mining claims within the Pah Rah project area.

Map Number	Location T	R	Section	Claim Name	Claim Type	Owner of Record	Last Proof of Labor
Unpatented Mining Claims							
1	22N	23E	27, 28, 33, 34	Moongold 1-11	lode	Brancote U.S. Inc.	1999
2	21N	23E	11	Norris Spring 2	lode	Tim Norris, Michael R. Savola	1999
3	21N	23E	9	North OLI 122, 124, 126, 128	lode	Alta Gold Co.	1999
4	21N	23E	17	OLI 13, 15, 17, 19	lode	Alta Gold Co.	1999
5	21N	23E	19 (NE)	OLI 133, 134	lode	Alta Gold Co.	1999
6	21N	23E	19 (SW)	OLI 71, 73, 75	lode	Alta Gold Co.	1999
Patented Mining Claims							
A	22N	23E	17, 20, 21	Gypsy, Morning Star Extension, Crater, Denver, White Hill No. 2, White Hill, Morning Star, Gold Queen, Granite	Patented lode	Robert I. and Mary D. Cowles	N/A, fee land
A	22N	23E	20	Red Butte No. 1, Carrie, Baystate, Baystate No. 2, Baystate No. 3, Baystate No. 4	Patented lode	Alta Gold Co.	N/A, fee land

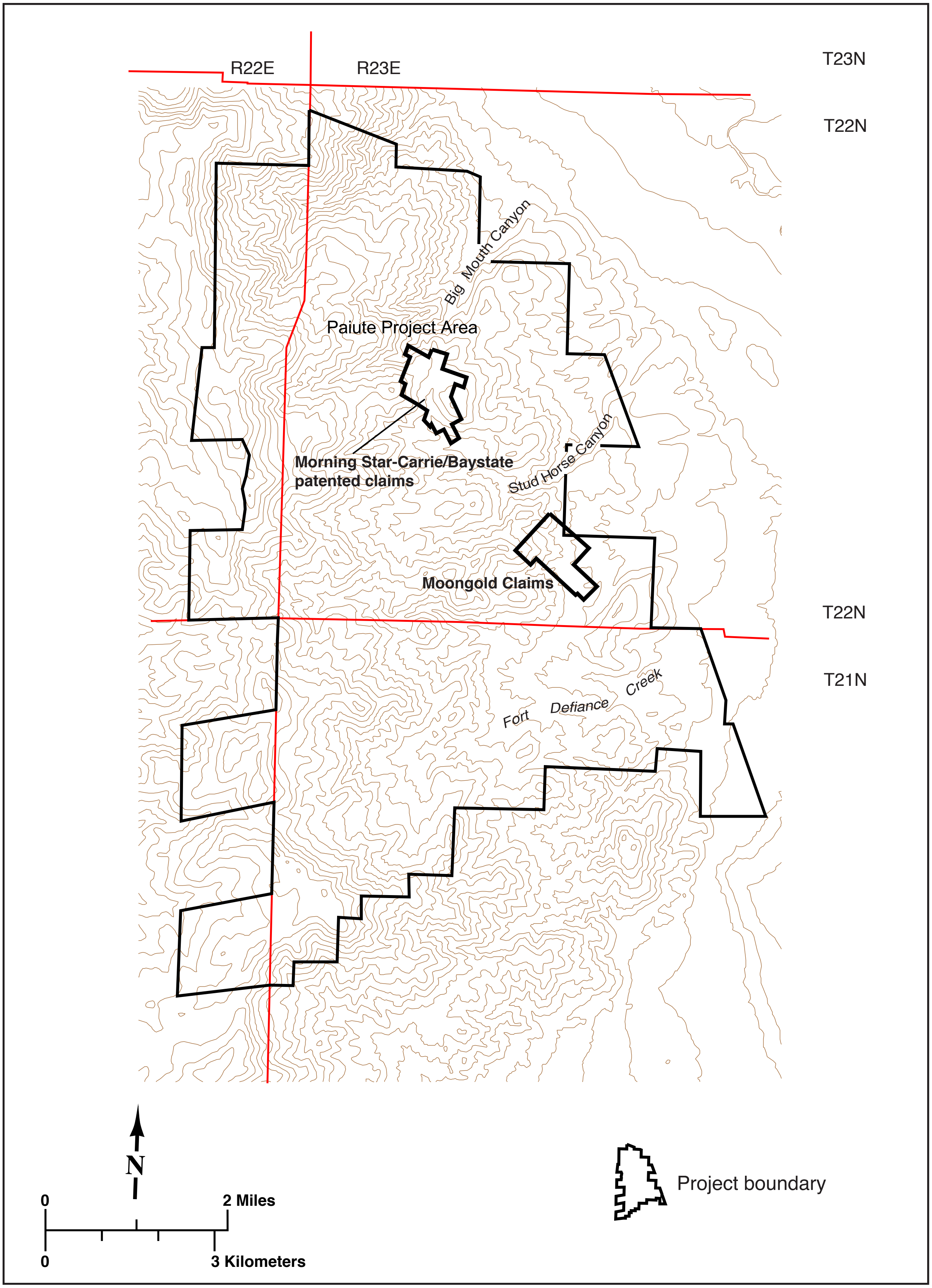


Figure 4-1. Location map, North Olinghouse district.

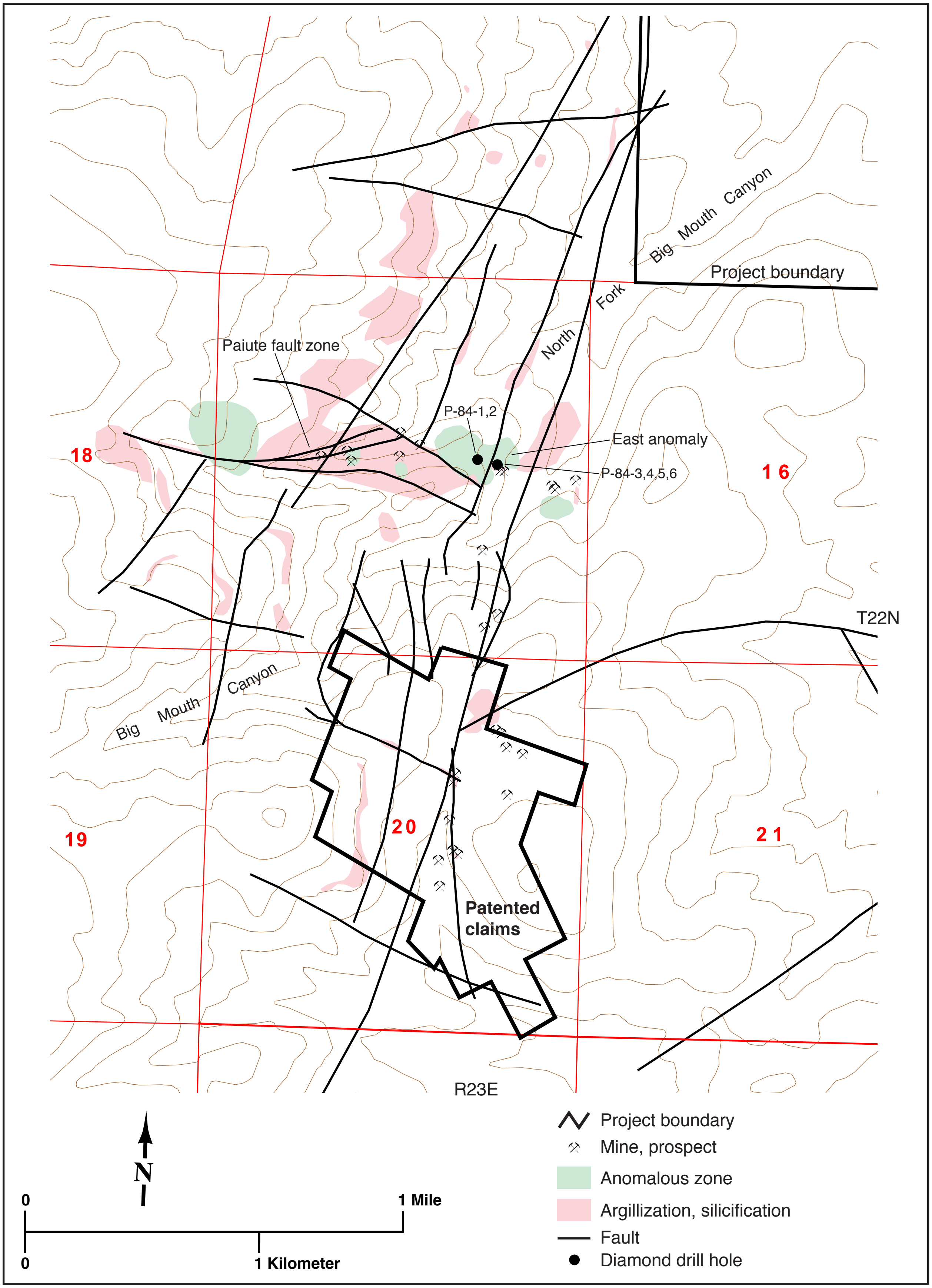


Figure 4-2. Big Mouth Canyon prospects and anomalous areas.

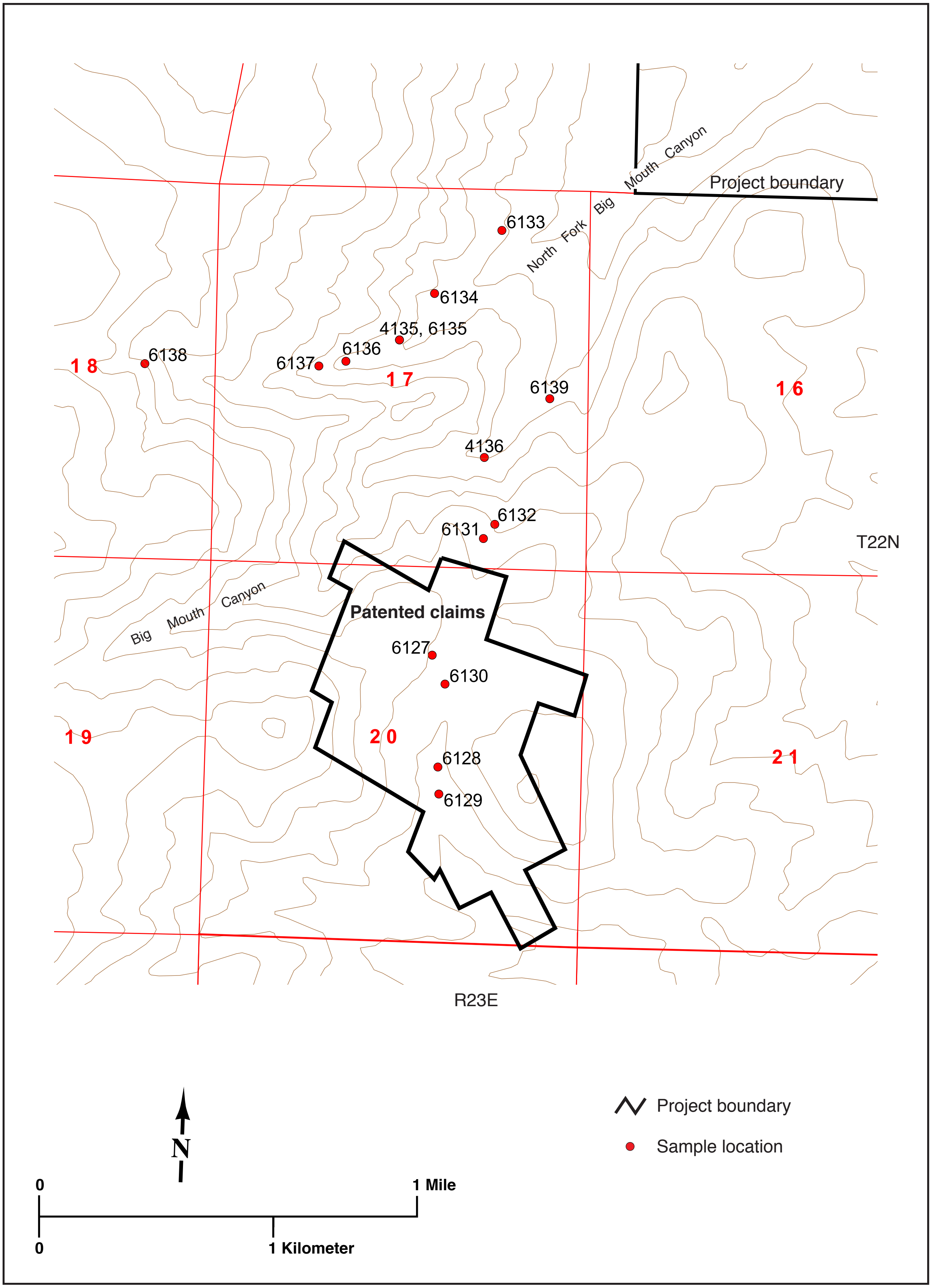


Figure 4-3. Mine-site sample locations in the Big Mouth Canyon area.

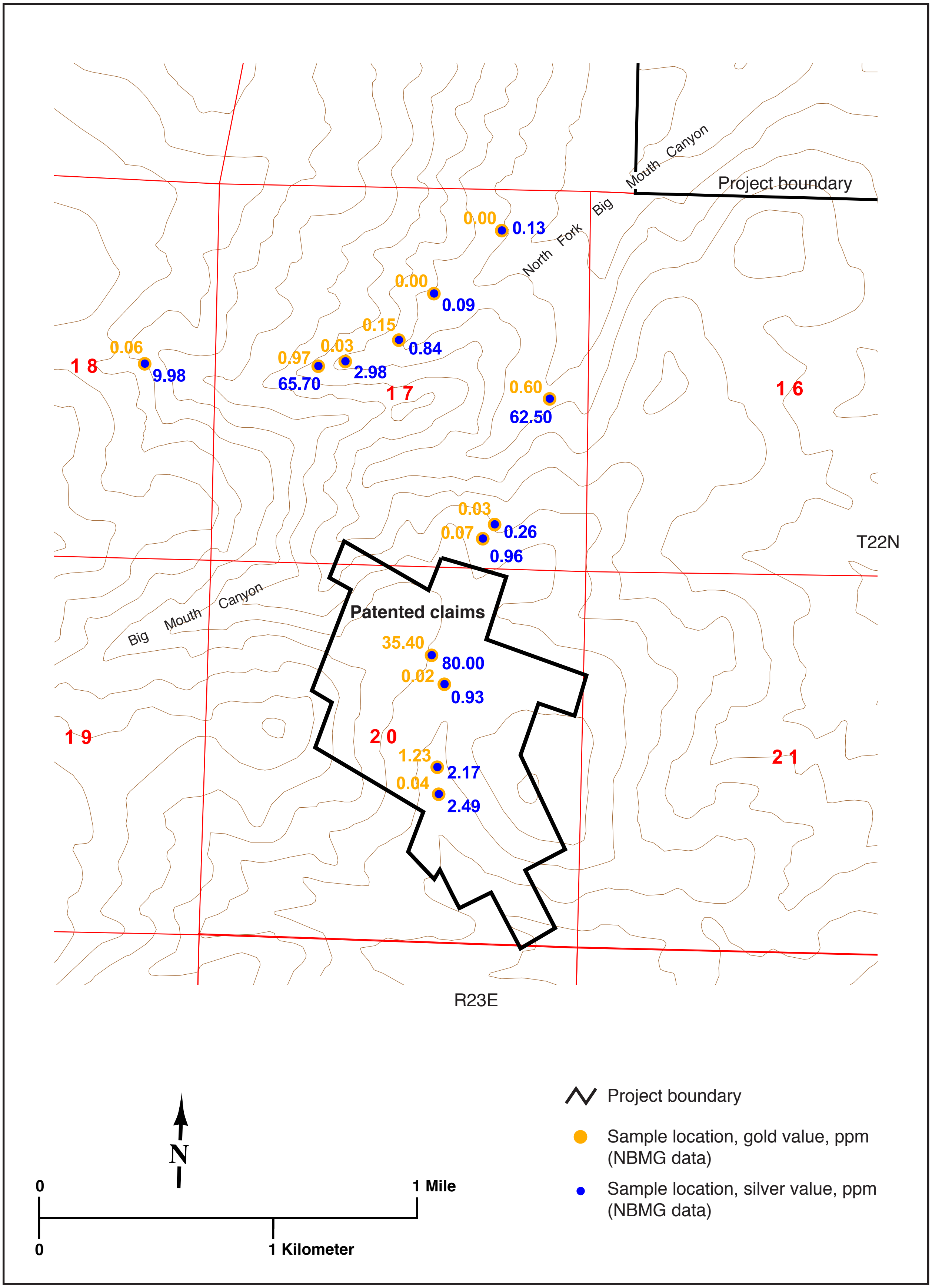


Figure 4-4. Gold-silver geochemistry in the Big Mouth Canyon area.

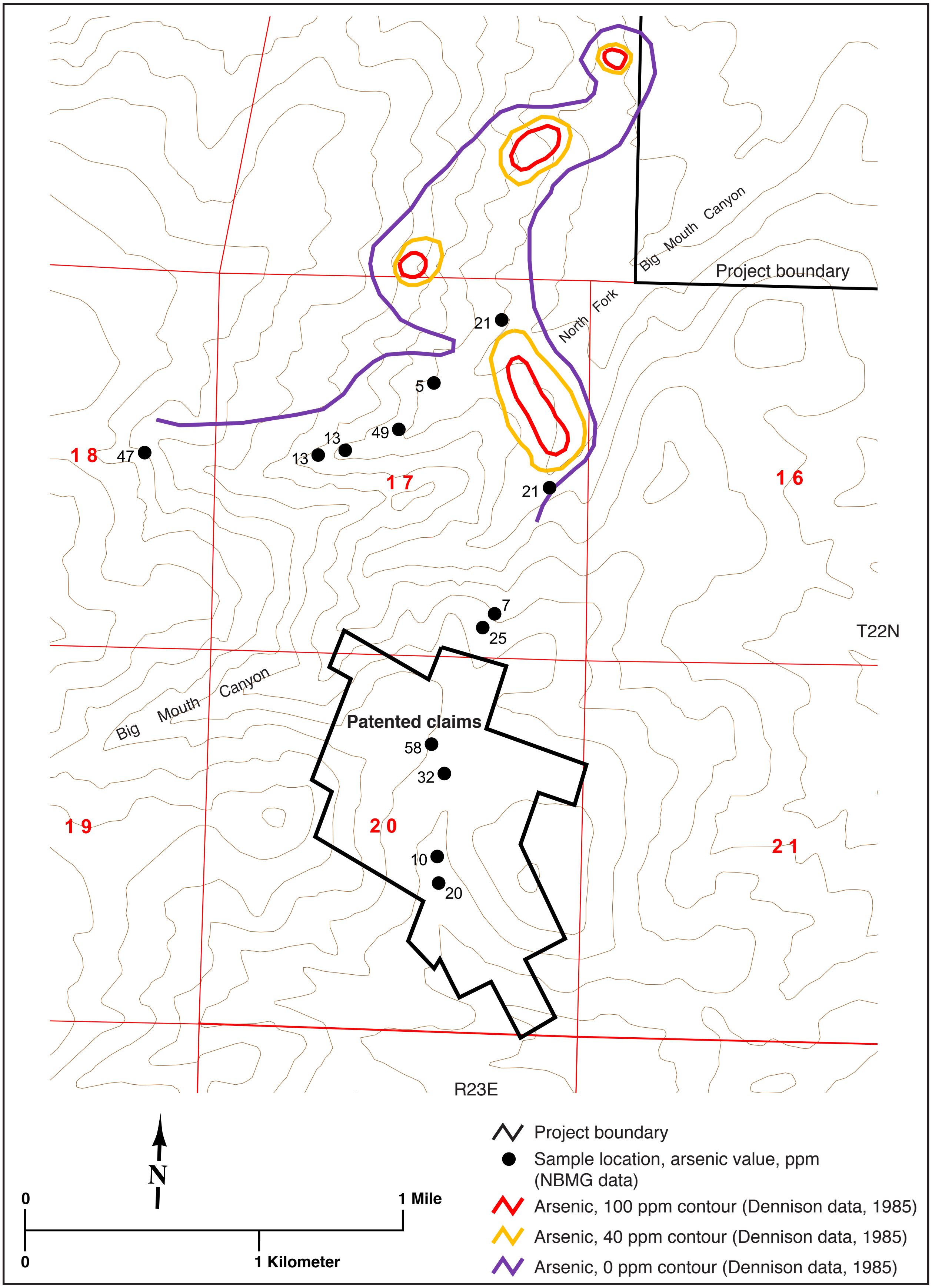


Figure 4-5. Arsenic geochemistry in the Big Mouth Canyon area.

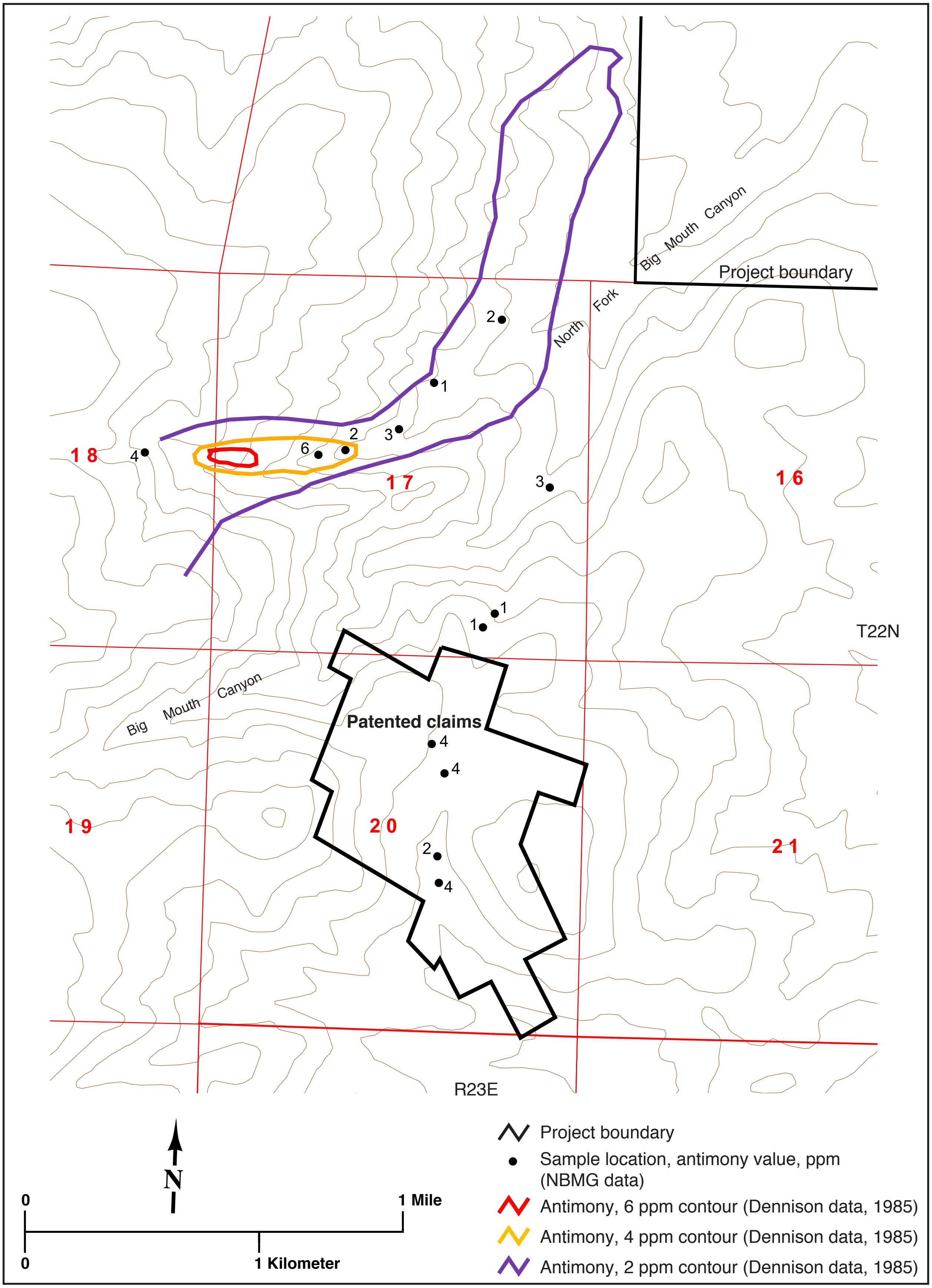


Figure 4-6. Antimony geochemistry in the Big Mouth Canyon area.

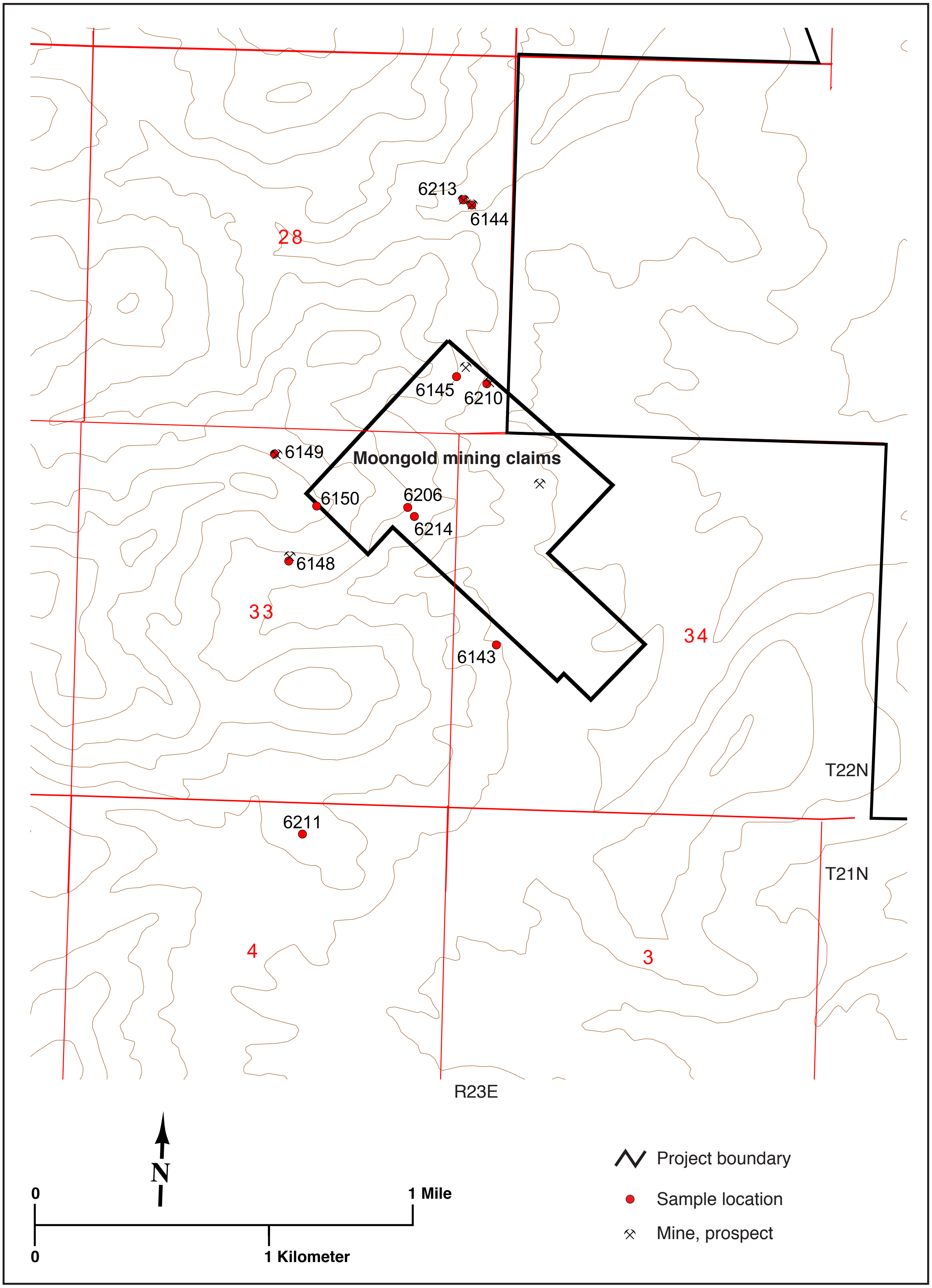


Figure 4-7. Mine-site sample locations in the Stud Horse Canyon area.

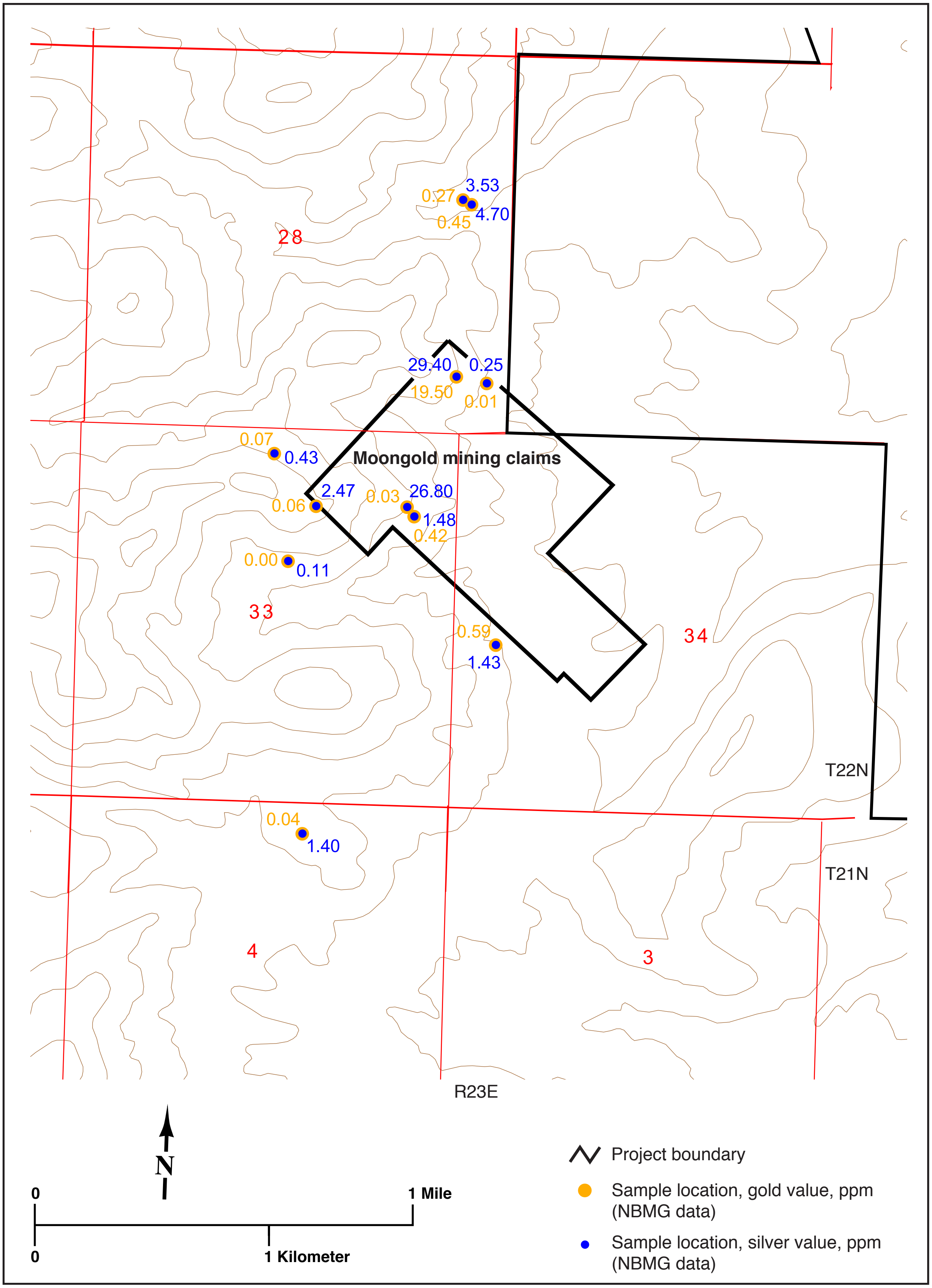


Figure 4-8. Gold-silver geochemistry in the Stud Horse Canyon area.

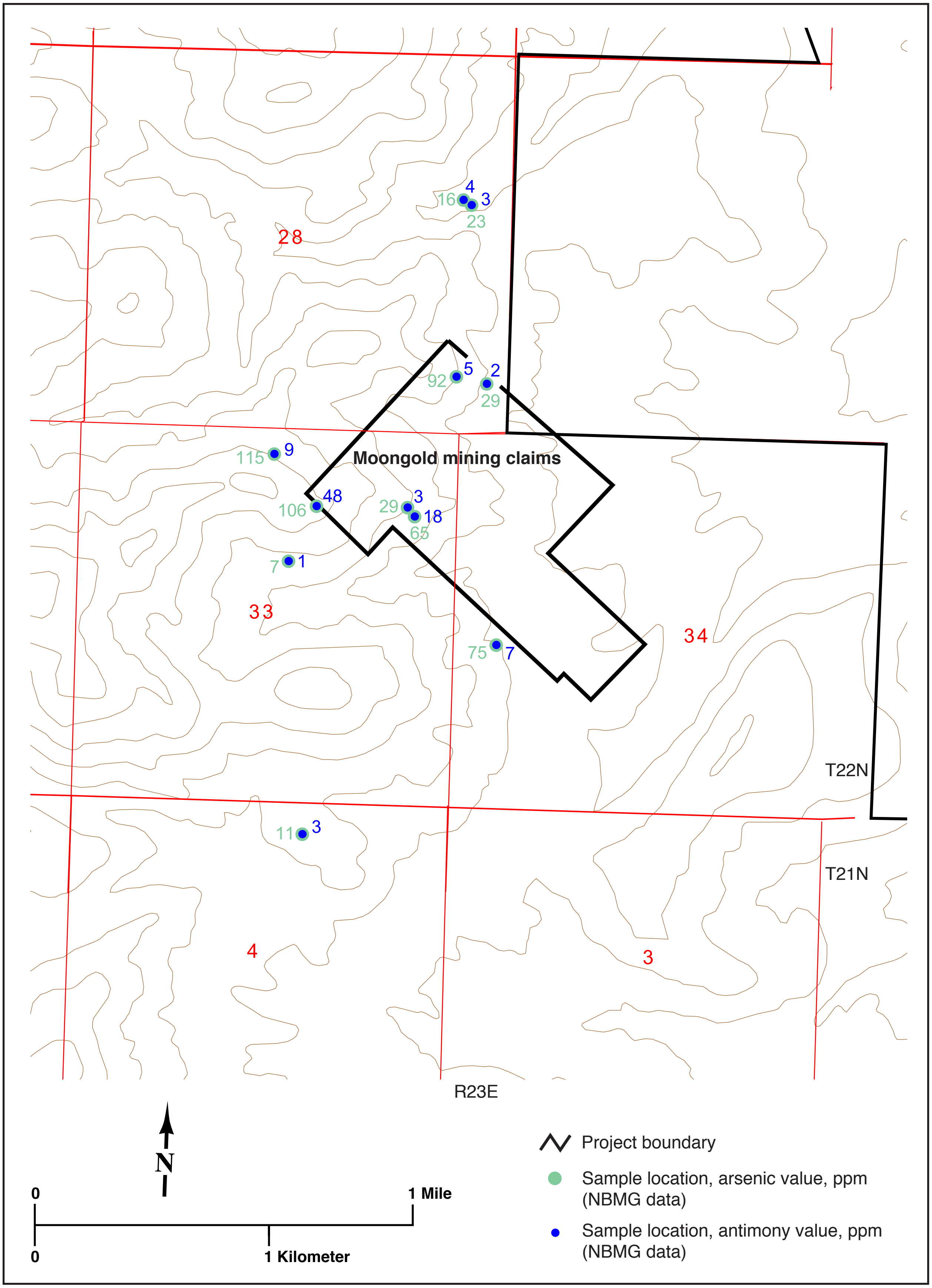


Figure 4-9. Arsenic-antimony geochemistry in the Stud Horse Canyon area.

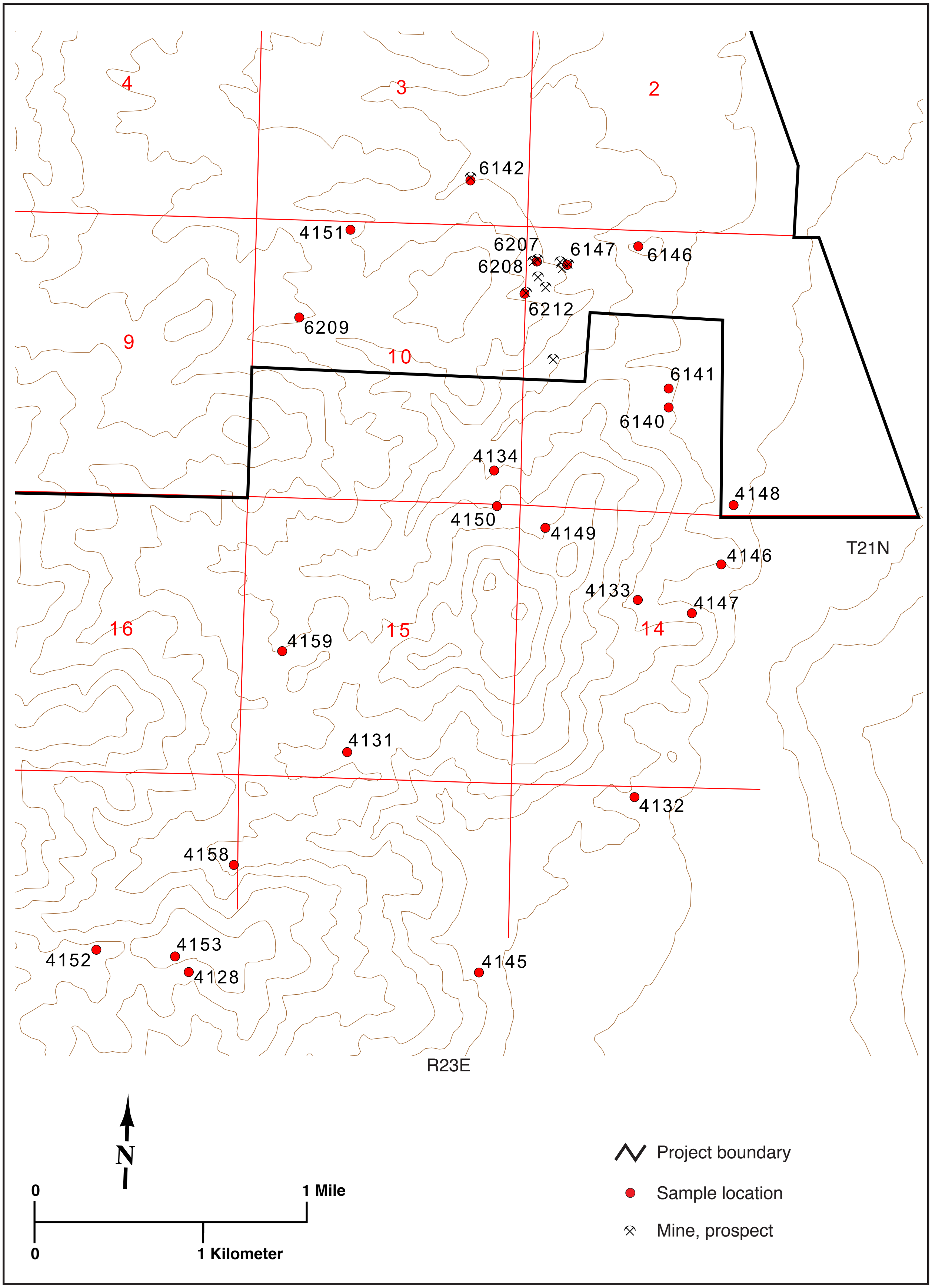


Figure 4-10. Mine-site sample locations in the Fort Defiance Creek area.

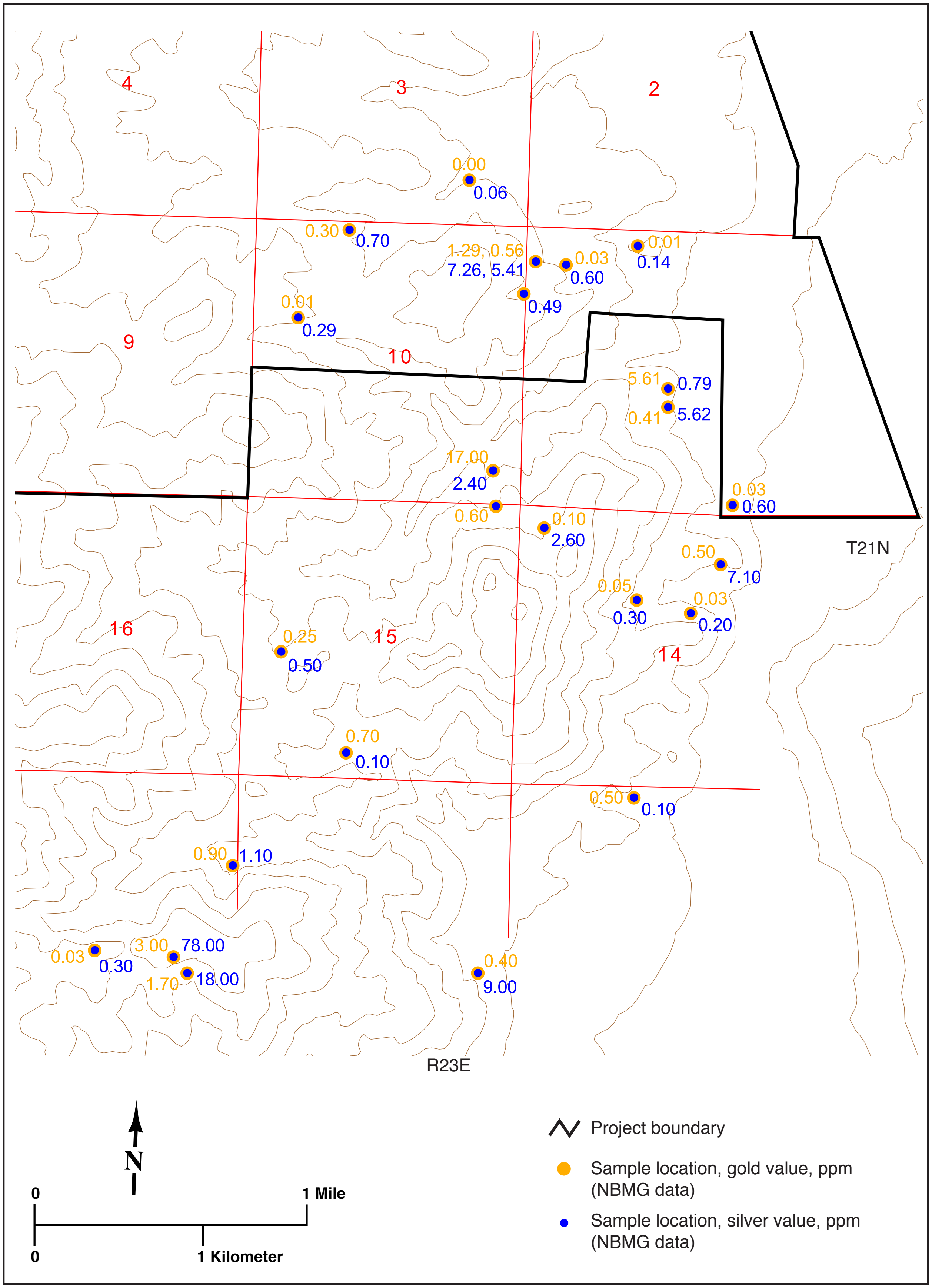


Figure 4-11. Gold-silver geochemistry in the Fort Defiance Creek area.

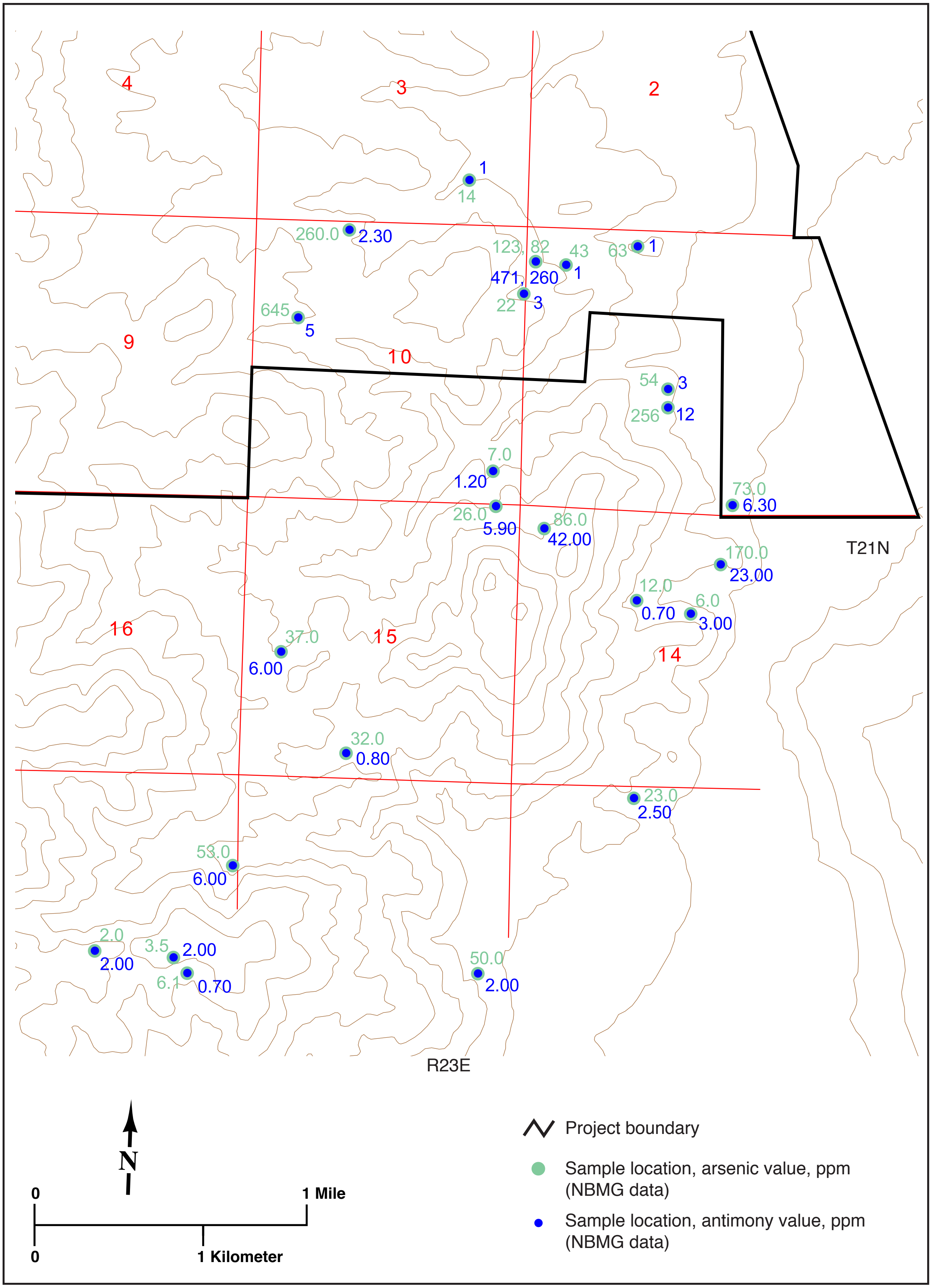


Figure 4-12. Arsenic-antimony geochemistry in the Fort Defiance Creek area.

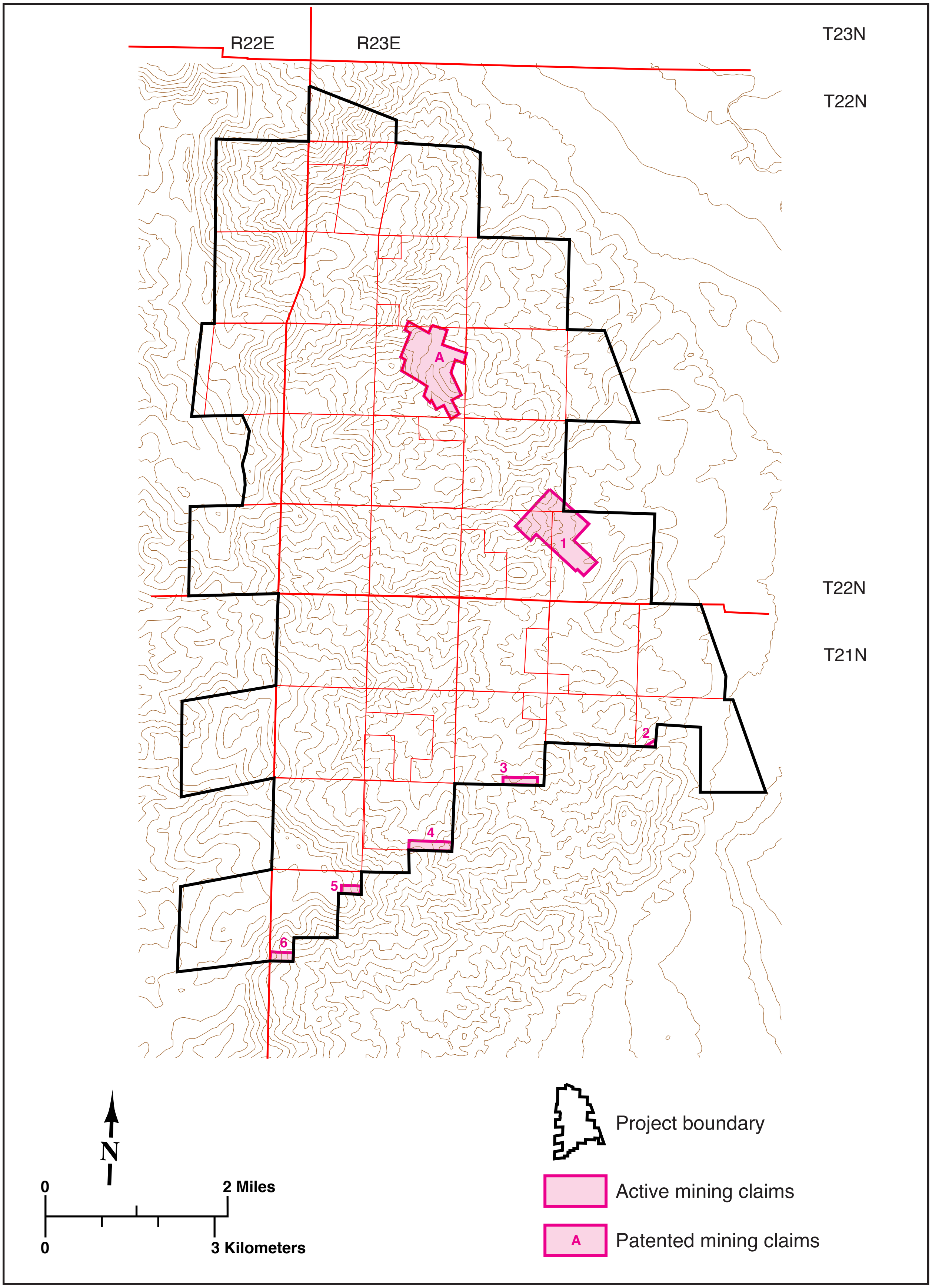


Figure 4-13. Active mining claims in the Pah Rah project area (see table 4-1).

5 POTENTIAL FOR THE OCCURRENCE OF MINERAL RESOURCES

5.1 Energy resources

5.1.1 Petroleum

A number of factors are commonly considered in an evaluation petroleum potential. These include such things as oil or gas shows in exploration wells, potential petroleum source rocks in or adjacent to the study area, thermal maturity of any source rocks, and the presence of igneous rocks (either volcanic or plutonic) that may preclude the presence of source rocks.

The Pah Rah Range is made up of middle Oligocene to late Miocene volcanic rocks which overlie Mesozoic granitic rocks and lesser amounts of somewhat older Mesozoic metasedimentary and possibly metavolcanic rocks. The only possible petroleum source rocks in the Tertiary section are very thin dark shales interlayered with basalt flows. These can not have acted as source rocks because they are too thin and have never been buried to great enough depth to generate petroleum. Sparse exposures of the underlying pre-Tertiary bedrock of the Pah Rah Range indicate that probably all of the range is underlain by granitic rocks with possibly a few pendants of somewhat older, metamorphosed sedimentary and volcanic rocks. Tertiary caldera sources, filled with ash-flow tuff and underlain by Tertiary granitic rocks, are also possible for parts of the Range. None of these rocks can be considered potential petroleum source rocks. Nearby Mesozoic marine rocks, for example at Marble Bluff (about 8 km east of the Pah Rah Range, at the south end of Pyramid Lake), and in lower Right Hand Canyon (about 6 km west of the study area) are strongly metamorphosed to marbles, slates, and schists and have thus been heated well beyond the temperature range of hydrocarbon generation. In fact, metamorphic heating has been severe enough to destroy any hydrocarbons that might have migrated to adjacent rocks earlier in their history. Granitic and volcanic rocks are considered to have zero potential as a source rock for petroleum, and may only act as a reservoir under exceptional circumstances (when petroleum migrates into it much later in its history). There is no indication of such migration, and no obvious younger source rocks to supply any such petroleum. The Mesozoic sedimentary rocks may once have been potential source rocks, but have been metamorphosed considerably beyond temperatures of petroleum preservation.

The unfavorable conditions described above for petroleum generation and preservation are typical of much of western Nevada, which overall is considered to have very low potential (Garside and others, 1988, fig. 3). In the Pah Rah Range in particular, as described above, there is an absence of rocks capable of generating petroleum, and no other indications of the accumulation and migration of petroleum. We consider the project area to have no potential (certainty level D) for petroleum resources.

5.1.2 Geothermal resources

Geothermal energy is the natural heat of the earth. Although the earth is a great reservoir of heat energy, most of it is buried too deeply or is too diffuse to consider as recoverable energy. In areas of certain hot spring systems geothermal energy is concentrated at depths shallow enough and temperatures high enough for use. Such use includes the generation of electric energy (high temperature applications) as well as low-temperature uses such as space heating and industrial process heat.

Nevada has a large number of hot springs and wells (Garside and Schilling, 1979) in more than 300 resource areas throughout the state (Garside, 1994). The Basin and Range is considered a favorable area for geothermal resources because it has higher than average heat flow and is an area of crustal extension, where faults can provide permeable reservoirs and conduits for deep circulation. Nevada's springs and wells are widely distributed, with an increased concentration in the northwestern part of the state. The maximum spring and well temperatures are higher in this area as well. In fact, water temperatures in springs and shallow wells over 75°C are confined to this area, as are the plants that generate electricity from geothermal energy or use it moderate-temperature process heat (Garside and Hess, 1994). This pattern of spring temperatures and concentration closely follows that of heat flow (see Sass and others, 1971).

Most of the geothermal activity in the northwestern part of Nevada is commonly interpreted as being related to circulation of ground water to deep levels along faults in a region of higher-than-average heat flow (the Battle Mountain heat flow high, see Sass and others, 1971). In a few areas along the margins of the Basin and Range Province, geothermal resources area associated with Quaternary magmatism (e.g., Steamboat Hot Springs south of Reno).

The Pah Rah study area lies entirely within the mountain range block of the Pah Rah Range and does not include any major range-bounding faults (figs. outline map and geol. map). The youngest igneous rocks of the area are about 8 Ma (John and others, 1999), much too old to act as a present heat source (for example, see Wohletz and Heiken, 1992; Smith and Shaw, 1978). Thermal springs or wells (commonly those having temperatures 10°C or greater than the mean air temperature at the surface, and increasing by 25°C or more per kilometer with depth; Garside, 1994) are not known from the area. Garside and Schilling reported springs that may have somewhat anomalous temperatures about 5 km to the southeast and 6 km to the northwest of the study area; however, there is some doubt that these springs are correctly located or thermally anomalous (L. Garside, unpub. data, 1999). The closest confirmed warm spring is on Anahoe Island in Pyramid Lake, about 11 km from the north boundary of the study area. This spring, and others nearby (Garside and Schilling, 1979) at The Pyramid and The Needle Rocks (north end of Pyramid Lake) are probably associated with a strand of the Walker Lane, a major northwest-striking right-lateral strike slip fault zone which is located somewhat east of the study area.

Because geothermal activity is associated with northwest-striking faults near Pyramid Lake, undiscovered geothermal fluids may be present a depth in the area farther south along this fault zone, from the southwest corner of Pyramid Lake to Wadsworth. However, this area is 1-4 km east of the east boundary of the study area, and there is no reason to anticipate anomalous geothermal fluids outside the zone, in the Pah Rah Range structural block.

Based on the above data and interpretations, we consider the Pah Rah project area to have no potential for geothermal resources, certainty level D.

5.1.3 Coal resources

Coal has been reported from two areas of the Pah Rah Range, below ca. 31-Ma ash-flow tuffs along Coal Creek, and apparently in sedimentary interbeds in a sequence of middle Miocene basalt flows (see Section 4.2.1.3). At the former locality, the only coaly material observed during a recent field examination was a few coalified tree leaves and small limb sections. The second locality can not be located at present; apparently the coal bed was noted only in a 32-foot-deep shaft about 100 years ago. Geologic mapping and examination of the dumps of workings has not resulted in the rediscovery of the coal occurrence or any other coaly material in the presumed area of the shaft. Either the coal find was exaggerated in the media at the time of discovery or it soon became obvious that it was of very limited extent. If no more discoveries have been made in the past 100 years, the discovery, even if true, is certainly of no economic significance. In any event, any coals possibly present in the sedimentary units between the basalt flows of the area would be thin and discontinuous, and based on other coals in Tertiary sedimentary units of western Nevada (Garside and others, 1980) they would be of low quality.

Based on the above evidence, there is no potential, certainty level D, for economic concentrations of coal in the Pah Rah Range.

5.2 Metallic mineral resources

5.2.1 Gold, silver

Gold and silver occur in various combinations in one mineral deposit type within the Pah Rah project area.

5.2.1.1 Gold-silver in low-sulfidation epithermal deposits

Gold-silver mineralization in propylitized, argillized, and silicified ash-flow tuffs associated with northeast- and northwest-trending fault zones is concentrated in three general areas within the Pah Rah project area.

To the north, in the vicinity of Big Mouth Canyon, exploration has defined an elongate area of anomalous gold-silver-arsenic-antimony mineralization apparently controlled by east-west- and northwest-striking faults within a wide, northeast trending structural zone. This area has received limited surface exploration, and has been tested by shallow drill holes at one location. There could be untested potential in this area for small, high grade ore shoots along one or more narrow vein structures that follow the fault structures.

To the south, in the Stud Horse Canyon area in a similar geologic setting, trace gold-silver values occur along narrow, northwest-striking veins. This area has had limited surface exploration and sampling, but no drilling.

The third area, near Fort Defiance Creek, is defined by several prospects possibly associated with northeast-striking fault structures that project from the main Olinghouse district to the southwest.

Rock exposures are good in all three of these areas, and there is sufficient information available to limit the mineral potential to moderate. All three areas are estimated to have moderate potential, certainty level C, for gold-silver in low-sulfidation deposits (fig. 5-1).

All of the remainder of the Pah Rah project area, except for the alluvial-covered area along the eastern border, is rated low potential, certainty level B, for the occurrence of gold-silver in low-sulfidation deposits (fig. 5-1).

5.3 Uranium

Although there rocks present in the Pah Rah project area that have hosted uranium occurrences in other parts of Washoe County, there are no known uranium occurrences within the project area. The Pah Rah project area is assessed to have low potential, certainty level C, for the occurrence of uranium.

5.4 Industrial minerals

5.4.1 Construction aggregate

There are many uses for construction aggregate, some of which require minimal specifications. For example, for aggregate to be used as fill, specifications are generally not rigorous. At the other end of the spectrum, high quality aggregate is needed for portland cement and asphalt concrete to ensure that the end product will have adequate strength and durability. Aggregate used for base is generally of intermediate quality; it may have to meet rigorous standards in some cases, but aggregates that meet specifications for base may fail to meet requirements for concrete aggregate. In general, large aggregate producers mine material for many uses, and high quality material is sought for such operations so that specifications for high quality (and high value) aggregate will be met as well as less rigorous specifications for lower quality material. Therefore, potential of a geologic unit for use as construction aggregate, as used in figure 5-2, is based on potential for use in high quality construction material. Figure 5-2 has been adapted with minor changes from an earlier report (Bryan and others, 1992). The aggregate potential areas are generally based on the mapped geologic boundaries but in some areas potential boundaries and mapped geologic boundaries differ substantially. Because of the generalizations that were necessary to compile this small scale map, the boundaries for potential areas are approximate or in some cases speculative.

Rating geologic units, including both unconsolidated and bedrock units, according to their potential for use as sources of high-quality aggregate is based on determinations of pertinent physical properties. The most important features of high quality aggregate are hardness (resistance to abrasion), soundness (resistance to deterioration, particularly by the effects of weathering), and durability (resistance to deterioration with time). Aggregate quality is usually determined by careful testing prior to use, and such testing is beyond the scope of this project. However, quality may generally be estimated on the basis of overall competence during hand specimen examination, in conjunction with subsurface geologic interpretation of the site, although the presence of competent rock does not always mean that a geologic unit as a whole will provide high-quality aggregate.

Different rock types have variable reactions to long-term surface exposure. Tertiary volcanic rock in the project area is of variable potential; basalt or basaltic andesite is generally of higher quality than more siliceous volcanic rocks such as dacite and rhyolite. In addition to rock type, the extent of weathering is also dependent upon the age of the rock and the length of time that it has been exposed, as well as upon the weathering environment. Rock underlying large areas in the Pah Rah project area has been altered by hydrothermal processes, rendering it useless for high quality aggregate, mainly because of the transformation of more resistant silicate minerals to clay.

Most sand and gravel units in the project area are composed of a mixture of rock types. If some of the gravel clasts are composed of rock that is relatively susceptible to decomposition, such as hydrothermally altered rock, this may preclude the entire unit from being economically useful as a source of high-quality aggregate. In general, material in older alluvial fans includes more decomposed rock because of longer exposure to weathering processes, and the highest quality gravels are the youngest alluvial deposits.

5.4.1.1 Sand and gravel

Most areas of sand and gravel in the study area mainly consist of alluvial fans that contain some poor quality detritus. For this reason, potential of the deposits in these areas for use as construction aggregate is rated as low, certainty level B (fig. 5-2).

5.4.1.2 Bedrock

Two areas are estimated to have moderate potential, certainty level B for bedrock sources of construction aggregate (fig. 5-2). The rock types in these areas are mainly basalt or basaltic andesite flows of the Pyramid sequence. The remainder of the project area, less the small gravel-covered areas along the eastern border, are estimated to have low potential, certainty level B, for bedrock sources of construction aggregate. Bedrock units in the areas rated low potential are dominated by volcanic sequences that consist mainly of tuffs or breccias with variable hydrothermal alteration.

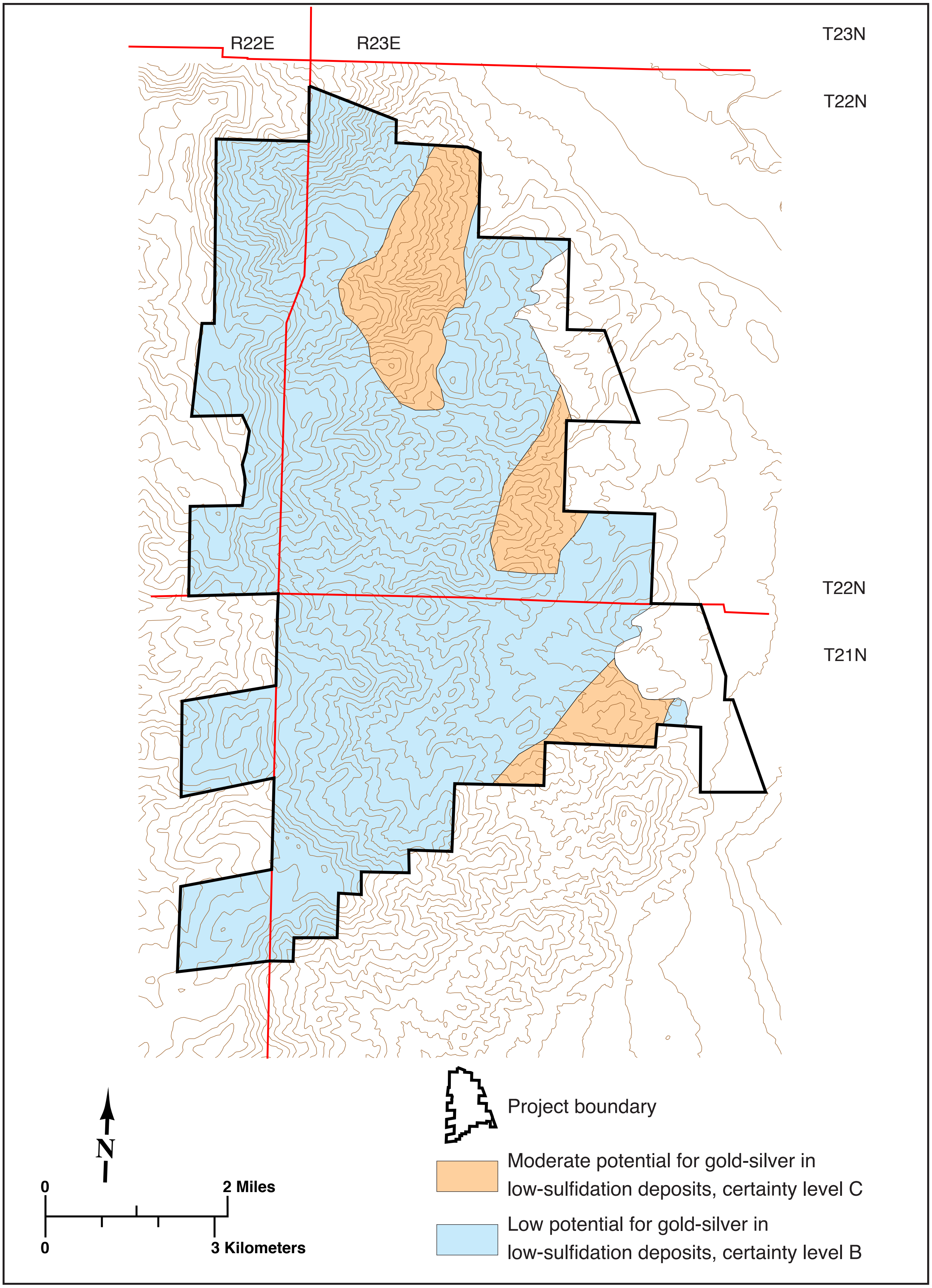


Figure 5-1. Low-sulfidation epithermal gold-silver potential in the Pah Rah project area.

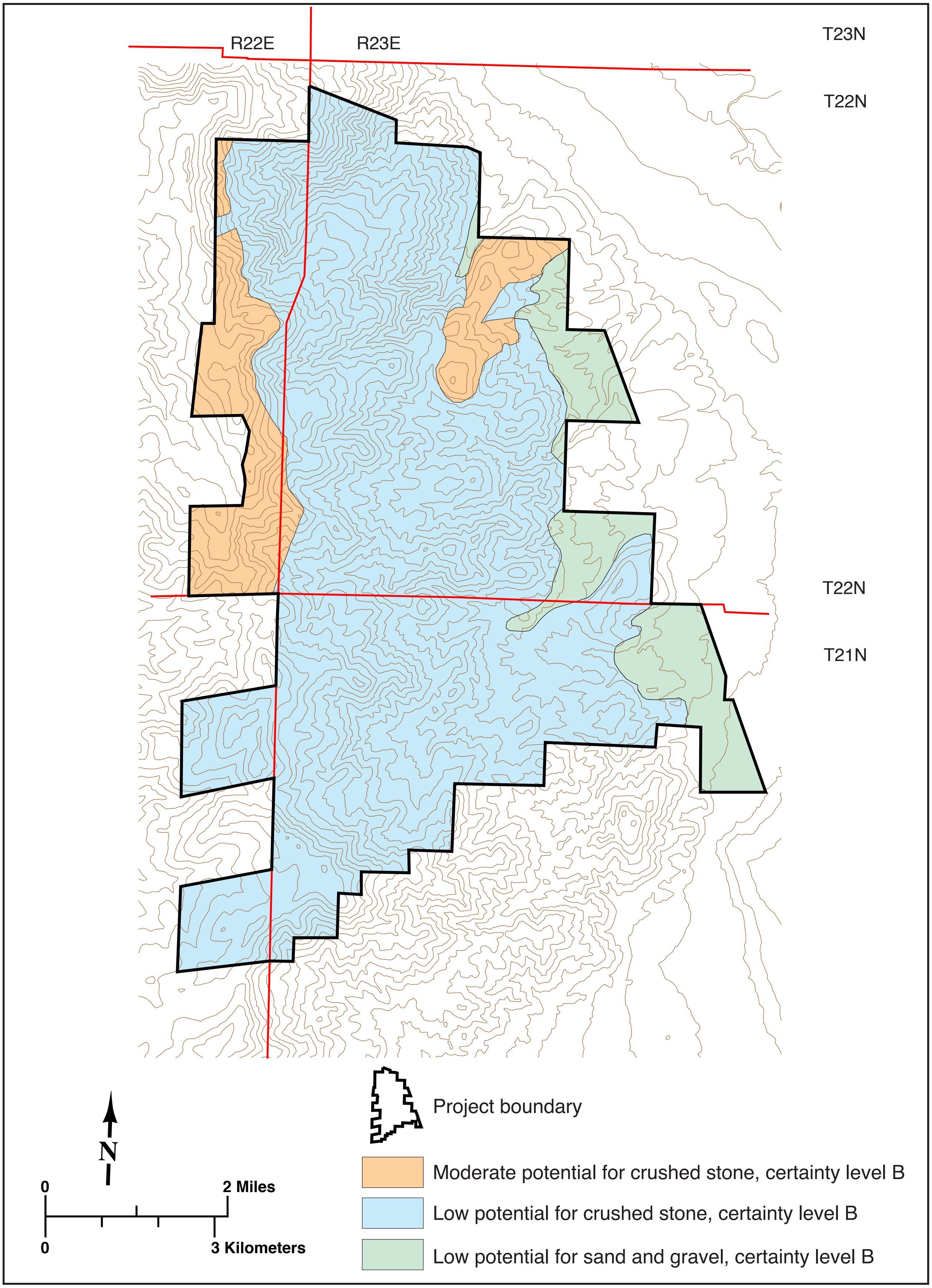


Figure 5-2. Construction aggregate potential in the Pah Rah project area (Modified from Bryan and others, 1994, plate 2).

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Appendix A1. Analytical data, Pah Rah project area, NURE data.

Map Id.	Sample	Longitude	Latitude	Type	AL	Ce	Dy	Eu	Fe	Hf	La	Lu	Mn	Na	Sc	Sm	Th	Ti	U	V	Yb	Ag	As
					NAA	NAA	NAA	NAA	NAA	NAA	NAA	NAA	NAA	NAA	NAA	NAA	NAA	NAA	DNC	NAA	NAA	AA	AA
					ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
1	RNAC016S	119.40	39.80	s. sed	67466	36	0	0	30373	8	32	0	769	17187	5	6	16	6300	5	83	1	0	5
2	RNAC017S	119.38	39.77	s. sed	107536	65	0	0	45740	6	0	0	715	18520	9	0	12	19313	3	112	0	0	2
3	RNAC018S	119.37	39.79	s. sed	98098	32	0	1	21473	5	13	0	1919	0	7	3	5	9060	3	95	0	0	13
4	RNBC003S	119.38	39.66	s. sed	83855	45	5	1	47567	4	10	0	771	12427	14	3	3	4913	2	152	2	0	10
5	RNBC004S	119.43	39.66	s. sed	99050	61	1	1	49253	4	12	0	888	14560	9	2	2	6655	2	143	6	1	5
6	RNBC009S	119.38	39.68	s. sed	89299	50	0	2	34033	5	10	0	648	10640	6	11	6	4823	3	79	0	1	6
7	RNBC010S	119.37	39.70	s. sed	98764	71	1	0	61093	3	0	0	1004	18233	7	0	3	7093	2	177	0	1	5
8	RNBC011S	119.38	39.72	s. sed	103818	29	0	0	28240	5	10	0	865	19047	8	2	2	6018	2	179	1	0	2
9	RNAC019S	119.35	39.78	soil	61194	37	8	1	15047	4	18	0	200	9073	4	3	6	1847	3	47	0	0	13
10	RNBC012S	119.36	39.72	soil	98478	24	0	1	21593	3	10	0	0	0	7	1	3	3391	2	134	1	0	3

Appendix A1. Analytical data, Pah Rah project area, NURE data.

Map Id.	Sample	Au	Ba	Be	Ca	Co	Cr	Cu	K	U	Mg	Mo	Nb	Ni	P	Pb	Se	Sn	Sr	U	W	Y	Zn
		AA	AA	AA	AA	AA	AA	AA	OES	OES	AA	AA	CM	AA	CM	AA	AA	AA	AA	FLU	CM	AA	AA
		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
1	RNAC016S	0	873	2	1100	5	90	6	22000	25	2800	2	10	5	900	10	1	5	53	1	2	5	50
2	RNAC017S	0	323	2	1400	20	185	19	14000	11	5000	2	10	25	800	30	1	10	106	1	2	5	47
3	RNAC018S	0	208	2	1700	10	115	12	18000	14	3500	2	10	17	800	15	1	5	73	1	2	5	50
4	RNBC003S	0	190	2	8800	17	295	26	11000	22	5500	2	10	37	1600	20	1	5	100	0	2	10	70
5	RNBC004S	0	277	2	9200	20	230	29	13000	13	3950	2	10	22	1700	25	1	5	113	0	2	20	70
6	RNBC009S	0	385	2	14000	12	135	15	9000	16	2900	2	5	42	1100	25	1	5	53	0	2	5	47
7	RNBC010S	0	750	2	5600	20	250	23	10000	8	4050	2	10	22	1300	5	1	5	93	0	2	5	67
8	RNBC011S	0	510	3	8500	20	215	16	11000	6	4000	2	5	17	2200	25	1	10	133	0	2	5	45
9	RNAC019S	0	498	2	1200	5	90	7	18000	15	3600	2	10	7	900	20	1	5	234	2	2	5	35
10	RNBC012S	0	522	2	3000	12	210	14	11000	8	2950	2	10	15	1300	20	1	5	100	0	2	10	45

Appendix A2

SAMPLE NO.	DEPOSIT NAME	MINING DISTRICT	DESCRIPTION
4126	Keystone mine	Olinghouse	Select sample from dump or iron-stained andesite with sparse pyrite and rare thin quartz veinlets.
4128	Buster mines	Olinghouse	Select silicified latite(?) and vein quartz from dump.
4129	Babe No. 1 claim	Olinghouse	Select quartz veinlets in dacite from outcrop.
4130	Babe No. 1 claim	Olinghouse	Gold-bearing ore sample from underground.
4131		Olinghouse	Select vein and stockwork quartz from outcrop.
4132		Olinghouse	Select vein quartz from dump and outcrop.
4133		Olinghouse	Select pyritized tuff and sparse quartz vein matter from dump.
4134	Stud mine	Olinghouse	Select quartz vein matter and pyritized wall rock from dump of adit.
4135		Olinghouse	Select quartz vein matter and silicified and argillized tuff from a dump.
4136	Paiute No. 35 claim	Olinghouse	Select calcite and quartz vein matter from dumps.
4145		Olinghouse	Select quartz vein and stockwork matter.
4146	Golden Hawk claims(A)	Olinghouse	Select vein quartz from dumps.
4147	Golden Hawk claims(B)	Olinghouse	Grab sample from outcrop of silicified and quartz-veined tertiary welded tuff.
4148	Golden Hawk claims	Olinghouse	Grab vein quartz from N30E, 80SE - 90 degree veins in tertiary welded tuff.
4149	Norris Spring No. 11 claim	Olinghouse	Select quartz vein matter from dumps.
4150	Norris Spring No. 7 claim	Olinghouse	Select quartz vein matter from dumps.
4151	Woody mine	Olinghouse	Select silicified andesite.
4152	Bosici mines	Olinghouse	Select basalt samples with mineralized vesicles.
4153	Bosici mines	Olinghouse	Select silicified felsic dike and quartz vein matter.
4158		Olinghouse	Select quartz vein matter from dump

SAMPLE NO.	DEPOSIT NAME	MINING DISTRICT	DESCRIPTION
4159		Olinghouse	Select sample from dump; pyrite-bearing chalcedonic silica vein matter
4537		Olinghouse	Select silicified and argillized basalt and quartz vein material; was collected as sample from dump
4538	Sunbeam and Caroline Claims	Olinghouse	Select vein quartz from dump
4539		Olinghouse	Select dump sample of vein calcite
4540		Olinghouse	Select vein quartz from dump of caved adit.
6127	Morning Star Patent	Olinghouse	Stockwork vein material collected from mine dump; white and clear drusy quartz veinlets, some acicular quartz crystals on vug surfaces, clots hematite/limonite-after-pyrite crystals up to 3-4mm; centers of crystals still pyrite; wall rock propylitized, chlorite present.
6128	Carrie/Bay State Patents	Olinghouse	FeOx-stained porphyritic andesite (?), some biotite casts, clots of brecciated, white vein quartz with limonite points; limonite flooding, no obvious mineralization.
6129	Carrie/Bay State Patents	Olinghouse	Vein quartz, dense, white to clear vitreous, some disseminated pyrite and limonite-after-pyrite; FeOx-stain on fracture surfaces; small vugs with acicular quartz crystals; limonite-after-pyrite cubes; rock totally silicified, possibly an andesite.
6130	Morning Star Patent	Olinghouse	Vuggy, silicified tuff, white and clear quartz vein material; possible adularia, some limonite-after-pyrite points; rock greenish from chlorite, most biotite altered to sericite; jarosite points in quartz.
6131		Olinghouse	White and vitreous, clear vein quartz, trace disseminated pyrite, rock on dump is silicified, limonite flooding; rock possibly silicified dacite; feldspars altered to white, waxy clay mineral; rock brecciated, healed with clear quartz, quartz overgrowths on rock fragments; crystals FeOx-stained.
6132		Olinghouse	Dump sample, brecciated, silicified dacitic tuff, stockwork veining, greenish alteration patches; limonite flooding and points; rock cemented with clear and white vein quartz, vuggy, with vugs lined with clear quartz crystals; FeOx staining on crystals.
6133	Big Mouth Canyon	Olinghouse	Outcrop of FeOx-stained, silicified dacite intrusive (?); crusts hematite and limonite on fracture surfaces, some jarosite in small vugs; clear quartz eyes.
6134	Big Mouth Canyon	Olinghouse	Brecciated, hematite-limonite-stained dacite (?), sample from outcrop of bleached, FeOx-stained rock forming nose of ridge; could be dike.
6135	Big Mouth Canyon	Olinghouse	Thin quartz veinlets in propylitized tuff; white quartz, some fracture surfaces coated with white barite crystals; rock silicified and laced with quartz veinlets, limonite staining on fractures; quartz crystals line vugs, barite grown on quartz; some vugs have crystalline coating of pyrite (now hematite) on barite and quartz; also some MnOx coatings.
6136	BG Claims	Olinghouse	Quartz vein material with FeOx-stained surfaces, some disseminated pyrite, MnOx-staining; rock is silicified quartz breccia cemented by quartz, hematite crusts and surface coatings, vugs lined with quartz crystals, pyrite cubes in breccia matrix--possibly a hydrothermal breccia.
6137		Olinghouse	Quartz and calcite vein material from sheared outcrop of silicified dacite tuff; FeOx-stained fracture surfaces; some clots of bronzy crystalline pyrite in hematite along fractures.
6138		Olinghouse	Stockwork quartz veins, 1-2 mm thick, FeOx-stained; veins cut silicified dacitic tuff.
6139		Olinghouse	Silicified tuff with quartz veinlets, FeOx-stained, gossan clots and crusts on fracture surfaces, locally heavy MnOx-staining; trace pyrite in gossan clots; rock brecciated and cemented with quartz.

SAMPLE NO.	*DEPOSIT NAME*	*MINING DISTRICT*	*DESCRIPTION*
6140		Olinghouse	Vein quartz in silicified dacite tuff, stockwork veining, clear, vuggy quartz with limonite points and crusts on fracture surfaces; trace pyrite; wall rock propylitized with some epidote on fracture surfaces; is a silicified quartz breccia, fragments of quartz and silicified rock in a quartz matrix--rubble breccia.
6141		Olinghouse	Vein quartz, drusy clear quartz veinlets in argillized dacite (?), some large clots cherty-white quartz; limonite crusts and points; clear quartz crystals in vugs; some MnOx coatings; rock has a vuggy-silica texture.
6142		Olinghouse	Silicified dacitic tuff, lithic fragments, FeOx-staining on fractures, no veining or obvious mineralization; rock argillically altered, biotite altered to white mica.
6143	Moongold Claims	Olinghouse	Bleached, silicified tuff with drusy quartz crystals on fracture surfaces; quartz is stained amber from FeOx; also FeOx-stained fracture coatings and flooding.
6144	Secret Canyon Upper Adit	Olinghouse	Stockwork vein material; white to clear quartz veinlets up to 2cm thick; acicular clear crystals in vugs, disseminated pyrite, FeOx-staining on surfaces, some limonite points and crusts; clots barite (on one rock fragment); quartz-flooded rock, greenish from chlorite.
6145	Moongold No. 6 Claim	Olinghouse	Crushed, FeOx-stained vein quartz from NS-striking vein in shear zone; some FeOx points in vein material.
6146		Olinghouse	Bleached, silicified andesite (?), feldspars and mafic minerals altered and gone; lots of clay and possible white mica, some vuggy quartz; limonite on fractures and in vugs; gypsum on dump.
6147		Olinghouse	Vuggy quartz with some crystals in vugs; clots gossan material in quartz.
6148	Stud Horse Prospect	Olinghouse	Argillically-altered tuff, FeOx-stained fractures, minor quartz veining.
6149		Olinghouse	Silicified, bleached tuff; totally replaced by quartz, laced with hairline clear and white quartz veinlets; FeOx stain on fractures; some thick crusts FeOx; rock brecciated, breccia fragments silicified rock and clear quartz cemented by matrix of white and cloudy quartz; silicified ledge material.
6150		Olinghouse	FeOx-stained, silicified tuff with gossan clots on fracture surfaces; some quartz veining; sample from hematite-stained outcrop; quartz breccia cemented by cloudy white quartz, jarosite on fracture surfaces; silicified ledge material.
6206		Olinghouse	Silicified ledge in diorite porphyry, quartz veining, limonite coatings on fractures; pale yellow and greenish-yellow oxide staining.
6207	Locality OG192g	Olinghouse	Same location as 6208 (Garside sample OG192g); silicified ledge material, brecciated quartz-replaced rock cemented by quartz, cut by veinlets of hematite/limonite, some breccia fragments have cellular texture with gossan points.
6208	Locality OG192g	Olinghouse	Select vein material from dump and vein; bands of vein quartz plus iron-oxide boxworks in argillically-altered intrusive.
6209	Locality OG200g	Olinghouse	Grab sample of silicified and argillized hornblende andesite intrusive (Miocene); from one of several east-northeast, 1m-wide high-angle silicified ledges which have local vuggy textures.
6210	Moongold No. 5	Olinghouse	(Locality OG132g) Grab sample of mineralized dump material, argillized and silicified dacitic ash-flow tuff plus veins and veinlets of calcite and drusy quartz..
6211	Locality OG144g	Olinghouse	Select vein matter and silicified dacitic welded tuff from outcrop; white, narrow, chalcedonic veins and veinlets in tuff.
6212	Locality OG193g	Olinghouse	Select silicified tuff (?) containing disseminated pyrite from a dump at a small shaft and adit; possible alunite (?) present.

SAMPLE NO.	*DEPOSIT NAME*	*MINING DISTRICT*	*DESCRIPTION*
6213	Secret Canyon, Lower Adit	Olinghouse	Grab sample of quartz vein material from lower dump at prospects in Secret Canyon. Garside Locality OG133g.
6214	Locality OG131g	Olinghouse	Grab sample from small dump of quartz stockwork and silicified dacitic ash-flow tuff; pyrite, jarosite, and hematite present.

Appendix A3. Analytical data, Pah Rah project area, 1999 samples

Sample Id	UTM North	UTM East	Ag	Al	As	Au	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu
Units			ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm
			USML	ACME	USML	USML	ACME	ACME	USML	ACME	USML	ACME	ACME	USML
4537	4392390	290850	1.95	3.19	145	1.04	107	<1	0.438	0.19	0.08	6	119	16.8
4538	4393200	292850	1.54	3.49	20.7	0.049	169	<1	0.425	6.6	0.426	6	131	43
4539	4393900	291480	3.21	0.85	5.22	0.448	189	<1	0.255	25.96	3.7	2	33	12.2
4540	4393520	291280	107	3.38	24.4	65.9	574	<1	0.219	1.42	4.02	4	182	37.3
6127	4404340	292570	80	2.66	57.5	35.4	592	1	0.32	0.06	0.37	< 2	242	3.75
6128	4403860	292595	2.17	7.28	9.72	1.23	1114	2	0.105	1.47	0.163	< 2	78	3.8
6129	4403745	292600	2.49	2.86	19.8	0.042	1230	1	0.185	0.05	0.173	< 2	174	3.56
6130	4404215	292625	0.927	4.49	31.6	0.016	942	1	0.357	0.07	0.023	< 2	97	2.74
6131	4404840	292790	0.96	5.83	25.3	0.066	941	1	0.099	0.14	0.035	< 2	96	2.44
6132	4404900	292840	0.264	4.61	6.57	0.029	1555	2	0.191	0.14	0.185	4	169	2.82
6133	4406160	292870	0.128	6.49	20.5	0.002	795	2	0.137	0.19	0.074	< 2	100	2.04
6134	4405890	292580	0.09	6.57	5.3	0.001	384	2	0.126	0.05	0.017	< 2	54	1.36
6135	4405691	292430	0.839	3.98	49.2	0.15	5031	2	0.182	0.1	0.287	4	159	5.04
6136	4405600	292200	2.98	4.98	12.9	0.032	784	2	0.08	0.11	0.546	5	187	16.8
6137	4405580	292085	65.7	6.48	13	0.972	1495	1	0.199	6.35	0.438	< 2	66	8.42
6138	4405590	291340	9.98	4.64	47.1	0.057	501	1	0.227	0.1	0.349	< 2	80	2.54
6139	4405440	293075	62.5	3.12	20.9	0.595	810	2	0.17	0.05	0.182	11	121	12.9
6140	4397060	297100	5.62	3.03	256	5.61	243	1	0.101	0.16	0.116	4	129	14.6
6141	4397170	297100	0.793	3.88	54.1	0.407	217	1	0.096	0.12	0.081	5	131	11.3
6142	4398400	295930	0.058	6.39	13.6	0.0006	2225	1	0.077	0.18	0.049	< 2	58	2.23
6143	4400520	294920	1.43	6.34	74.7	0.589	957	1	0.224	0.26	0.069	< 2	103	6.47
6144	4402407	294815	4.7	4.27	22.7	0.446	891	1	0.659	0.07	0.076	< 2	103	2.68
6145	4401670	294750	29.4	2.76	92.1	19.5	105	1	0.372	0.09	0.079	< 2	259	8.51
6146	4398010	296920	0.14	5.92	63	0.01	744	1	1.09	1.52	0.104	< 2	103	23.2
6147	4397900	296500	0.596	3.61	42.5	0.026	227	1	3.68	0.14	0.037	3	172	21
6148	4400880	294030	0.108	7.31	6.81	0.002	1099	2	0.561	0.84	0.128	< 2	52	1.98
6149	4401340	293970	0.428	3.36	115	0.065	283	1	0.445	0.04	0.082	< 2	146	4.51
6150	4401115	294150	2.47	3.46	106	0.058	516	1	0.487	0.04	0.128	< 2	170	29.7
6206	4401110	294540	1.48	3.84	28.8	0.032	789	2	0.578	0.06	0.044	< 2	138	9.01
6207	4397920	296320	7.26	2.83	123	1.29	303	1	10.5	0.1	0.11	3	183	523
6208	4397920	296320	5.41	2.13	82	0.555	2128	1	18.7	0.12	0.077	4	189	631
6209	4397590	294920	0.288	10.56	645	0.013	187	1	0.715	0.44	0.178	< 2	65	149
6210	4401640	294880	0.252	2.43	29	0.006	70	1	0.206	0.07	0.028	< 2	256	5.12
6211	4399710	294090	1.4	3.67	10.5	0.036	131	1	3.76	0.05	0.036	< 2	128	85.2
6212	4397730	296250	0.49	4.59	21.8	0.09	115	1	3.32	0.29	0.137	3	204	39.6
6213	4402428	294779	3.53	3.12	16	0.271	333	1	0.413	0.07	0.058	< 2	185	3.28
6214	4401070	294570	26.8	2.69	64.5	0.424	485	1	0.632	0.04	0.318	< 2	210	17

Appendix A3. Analytical data, Pah Rah project area, 1999 samples

Sample Id	Fe	Ga	Hg	K	La	Mg	Mn	Mo	Na	Nb	Ni	P	Pb	Sb
Units	%	ppm	ppm	%	ppm	%	ppm	ppm	%	ppm	ppm	%	ppm	ppm
	ACME	USML	USML	ACME	ACME	ACME	ACME	USML	ACME	ACME	ACME	ACME	USML	USML
4537	2.05	0.695	0.206	1.03	15	0.16	122	16.9	0.1	5	5	0.075	13.8	1.65
4538	2.47	2.66	0.322	0.44	<2	0.72	824	9.1	0.03	2	10	0.057	144	0.978
4539	0.68	1.01	0.017	0.34	<2	0.17	2456	2.83	0.13	3	4	0.029	46.8	0.777
4540	1.4	1.57	0.151	2.22	2	0.39	156	4.66	0.05	2	9	0.029	162	2.3
6127	2.75	0.268	0.102	1.17	10	0.14	90	95.4	0.03	2	8	0.012	39	4.17
6128	1.88	0.756	0.42	10.47	35	0.31	374	14.8	0.66	7	3	0.053	40.5	1.85
6129	0.91	0.093	0.406	2.57	5	0.05	75	126	0.05	< 2	8	0.011	39.3	3.6
6130	1.4	0.419	0.508	3.01	18	0.2	109	103	0.06	4	3	0.027	67.3	3.52
6131	1.53	0.322	0.195	9.72	24	0.18	88	26.6	0.5	5	4	0.033	19	1.14
6132	1.99	0.853	0.057	2.34	19	0.19	228	11.9	0.22	4	5	0.034	27.4	0.692
6133	1.66	0.886	0.327	9.72	40	0.11	120	5.37	0.95	11	3	0.016	28.1	2.36
6134	0.72	0.638	0.13	11.21	36	0.05	128	3.7	0.22	11	2	0.005	11.6	1.1
6135	1.88	0.463	0.532	1.86	18	0.2	1213	65	0.07	4	7	0.026	58.2	2.79
6136	3.58	0.867	0.388	2.22	21	0.23	1795	10.6	0.55	4	5	0.043	27.3	2.34
6137	1.82	1.03	0.456	3.2	30	0.25	835	9.11	0.84	4	5	0.042	68.7	6.15
6138	1.05	0.123	0.82	2.38	20	0.21	108	97.6	0.04	4	3	0.018	165	3.5
6139	5.41	0.187	0.28	1.26	16	0.15	1966	5.37	0.02	3	5	0.026	48.5	3.48
6140	1.74	0.356	0.402	0.98	12	0.14	198	13	0.21	< 2	4	0.038	52.1	11.7
6141	1.77	0.229	0.679	1.34	16	0.17	223	14.9	0.04	2	7	0.032	19.7	3.34
6142	1.19	0.731	0.07	9.71	13	0.11	91	2.89	2.55	7	2	0.033	13	0.915
6143	1.59	0.262	0.993	2.61	11	0.18	62	48.3	1.26	3	6	0.032	68.6	6.74
6144	1.43	0.276	0.213	2.29	19	0.27	61	182	0.04	3	3	0.03	59	2.54
6145	2.84	0.168	0.465	0.65	13	0.06	129	26.3	0.03	3	9	0.082	30.9	4.93
6146	4.38	1.64	0.016	2.16	19	0.29	213	10.4	0.21	4	3	0.105	20.4	1.08
6147	3.63	0.56	0.06	1.53	7	0.12	87	13.5	0.05	< 2	7	0.04	29.9	1.05
6148	1.63	0.449	0.024	2.51	35	0.14	450	15.8	1.03	8	2	0.042	15.6	0.719
6149	1.86	0.307	2.05	1.44	20	0.07	70	119	0.03	5	6	0.023	28.6	9.29
6150	1.41	0.564	1.17	2.05	10	0.13	45	47.8	0.03	3	3	0.015	46.2	47.7
6206	1.41	0.295	0.401	2.12	15	0.16	57	39.8	0.05	3	3	0.057	19	3.25
6207	15.04	3.6	5.39	1.24	9	0.12	105	19.8	0.08	4	6	0.091	123	471
6208	17.57	2.24	7.27	0.59	6	0.1	100	11.5	0.03	5	6	0.06	35.7	260
6209	8.09	6.87	4.79	0.06	21	0.03	32	10.6	0.03	7	< 2	0.088	33.3	4.94
6210	2.04	0.314	0.112	0.46	24	0.04	48	18.1	0.02	3	5	0.04	20.4	2.11
6211	2.91	0.975	0.997	1.1	20	0.13	54	10.9	0.05	4	5	0.02	7.15	3.2
6212	2.25	0.383	0.09	1.76	17	0.13	130	14.6	0.04	7	6	0.024	31.6	2.84
6213	1.03	0.379	0.125	1.56	15	0.22	58	108	0.02	3	8	0.018	53.9	3.61
6214	2.46	0.773	3.22	1.28	39	0.11	49	45.9	0.03	3	4	0.038	67.5	18.3

Appendix A3. Analytical data, Pah Rah project area, 1999 samples

Sample Id	Sc	Se	Sn	Sr	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr
Units	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	ACME	USML	ACME	ACME	USML	ACME	ACME	USML	ACME	ACME	ACME	ACME	USML	ACME
4537	4	0.425	<2	32	0.614	2	0.21	0.287	<10	81	<4	5	27.4	28
4538	6	0.092	<2	202	0.92	3	0.21	0.266	11	91	4	10	78.6	26
4539	1	0	<2	225	0.048	<2	0.07	0.438	36	15	<4	12	12.8	11
4540	3	0.584	<2	63	0.718	2	0.08	0.415	<10	49	<4	4	135	16
6127	1	1.88	2	30	0.166	5	0.07	0.134	< 10	41	< 4	4	65.2	30
6128	4	0	3	94	0.114	15	0.2	0.104	< 10	42	< 4	11	29.2	59
6129	1	0.055	< 2	71	0.183	4	0.03	0.203	< 10	14	< 4	4	15.9	14
6130	2	0	< 2	68	0.165	10	0.12	0.234	< 10	42	< 4	8	15.6	58
6131	3	0	3	68	0.051	11	0.16	0.265	< 10	48	< 4	8	14.5	57
6132	4	0	2	56	0.069	9	0.14	0.13	< 10	47	< 4	7	37.8	42
6133	3	0.301	2	64	0.009	21	0.07	0.134	< 10	6	< 4	16	18.5	95
6134	3	0.107	2	23	0.155	21	0.07	0.186	< 10	4	< 4	14	5.87	75
6135	2	0	2	79	0.017	9	0.13	0.213	< 10	32	< 4	7	64.4	52
6136	4	0	2	41	0.059	9	0.14	0.144	19	39	< 4	10	88.1	48
6137	3	0.624	< 2	157	0.094	10	0.14	0.063	< 10	38	< 4	6	36.9	49
6138	2	0.075	2	69	0.153	10	0.12	0.167	13	36	< 4	9	29.3	63
6139	2	0.066	2	31	0.238	4	0.06	0.025	< 10	31	< 4	8	101	27
6140	4	0	< 2	30	0.271	2	0.12	0.19	< 10	65	< 4	3	29.5	4
6141	4	0.143	< 2	27	0.373	< 2	0.12	0.235	< 10	69	< 4	3	41.2	9
6142	2	0	2	217	0.192	7	0.19	0.145	< 10	20	< 4	4	12.9	53
6143	4	0	2	209	0.262	4	0.19	0.25	< 10	62	< 4	2	26.1	18
6144	2	0.079	2	41	0.501	9	0.12	0.295	< 10	73	< 4	6	21.6	50
6145	2	0.572	2	46	1.14	4	0.07	0.245	< 10	16	< 4	5	45.2	23
6146	4	1.77	2	359	1.05	6	0.16	0.145	< 10	91	< 4	4	52.3	19
6147	5	1.01	< 2	41	1.31	2	0.13	0.129	< 10	70	< 4	3	20.4	14
6148	3	0.193	3	130	0.163	13	0.16	0	< 10	22	< 4	12	39.6	78
6149	2	0.236	2	33	0.437	11	0.03	0.194	< 10	13	< 4	4	26.7	37
6150	2	0.729	2	20	1.36	4	0.09	0.276	< 10	25	< 4	3	13.9	33
6206	2	0	< 2	280	0.603	7	0.11	0.236	< 10	40	< 4	4	17.4	29
6207	2	12.8	3	201	19.4	4	0.07	0.202	< 10	47	< 4	2	106	9
6208	1	19.8	4	56	11.8	4	0.05	0.193	< 10	17	< 4	< 2	59.3	7
6209	14	5.89	2	1190	7.49	4	0.39	0.405	< 10	172	< 4	8	57.7	68
6210	1	0.223	< 2	43	0.198	5	0.05	0.101	< 10	15	< 4	5	13.3	20
6211	3	1.12	3	15	2.17	14	0.04	0.17	< 10	27	< 4	5	12	40
6212	3	2.25	< 2	105	0.685	11	0.09	0.306	< 10	23	< 4	9	13.1	61
6213	2	0.207	< 2	23	0.353	7	0.1	0.295	< 10	88	< 4	5	18.8	41
6214	3	0.717	2	125	4.44	5	0.09	0.196	< 10	33	< 4	9	96.8	28

Appendix A4. Analytical data, Pah Rah project area, U. S. Geological Survey analyses

Sample	UTM N	UTM E	Ca	Fe	Mg	Na	Ti	Ag	As	Au	B	Ba	Be	Bi	Cd	Co	Cr	Cu	Ga	Ge	Mn
			%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
4126	4393156	291116	7	7	1.5	2	0.5	7	N200	N10	15	1000	<1	N10	N20	20	70	50	30	N10	700
4128	4393726	294267	0.3	3	15	0.5	0.2	70	N200	N10	10	1000	1	N10	N20	N10	10	20	7	N10	200
4129	4392874	291921	2	3	2	2	0.3	5	N200	N10	N10	1500	<1	N10	N20	15	<10	150	30	N10	1000
4130	4392878	291935	3	3	0.7	<0.2	0.7	7	N200	20	20	300	1	N10	N20	N15	70	30	15	N10	700
4131	4395024	295203	3	1.5	0.3	<0.2	0.15	3	200	N10	15	1000	2	N10	N20	N10	<10	7	15	N10	500
4132	4394759	296899	0.2	1.5	0.3	<0.2	0.15	1	<200	N10	N20	N10	3	N10	N20	N10	10	7	15	N10	150
4133	4395924	296916	0.7	3	0.5	1.5	0.3	2	N200	N10	20	1500	2	N10	N20	N10	<10	20	30	N10	1500
4134	4396686	296070	0.15	2	0.3	0.5	0.15	7	N200	<10	20	700	3	N10	N20	N10	10	20	20	N10	500
4135	4405691	292430	0.1	2	0.3	<0.2	0.15	150	N200	<10	30	700	1.5	N10	N20	N10	10	15	10	N10	200
4136	4405188	292795	20	1.5	0.3	0.5	0.07	2	N200	N10	15	2000	1.5	N10	N20	N10	10	5	10	N10	2000
4145	4393725	295979	0.3	3	0.5	<0.2	0.15	10	200	N10	30	>5000	1.5	N10	N20	N10	10	50	15	N10	100
4146	4396134	297411	0.7	5	0.7	<0.2	0.2	15	<200	N10	20	2000	1.5	N10	N20	N10	20	70	10	N10	1000
4147	4395845	297235	0.15	0.7	0.15	<0.2	0.07	0.5	N200	N10	30	500	2	N10	N20	N10	N10	15	15	N10	500
4148	4396484	297481	0.05	1.5	0.2	N0.2	0.07	0.7	<200	N10	30	700	1.5	N10	N20	N10	<10	15	15	N10	150
4149	4396348	296372	<0.05	1	0.15	N0.2	0.07	5	<200	N10	15	>5000	2	N10	N20	N10	<10	7	10	N10	150
4150	4396478	296086	0.05	1.5	0.3	N0.2	0.07	0.7	N200	N10	15	500	3	N10	N20	N10	<10	7	15	N10	1000
4151	4398107	295223	0.3	7	0.15	N0.2	0.3	2	300	N10	N10	500	<1	<10	N20	N10	20	50	30	N10	150
4152	4393858	293722	7	7	3	2	1	N0.5	N200	N10	N10	1000	<1	N10	N20	50	150	150	30	N10	1000
4153	4393820	294187	0.3	1.5	0.5	1.5	0.1	100	N200	<10	10	1000	1.5	N10	N20	N10	<10	30	10	N10	500
4158	4394360	294535	1	3	0.7	0.5	0.5	3	<200	N10	10	500	<1	N10	N20	20	100	30	20	N10	500
4159	4395620	294820	0.3	3	0.3	0.7	0.3	0.7	N200	N10	10	1500	1.5	15	N20	<10	10	50	30	N10	700

Appendix A4. Analytical data, Pah Rah project area, U. S. Geological Survey analyses

Sample	Mo	Ni	Pb	Sb	Sc	Sn	Sr	V	W	Y	Zn	Zr	AA Ag	AA As	AA Au	AA Bi	AA Cd	AA Cu	AA Mo	AA Pb	AA Sb	AA Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
4126	7	20	50	N100	20	N10	700	150	N20	30	N200	150	1.2	17	6.2	0.7	0.1	6	1.5	8.3	1.3	16
4128	7	<5	100	N100	7	N10	150	70	N20	10	N200	100	18	6.1	1.7	0.6	0	4.8	1.1	33	0.7	10
4129	N5	7	200	N100	10	N10	700	150	N20	20	N200	150	4.4	2.2	1.5	0.6	1.6	59	0.2	34	0.7	16
4130	N5	20	20	N100	15	N10	300	150	N20	20	N200	150	9.5	7.3	16.7	0.6	0	22	0.3	60	1.3	27
4131	70	<5	30	N100	<5	N10	300	70	N20	15	N200	100	0.1	32	0.7	0.6	0	1.5	6.8	5.9	0.8	3.7
4132	15	<5	100	N100	5	N10	150	70	N20	15	N200	150	0.1	23	0.5	0.6	0	1.3	2	29	2.5	5.2
4133	7	<5	100	N100	7	N10	300	70	N20	30	N200	300	0.3	12	<0.05	0.6	0	2.4	1	15	0.7	23
4134	70	5	200	N100	<5	N10	N100	70	N20	20	200	200	2.4	7	17	0.6	0.1	4.3	11	120	1.2	39
4135	100	<5	700	<100	<5	N10	N100	70	N20	10	N200	200	12	2.9	0.3	0.6	0.1	0.9	14	41	1.1	6.7
4136	20	<5	50	100	5	N10	700	70	N20	20	200	100	0.5	10	0.25	0.6	0	0.7	3.2	11	0.6	4.3
4145	15	<5	50	N100	7	N10	2000	50	N20	20	N200	150	9	50	0.4	2	0.1	22	5.5	73	2	24
4146	20	<5	1500	<100	7	N10	300	70	N20	20	700	150	7.1	170	0.5	2	1.3	87	9.4	1700	23	520
4147	N5	5	50	150	5	N10	N100	15	N20	30	N200	150	0.2	6	N0.05	2	0.1	10	0.5	31	3	36
4148	30	<5	30	N100	5	N10	N100	20	N20	20	N200	150	0.6	73	N0.05	2	0.1	4.5	16	32	6.3	33
4149	300	<5	30	200	5	N10	500	20	N20	15	N200	200	2.6	86	0.1	2	0.1	5.5	270	28	42	43
4150	20	<5	70	100	<5	N10	N100	30	N20	30	N200	150	0.6	26	0.6	2	0.1	4.7	12	73	5.9	44
4151	70	<5	300	N100	15	15	700	200	N20	15	N200	150	0.7	260	0.3	3.4	0.1	41	59	85	2.3	46
4152	N5	50	20	N100	30	N10	1000	200	N20	50	N200	200	0.3	2	N0.05	2	0.1	150	0.6	6.7	2	120
4153	70	<5	3000	N100	<5	N10	300	50	N20	15	N200	100	78	3.5	3	2	0.8	55	22	2500	2	96
4158	<5	20	15	N100	10	N10	300	150	N20	15	<200	50	1.1	53	0.9	6	0.3	18	1	6	6	0.3
4159	5	5	50	N100	5	N10	<100	50	N20	20	<200	200	0.5	37	0.25	6	0.4	21	2	21	6	0.3

PROPERTY NAME: unknown

FORM DATE:

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au

100K SHEET: Reno

DEPOSIT TYPE: Placer

7 1/2' QUAD: Olinghouse

OWNERSHIP: Bill Murdock

SECTION: 26,27

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4392450

UTM East: 295960

PRODUCTION:

HISTORY:

DEVELOPMENT: Old shallow placer shaft; new pit dug by bulldozer (10m deep, 10m wide, and 30m long _ approx.)

GEOLOGY: This area is reportedly one that was identified by the Southern Pacific Co. as having placer alluvial gold. An old placer shaft attests to earlier work as well. A new pit is being dug by Bill Murdock.

REMARKS:

REFERENCES:

SAMPLE SITE:

EXAMINER: L. J. Garside

PROPERTY NAME: Keystone Mine **FORM DATE:**

OTHER NAMES: Ora Claims; Nevada-Keystone Mine

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au

100K SHEET:

DEPOSIT TYPE: quartz-adularia vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: NE1/4 Sec. 30

TOWNSHIP: T21N

RANGE: R23E

UTM North: 4393160

UTM East: 291090

PRODUCTION: $20 per ton in 1900. 856 tons of ore valued at $10,682 in 1910. Ore averaged $15-40 per ton.

HISTORY: Located about 1897 as Ora placer claim. Main shaft and workings started in 1900. Operated by the Keystone Mining Co. in 1910.

DEVELOPMENT: Adit with large dump. Numerous other workings in the vicinity. Adit trends N30E. Main shaft 60 m deep. 365 m of workings.

GEOLOGY: Free gold is reported to occur in quartz veins and veinlets. The wall rock is andesite (Tertiary). Quartz veins up to 6 m? wide are reported from the Keystone. Quartz vein matter is very rare on the dump (shown as tailings on the topographic map). The sample from the dump is mostly propylitized rock. Some carbonate vein matter also noted on dump. The shafts and adits are located on northwest-trending fault zones which occur in and adjacent to a granodiorite porphyry dike. The ore bodies consist of pyritized, silicified breccia and lenticular veins of calcite and quartz located within the fault zones. Free gold and pyrite occur in the vein material.

REMARKS: Sample 4126 is a select sample of iron-stained andesite with sparse pyrite and rare thin quartz veinlets collected from dump.

REFERENCES: Bonham, 1969; Couch and Carpenter, 1943; MASMILS 0320310090; MRDS M321129; Townley, 1985; Quade and others, 1990

SAMPLE SITE: 4126

EXAMINER: L. J. Garside, 6/27/89

PROPERTY NAME: Buster Mines

FORM DATE:

OTHER NAMES: TJ Claims (1988?)

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: gold

100K SHEET: Reno

DEPOSIT TYPE: Quartz vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 21

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4393726

UTM East: 294267

PRODUCTION: Unknown

HISTORY:

DEVELOPMENT: Shaft(?) with moderate-sized dump. New bulldozer roads and at least 3 rotary drill holes done last year by Billaton Minerals USA, Inc. Reportedly none were deeper than 175m.

GEOLOGY: Several prospects in this area are in the vicinity of a northerly-trending zone of alteration and light-colored latite? dikes which cut dark greenish gray andesite. The andesite has platy phenocrysts of plagioclase like the Alta Andesite (Tertiary) elsewhere. Limonite pseudomorphs of pyrite occur in the dike rock which is also altered and appears to be silicified and cut by vein quartz in samples from the dump (location 4128). The trend of mineralization in the working sampled could not be determined.

REMARKS: Sample 4128 is select silicified latite(?) and vein quartz from a dump. Photo 11 is of sample sacks from Billaton drilling project.

REFERENCES: Gerson, Geology of The Olinghouse Mining district, Washoe County, Nevada; M.S. thesis, University of Nevada-Reno.

SAMPLE SITE: 4128

EXAMINER: L. J. Garside

PROPERTY NAME: Babe No. 1 Claim **FORM DATE:** 6/28/89

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au

100K SHEET: Reno

DEPOSIT TYPE: quartz-adularia vein

7 1/2' QUAD: Olinghouse

OWNERSHIP: Al Cabanne, ORACO, 555 Crummer Lane, Reno, NV 89511 (198

SECTION: NW1/4 Sec. 29

TOWNSHIP: T21N

RANGE: R23E

UTM North: 4392870

UTM East: 291920

PRODUCTION: Minor

HISTORY: Operated by William Cocanour and Jim DeSilva in 1983.

DEVELOPMENT: Short adit and crosscuts, totaling less than 100 m. Mill and gravity concentrator listed in 1983.

GEOLOGY: Free visible crystalline gold occurs with drusy quartz along very thin (103 mm) quartz veins which cut a dike and adjacent wall rock basalt flows and andesite lahar(?). The gold-bearing veinlets appear to be concentrated in the dike which is a light gray, porphyritic dacite with slightly darker, cognate inclusions in it locally. The Tertiary basalt which is cut by the dike is nearly black and locally vesicular (and amygdaloidal). Epidote is a common associate of the veined rock, and calcite occurs locally in veinlets. Gold is usually associated with quartz but can be on calcite. Chrysocolla also occurs on vein surfaces with limonite after pyrite. The dacite dike is about 11 m wide and continues for a considerable distance on the surface. In the vicinity of the Renegade Claim to the south, gold reportedly occurs mainly in wall rock veins, not in the dike. Free gold can be found on outcrop at Babe No. 1 in the dike.

REMARKS: Sample 4129 is a select sample of dacite dike rock with gold-bearing quartz veinlets collected from surface exposures. Sample 4130 is a sample of clay-rich gold ore from narrow shear worked underground.

REFERENCES: Geesan, 1980; MASMILS 0320310269; Mine Inspector's List: 1983; Quade and others, 1990

SAMPLE SITE: 4129, 4130

EXAMINER: L. J. Garside, 6/28/89

PROPERTY NAME: unknown

FORM DATE:

OTHER NAMES: CLM claims (No. 11?), 1988?

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au

100K SHEET: Reno

DEPOSIT TYPE: Quartz stockwork

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 15

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4395024

UTM East: 295203

PRODUCTION: None

HISTORY:

DEVELOPMENT: Prospect pits

GEOLOGY: Drusy quartz veinlets and stockworks cut a rhyolite welded tuff(?) along a 1-2m wide zone which trends N25°E and dips 65°SE to 90 degrees. A nearby coarsely crystalline calcite vein up to 1m wide has a similar trend and is near vertical. The wall rock unit contains quartz, feldspar, and biotite, as well as sparse lithic fragments. Biotite and feldspar are altered. The calcite vein was not sampled, and is not prospected.

REMARKS: Sample 4131 is select vein and stockwork quartz from outcrop.

REFERENCES:

SAMPLE SITE: 4131

EXAMINER: L. J. Garside

PROPERTY NAME: unknown **FORM DATE:**

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au(?)

100K SHEET: Reno

DEPOSIT TYPE:

7 1/2' QUAD: Wadsworth

OWNERSHIP:

SECTION: 23

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4394759

UTM East: 296899

PRODUCTION: None

HISTORY:

DEVELOPMENT: Numerous small prospect pits over an area of about 0.25 km2

GEOLOGY: Narrow, irregular quartz veinlets which cut Tertiary welded tuff have been prospected in several small pits. At the sampled locality, iron-oxide minerals and drusy too dense, clear quartz occur as veinlets and veins up to a few cm wide in a probable fault zone which trends N25°E and appears to dip approximately 75°SE. The welded tuff may be the Nine Hill Tuff.

REMARKS: Sample 4132 is select vein quartz from dump and outcrop.

REFERENCES:

SAMPLE SITE: 4132

EXAMINER: L. J. Garside

PROPERTY NAME: unknown

FORM DATE:

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au(?)

100K SHEET: Reno

DEPOSIT TYPE: Vein?

7 1/2' QUAD: Wadsworth

OWNERSHIP:

SECTION: 14

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4395924

UTM East: 296916

PRODUCTION:

HISTORY:

DEVELOPMENT: Adit, mostly caved at portal

GEOLOGY: Mineralization observed in dump samples at the property consists of pyrite-bearing veinlets and fracture coatings with sparse brown calcite vein matter. Rare quartz vein matter was also observed on the dump, usually without calcite or pyrite. The attitude of any mineralized zone is unknown. The wall rock is plagioclase-bearing welded tuff (Nine Hill Tuff?)

REMARKS: Sample 4133 is select pyritized fracture coatings and calcite and quartz vein matter from dump.

REFERENCES:

SAMPLE SITE: 4133

EXAMINER: L. J. Garside

PROPERTY NAME: Stud Mine

FORM DATE:

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au(?)

100K SHEET: Reno

DEPOSIT TYPE: Vein?

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 10

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4396686

UTM East: 296070

PRODUCTION:

HISTORY:

DEVELOPMENT: An adit with moderate-sized dump. Probably several hundred meters of workings. Locked door on adit. Adit trend at portal is N25°W.

GEOLOGY: Based on examination of dump samples, mineralization at the Stud Mine is narrow quartz stringers with pyrite. No other sulfides were observed. Pyrite is also disseminated in the wallrock, a distinctive welded tuff with 2-3mm red, slightly vernacular quartz. This unit could be the tuff of Chimney Springs. Some of the vein quartz is amethystine; calcite vein matter was noted rarely on the dump. Pyrite also occurs on fractures without vein quartz. Alteration of the tuff is silicification and argillization. The attitude(s) of any veins could not be determined.

REMARKS: Sample 4134 is select vein matter and pyritized and pyrite-coated fractures of wallrock from dump.

REFERENCES:

SAMPLE SITE: 4134

EXAMINER: L. J. Garside

PROPERTY NAME: Sample Site 4135 **FORM DATE:**

OTHER NAMES: Big Mouth Canyon area

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: Vein

7 1/2' QUAD: Pah Rah Mtn.

OWNERSHIP:

SECTION: 17

TOWNSHIP: 22N

RANGE: 23E

UTM North: 4405691

UTM East: 292430

PRODUCTION: None

HISTORY:

DEVELOPMENT: Several short adits with small dumps; minor prospect pits.

GEOLOGY: Several very minor workings along a steep-walled canyon explore iron-stained and hydrothermally altered zones in Tertiary welded tuff. At one adit (20m long) apparently established on a 25(?) cm wide crush zone along a N60°W, 60°SW fault, quartz veinlets, iron oxides and silicified tuff are the only mineralization noted. Sparse biotite in the tuff is sericitized. No sulfides were noted. The tuff is relatively crystal poor and plagioclase-bearing; possibly the tuff of Coyote Spring.

REMARKS: Sample 4135 is select vein quartz and silicified and argillized wallrock from dump of short adit.

REFERENCES:

SAMPLE SITE: 4135

EXAMINER: L. J. Garside

PROPERTY NAME: Paiute No. 35 Claim

FORM DATE:

OTHER NAMES: Middle prospects, main fork Big Mouth Canyon

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: Vein

7 1/2' QUAD: Pah Rah Mtn.

OWNERSHIP:

SECTION: 17

TOWNSHIP: 22N

RANGE: 23E

UTM North: 4405188

UTM East: 292795

PRODUCTION: None or minor

HISTORY:

DEVELOPMENT: An adit about 50m long with a 10m crosscut.

GEOLOGY: The portal of the adit at this property is in relatively unaltered (propylitized?) crystal vitric welded tuff, possibly the tuff of Coyote Spring although lithics are quite common in this unit. In the adit bleached and silicified tuffs occur along a N40°W, vertical fault. Presumably calcite and quartz vein matter on the dump came from this zone. The calcite is coarsely crystalline and white to pink; rarely, pyrite is disseminated in it and in included wallrock fragments. The quartz vein matter is drusy quartz veinlets forming a stockwork around bleached and silicified tuff. Iron oxide minerals stain the quartz locally. No adularia was observed macroscopically, although its presence is reported by Bonham (1969, p. 75). A prospect 400m downstream from the above locality (sample site 4136) is a small caved adit and dump. Only silicified and bleached wallrock is on the dump; no vein matter was observed.

REMARKS: Sample 4136 is select quartz and calcite vein matter (about equal proportions) from dump.

REFERENCES: Bonham, H.F., Jr. (1969) Geology and mineral deposits of Washoe and Storey Counties, Nevada, NBMG Bull. 70.

SAMPLE SITE: 4136

EXAMINER: L. J. Garside

PROPERTY NAME: unknown

FORM DATE:

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au(?), Ag(?)

100K SHEET: Reno

DEPOSIT TYPE: Vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 22

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4393725

UTM East: 295979

PRODUCTION: None

HISTORY: Name written on wall of adit: Joseph Max???, January 10, 1917. Also another date: 1923.

DEVELOPMENT: A 6m long adit. Other adits and prospect pits in the vicinity

GEOLOGY: Quartz veining and stockworks occur in silicified welded tuff (Tertiary Tuff of Coyote Spring?). Drusy quartz veins and stockworks have open-space textures and limonite after pyrite. Biotite in wallrock is sericitized, and strongly silicified adjacent to veins. The adit is along a N35°E, 80°NW fault with slickensides and mullions having a 90 degree rake in the fault plane. Sparse barite is present in vein matter.

REMARKS: Sample 4145 is select quartz vein and stockwork matter.

REFERENCES:

SAMPLE SITE: 4145

EXAMINER: L.J. Garside and H.F. Bonham

PROPERTY NAME: Golden Hawk Claims

FORM DATE:

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au(?), Ag(?)

100K SHEET: Reno

DEPOSIT TYPE:

7 1/2' QUAD: Wadsworth

OWNERSHIP:

SECTION: 14

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4396134

UTM East: 297411

PRODUCTION: Minor (?)

HISTORY:

DEVELOPMENT: Three relatively short adits or inclined shafts.

GEOLOGY: The workings at the main area are along a fault zone which contains crushed, pyritic quartz vein matter. The fault is N60°E, 70°NW and about 30 cm wide. Wallrock is silicified tuff of Whiskey Springs. A nearby biotite and plagioclase-bearing, intermediate-composition dike or sill is also altered and contains epidote. In another adit a N55°E, 65°SE fault has slickensides which rake 18 degrees SW in the fault plane. Unprospected areas of silicified and quartz-veined tuff were sampled nearby (samples 4147, 4148). At locality 4148 numerous quartz veins have an attitude of N30°E, 80° to 90°SE. Wallrock at these prospects is also tuffs of Whiskey Springs.

REMARKS: Sample 4146 is select vein quartz from dumps. Sample 4147 is silicified tuff and quartz stockwork from an unprospected area across canyon to southwest. Sample 4148 is grab quartz vein matter from veined Tertiary welded tuff.

REFERENCES:

SAMPLE SITE: 4146, 4147, 4148

EXAMINER: L.J. Garside and H.F. Bonham

PROPERTY NAME: Norris Spring No. 11 Claim

FORM DATE:

OTHER NAMES: Lake View(?)

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au(?), Ag(?)

100K SHEET: Reno

DEPOSIT TYPE: Vein

7 1/2' QUAD: Wadsworth

OWNERSHIP:

SECTION: 14

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4396348

UTM East: 296372

PRODUCTION: Minor?

HISTORY: Old claim post inscribed WECORD? Lake View, Cop 54193

DEVELOPMENT: Several shallow shafts, most less than 50m. Some adits on lower slopes.

GEOLOGY: Drusy quartz veins occur in a fault zone about 10m wide which trends N20°E, 45°SE. The veins and stock works are individually, only a few cm wide; silicification of the wallrock is common. The wallrock is the tuff of Chimney Springs and overlying tuff (upper Chimney Springs), a quartz-rich ignimbrite. Jarosite, limonite, pyrite, and sparse barite are noted in quartz veins.

REMARKS: Sample 4149 is select quartz vein matter from dumps.

REFERENCES:

SAMPLE SITE: 4149

EXAMINER: L.J. Garside and H.F. Bonham

PROPERTY NAME: Norris Spring No. 7 Claim

FORM DATE:

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au(?), Ag(?)

100K SHEET: Reno

DEPOSIT TYPE: Quartz vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 15

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4396478

UTM East: 296086

PRODUCTION: Minor(?)

HISTORY:

DEVELOPMENT: Shaft and adit

GEOLOGY: A N40°W, 45°SE fault zone in the tuff of Chimney Springs has been prospected along a 150m length. At the main workings, drusy and chalcedonic quartz occur in the fault zone with associated jarosite and manganese oxide minerals. Pyrite occurs mainly as fracture coatings and wallrock disseminations. Water stands in one shallow shaft. The vein may be that explored by the Stud mine adit to the south 200m.

REMARKS: Sample 4150 is select quartz vein matter from dump.

REFERENCES:

SAMPLE SITE: 4150

EXAMINER: L.J. Garside and H.F. Bonham

PROPERTY NAME: Woody Mine

FORM DATE:

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au(?)

100K SHEET: Reno

DEPOSIT TYPE: Vein

7 1/2' QUAD: Olinghouse

OWNERSHIP: Willard Hunter, P.O. Box 11672, Reno, NV 89510 (1979)

SECTION: 10

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4398107

UTM East: 295223

PRODUCTION: None

HISTORY:

DEVELOPMENT: Several small prospect pits.

GEOLOGY: A 10m-wide mineralized fault zone with an attitude of N60°W, 60-79°(?) NE cuts hornblende andesite flows(?). The andesite in the area ranges from fine-grained greenish-gray locally vesicular rock with acicular hornblende and rare quartz to a more porphyritic phase with plagioclase and biotite. The Tertiary andesite appears to lie with angular unconformity on Oligocene-Miocene tuffs. The fault zone is silicified, and limonite after pyrite, sericite, and barite(?) were observed.

REMARKS: Sample 4151 is select silicified andesite.

REFERENCES:

SAMPLE SITE: 4151

EXAMINER: L.J. Garside and H.F. Bonham

PROPERTY NAME: Bosici Mines **FORM DATE:**

OTHER NAMES: Gold Eagle claims (1986?)

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag(?)

100K SHEET: Reno

DEPOSIT TYPE: Vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 21

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4393858

UTM East: 293722

PRODUCTION: Unknown

HISTORY:

DEVELOPMENT: A number of adits; several probably 50-100m. Drill holes up to 175m, probably by Homestake in 1986(?)

GEOLOGY: Workings in the vicinity of these samples explore silicified zones and veins with drusy quartz and sparse manganese oxide staining. Cerargyrite(?) may be present. The veins and silicified zones are within or closely associated with altered to fresh felsic dikes which cut amygdaloidal basalt flows of Miocene age. The dikes trend N15E and are mainly near vertical. Some contain biotite and feldspar phenocrysts and at least one phase is bleached and contains disseminated limonite pseudomorphic after pyrite. Sample 4153 is from a vein and silicified zone in this dike rock. At sample site 4152 vesicles in basalt are filled with from outside inward; a thin rim of celadonite and/or serpentine, crystalline epidote overlain with and intergrown with radially crystallized quartz (possibly pseudomorphic after a zeolite mineral), and calcite with oxide copper minerals. Some chalcocite and bornite(?) were also observed in the central part of filled vesicles.

REMARKS: Sample 4152 is select basalt samples with mineralized vesicles. Sample 4153 is select silicified felsic dike and quartz vein matter.

REFERENCES: Geasan, D.L., 1980, The geology of a part of the Olinghouse mining district, Washoe County, Nevada: unpubl. M.S. Thesis, University of Nevada, Reno, 118p.

SAMPLE SITE: 4152, 4153

EXAMINER: L.J. Garside and H.F. Bonham

PROPERTY NAME: Section 30 Adit

FORM DATE:

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: gold

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 30

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4392390

UTM East: 290850

PRODUCTION: none

HISTORY: claim notice from 1930

DEVELOPMENT: Completely caved adit with dump, other small prospect pits in the area

GEOLOGY: Based on an examination of dump material, the caved adit apparently encountered sparse quartz veining and silicification in predominantly propylitized basalt of the Pyramid Sequence. Dikes of dacite cut the wallrocks nearby.

REMARKS: Sample 4537 is select silicified and argillized basalt and sparse vein quartz from dump of adit

REFERENCES: Geeson, 1980 (MSM thesis)

SAMPLE SITE: 4537

EXAMINER: L. J. Garside 6/26/91

PROPERTY NAME: Sunbeam and Caroline Claims

FORM DATE:

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: gold

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 29

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4393200

UTM East: 292850

PRODUCTION: none

HISTORY:

DEVELOPMENT: bulldozer cuts, inclined shaft, adit (with rail)

GEOLOGY: Quartz veining is apparently associated with a complex system of dacitic dikes which cut Tertiary Pyramid Sequence basalts. Dikes trend northeast; a speculative trend of mineralized structures is N35°E. Dikes and basalt are propylitically altered. Sparse clear and milky quartz vein material was observed on the dump of the inclined shaft.

REMARKS: Sample 4538 is select vein quartz from the dump

REFERENCES: Geeson, 1980 (MSM thesis)

SAMPLE SITE: 4538

EXAMINER: L. J. Garside 7/16/91

PROPERTY NAME: Section 20 Inclined Shaft

FORM DATE:

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: gold

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 20

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4393900

UTM East: 291480

PRODUCTION:

HISTORY:

DEVELOPMENT: Inclined shaft, nearby minor prospect pits and adits into mineralized zone

GEOLOGY: A stockwork of white calcite vein material occurs in an apparently 50-cm-wide zone of brecciated basalt of the Pyramid sequence. The zone is present between a felsic dike and chloritized vesicular basalt, and has an attitude of N65°E, 65°NW. Sparse iron oxide minerals occur in the calcite.

REMARKS: Sample 4539 is select vein calcite from dump of inclined shaft

REFERENCES: Geeson, 1980 (MSM thesis)

SAMPLE SITE: 4539

EXAMINER: L. J. Garside 7/17/91

PROPERTY NAME: Section 19 Adit

FORM DATE:

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: gold

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 19

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4393520

UTM East: 291280

PRODUCTION:

HISTORY:

DEVELOPMENT: Caved adit with moderate-size dump; other short adits up canyon. Old building on site

GEOLOGY: The adit apparently explores quartz vein or stockwork mineralization in dacitic dike rock, possibly near the contact with basalt of the Pyramid Sequence. Nothing can be determined about the trend of mineralization. White and clear, drusy quartz veinlets occur in dike rock and contain sparse limonite after pyrite. Workings nearby up the canyon to the north are in areas of bleached basalt; no vein mineralization was noted on these dumps.

REMARKS: Sample 4540 is select vein quartz from dump of caved adit

REFERENCES:

SAMPLE SITE: 4540

EXAMINER: L. J. Garside 7/17/91

PROPERTY NAME:	Morning Star Patent
FORM DATE:	4/28/99
OTHER NAMES:	
MINING DISTRICT:	Olinghouse
COUNTY:	Washoe
COMMODITIES:	Au, Ag
100K SHEET:	Reno
DEPOSIT TYPE:	Vein
7 1/2' QUAD:	Pah Rah Mtn.
OWNERSHIP:	
SECTION:	20
TOWNSHIP:	22N
RANGE:	23E
UTM North:	4404340
UTM East:	292570
PRODUCTION:	unknown
HISTORY:	unknown
DEVELOPMENT:	Caved adit and pits at site 6127; two short adits at site 6130
GEOLOGY:	Adit at site 6127 follows N60°W, vertical to 80°E stockwork vein system in silicified, altered tuff; zone exposed in pit to the south of the adit is about 2m wide consisting of 0.5m-wide silicified rib on vertical wall, thin quartz vein in hanging wall which dips about 80° away from the vertical footwall. Two short adits at site 6130; one more or less is along N60°W, vertical to 80°W-dipping, silicified shear zone; stockwork quartz-adularia (?) veining over about 1.5-2m width of zone; wall rock is propylitized. Other short adit cuts into the footwall of the structure; may have been dug on N35°W cross-fracture zone.
REMARKS:	Adit at site 6127 is timbered at portal, caved, but may be open beyond; main adit at 6130 is 5-6m long.
REFERENCES:	
SAMPLE SITE:	6127; 6130
EXAMINER:	J. V. Tingley, 4/13/99

PROPERTY NAME: Carrie/Bay State Patents **FORM DATE:** 4/28/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: Vein

7 1/2' QUAD: Pah Rah Mtn.

OWNERSHIP:

SECTION: 20

TOWNSHIP: 22N

RANGE: 23E

UTM North: 4403860

UTM East: 292595

PRODUCTION: unknown

HISTORY: unknown

DEVELOPMENT: Caved adit at 6128; caved shaft at 6129, 4m-diameter collar, about 6m deep

GEOLOGY: Adit at 6128 driven on N60°E trend, no structure visible. Rock on dump composed of two rock types; frothy, pumice-rich tuff with iron-oxide-stained fractures and vug surfaces, and dense grey rock with large books of bronze biotite. Hill to the east above the adit is capped by Pyramid Sequence basalt flow. No obvious mineralization noted on dump. At shaft, a N55°E, 80°W-dipping shear zone is visible in the northwest wall, wallrock is dull purplish, biotite-rich tuff.

REMARKS: Caved adit has mine rail protruding from it, also twisted rail on edge of shaft collar.

REFERENCES:

SAMPLE SITE: 6128, 6129

EXAMINER: J. V. Tingley, 4/13/99

PROPERTY NAME: Upper prospects, main fork Big Mouth Canyon **FORM DATE:** 4/28/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: Vein

7 1/2' QUAD: Pah Rah Mtn.

OWNERSHIP:

SECTION: 17

TOWNSHIP: 22N

RANGE: 23E

UTM North: 4404900

UTM East: 292840

PRODUCTION: unknown

HISTORY: unknown

DEVELOPMENT: Caved adit in wash, small prospect pit up-slope to south-southwest

GEOLOGY: No visible outcrop at adit, may have been driven into west slope to intersect silicified ledge to the west. Small prospect cut upslope is about 1m wide, 3m deep into the hill, exposes a N40°W, vertical to 80°E-dipping silicified zone in silicified, bleached tuff; fractures are flooded with limonite; no distinct vein zone, just band of silicification; rock appears to be tuff.

REMARKS: Large dump at mouth of caved adit in wash; adit completely caved. Sample 6131 from prospect pit, 6132 from adit dump.

REFERENCES:

SAMPLE SITE: 6131, 6132

EXAMINER: J. V. Tingley, 4/13/99

PROPERTY NAME:	Outcrop 6134	**FORM DATE:**	4/28/99
OTHER NAMES:			
MINING DISTRICT:	Olinghouse		
COUNTY:	Washoe		
COMMODITIES:			
100K SHEET:	Reno		
DEPOSIT TYPE:	shear zone		
7 1/2' QUAD:	Pah Rah Mtn.		
OWNERSHIP:			
SECTION:	17		
TOWNSHIP:	22N		
RANGE:	23E		
UTM North:	4405890		
UTM East:	292580		
PRODUCTION:	none		
HISTORY:			
DEVELOPMENT:	none		

GEOLOGY: Outcrop of brecciated, hematite-limonite-stained dacitic(?) tuff. Prominent outcrop forms nose of ridge, is bleached and iron-oxide stained. Silicified mass is cut by N30°-40°W, vertical shear zone, also N10°W fracturing. Outcrop could be a dike, cannot see relationship with grey-green massive outcrop to west and south.

REMARKS:

REFERENCES:

SAMPLE SITE: 6134

EXAMINER: J. V. Tingley, 4/14/99

PROPERTY NAME: Sample Site 6135 **FORM DATE:** 4/28/99

OTHER NAMES: Sample Site 4135

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: quartz-adularia vein

7 1/2' QUAD: Pah Rah Mtn.

OWNERSHIP:

SECTION: 17

TOWNSHIP: 22N

RANGE: 23E

UTM North: 4405691

UTM East: 292430

PRODUCTION: none

HISTORY: unknown

DEVELOPMENT: nothing visible

GEOLOGY: Outcrop of silicified, stockwork zone in altered tuff. Stockwork and quartz veining trends N50°W, 70°-80°SW dipping fractures with 2mm-5cm-thick quartz veinlets along them; veinlets irregular, slightly vuggy. Coarse-grained, euhedral white barite crystals in vugs and on quartz surfaces; iron-oxide staining. Other fractures N80°E, vertical, with quartz, limonite, and barite; also N80°W zone about 6m wide on north side of canyon; veining and alteration appear to project to small workings on the south side of the canyon.

REMARKS: Sample 4135 collected from this site, 20m-long adit described; adit not seen in 1999 (?). Location monument BG 15 is located in the canyon bottom about 100m southwest of the sample site. BG 15 staked July 15, 1998 by Meridian Minerals Corp., Reno.

REFERENCES:

SAMPLE SITE: 6135; 4135

EXAMINER: J. V. Tingley, 4/14/99

PROPERTY NAME: Sample Site 6136 **FORM DATE:** 4/28/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Pah Rah Mtn.

OWNERSHIP:

SECTION: 17

TOWNSHIP: 22N

RANGE: 23E

UTM North: 4405600

UTM East: 292200

PRODUCTION: none

HISTORY:

DEVELOPMENT: dump at caved adit on north side of canyon; small timbered adit or dugout on south side.

GEOLOGY: Silicified outcrop, shear zone N60°-70°W, vertical; outcrop iron-oxide stained, minor manganese-oxide staining.

REMARKS:

REFERENCES:

SAMPLE SITE: 6136

EXAMINER: J. V. Tingley, 4/14/99

PROPERTY NAME: Sample Site 6137 **FORM DATE:** 4/28/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Pah Rah Mtn.

OWNERSHIP:

SECTION: 17

TOWNSHIP: 22N

RANGE: 23E

UTM North: 4405580

UTM East: 292085

PRODUCTION: unknown

HISTORY: unknown

DEVELOPMENT: Narrow, timbered adit, runs N50°E for about 8m, then appears to turn to NW

GEOLOGY: Adit follows N50°E shear zone cutting silicified dacitic tuff. Also N70°W and N10°W fracture sets present; all fracture surfaces coated with iron-oxide staining. Quartz and calcite vein material present on dump. Wall rock is propylitized and argillized, bleached, feldspar cloudy white. Disseminated pyrite present.

REMARKS:

REFERENCES:

SAMPLE SITE: 6137

EXAMINER: J. V. Tingley, 4/14/99

PROPERTY NAME: Sample Site 6138 **FORM DATE:** 4/28/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Pah Rah Mtn.

OWNERSHIP:

SECTION: 17

TOWNSHIP: 22N

RANGE: 23E

UTM North: 4405590

UTM East: 291340

PRODUCTION: unknown

HISTORY: unknown

DEVELOPMENT: Caved adit, dump

GEOLOGY: Adit driven along fractured zone/contact between bleached, argillized, iron-oxide-stained tuff and dull grey rock (same rock type, only propylitized and not bleached). Fracture zone N50°W strike, 70° NE dip, also N30°E fracture set. Rock on dump is greenish, propylitically-altered, silicified tuff with hairline, stockwork quartz veining, veins clear, vuggy, with acicular quartz crystals in vugs. Quartz veinlets up to 2mm thick, surfaces flooded with limonite.

REMARKS: Dump is on the north side of the canyon, portal of adit caved.

REFERENCES:

SAMPLE SITE: 6138

EXAMINER: J. V. Tingley, 4/14/99

PROPERTY NAME:	Lower prospects, main fork Big Mouth Canyon	**FORM DATE:**	4/28/99
OTHER NAMES:			
MINING DISTRICT:	Olinghouse		
COUNTY:	Washoe		
COMMODITIES:	Au, Ag		
100K SHEET:	Reno		
DEPOSIT TYPE:	Vein		
7 1/2' QUAD:	Pah Rah Mtn.		
OWNERSHIP:			
SECTION:	17		
TOWNSHIP:	22N		
RANGE:	23E		
UTM North:	4405440		
UTM East:	293075		
PRODUCTION:	unknown		
HISTORY:	unknown		
DEVELOPMENT:	Caved adit, large dump		
GEOLOGY:	Prominent silicified outcrop cut by N50°W and N20°E, 30°SE-dipping fracture sets, limonite flooding on fracture surfaces.		
REMARKS:	Large dump is on a point on the south side of the canyon, probably from adit now completely caved, slight indentation in slope is probable adit portal site. There is a small dump uphill, on the east side of the silicified outcrop.		
REFERENCES:			
SAMPLE SITE:	6139		
EXAMINER:	J. V. Tingley, 4/14/99		

PROPERTY NAME:	Sample Site 6140	**FORM DATE:**	4/28/99
OTHER NAMES:			
MINING DISTRICT:	Olinghouse		
COUNTY:	Washoe		
COMMODITIES:	Au, Ag		
100K SHEET:	Reno		
DEPOSIT TYPE:	vein		
7 1/2' QUAD:	Wadsworth		
OWNERSHIP:			
SECTION:	11		
TOWNSHIP:	21N		
RANGE:	23E		
UTM North:	4397060		
UTM East:	297100		
PRODUCTION:	unknown		
HISTORY:	unknown		
DEVELOPMENT:	Shaft		
GEOLOGY:	Silicified quartz breccia in propylitized dacitic (?) tuff		
REMARKS:	Sample collected from dump of vertical shaft; collar timbered, but open and caving below first set; no ladder, covering of shaft pulled aside; cannot safely get close enough to estimate depth or see rock exposed in shaft.		
REFERENCES:			
SAMPLE SITE:	6140		
EXAMINER:	J. V. Tingley, 4/15/99		

PROPERTY NAME: Sample Site 6141

FORM DATE: 4/29/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Wadsworth

OWNERSHIP:

SECTION: 11

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4397170

UTM East: 297100

PRODUCTION: unknown

HISTORY: unknown

DEVELOPMENT: Open shaft, 2m by 3m at collar, sloughing at collar, cannot estimate depth

GEOLOGY: Appears to be a N25°W-striking, vertical shear zone exposed at shaft collar, rock is brecciated and iron-oxide stained, wall rock argillically-altered tuff. EW and N70°E fractures also present. Vein quartz with clear, drusy quartz veinlets on dump.

REMARKS: Shaft fenced, but fencing is down on the NW side. Old wooden ladder extending from shaft on west side.

REFERENCES:

SAMPLE SITE: 6141

EXAMINER: J. V. Tingley, 4/15/99

PROPERTY NAME: Sample Site 6142 **FORM DATE:** 4/29/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 3

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4398400

UTM East: 295930

PRODUCTION: unknown

HISTORY: unknown

DEVELOPMENT: Adit, about 5m long, caved at portal

GEOLOGY: Adit driven on N40°E-striking, 65°SE-dipping fracture zone in silicified dacitic tuff; also N40°W, 75°NW fractures present. Fracture surface are stained with iron oxide, no veining or obvious signs of mineralization.

REMARKS: Adit driven S40°E from into south side of canyon, caved at portal but could crawl over caved material, is open for about 5m beyond.

REFERENCES:

SAMPLE SITE: 6142

EXAMINER: J. V. Tingley, 4/15/99

PROPERTY NAME: Moongold No. 41 Claim

FORM DATE: 4/29/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 34

TOWNSHIP: 22N

RANGE: 23E

UTM North: 4400520

UTM East: 294920

PRODUCTION: none

HISTORY: unknown

DEVELOPMENT: Two shallow prospect pits, 5m apart; deeper pit is to SE, extends 3m into hill and is about 1.5m deep and 2m wide.

GEOLOGY: Indistinct structure, N50°W, 75°SE, bleached, silicified dacitic tuff in about 1m-wide argillized zone, quickly grades into propylitically altered rock beyond sheared zone.

REMARKS: Sample of silicified rock with drusy quartz crystals on fracture surfaces, collected from small dump by pits.

REFERENCES:

SAMPLE SITE: 6143

EXAMINER: J. V. Tingley, 4/15/99

PROPERTY NAME: Secret Canyon Adits

FORM DATE: 4/29/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 28

TOWNSHIP: 22N

RANGE: 23E

UTM North: 4402407

UTM East: 294815

PRODUCTION: unknown

HISTORY: unknown

DEVELOPMENT: Two adits into south wall of canyon, both caved, large dumps

GEOLOGY: Upper adit portal exposes N50°W, 65°SW-dipping structure with 1-2m-wide section of quartz vein rubble and silicified wall rock in white mica/clay gouge. Propylitically altered tuff in hanging wall (west) and argillically-altered material in the structure and in the footwall. There is a N55°-60°W, vertical structure along the footwall, there are blocks of kaolinized tuff between the footwall and the central gouge zone. The footwall rock is greenish, propylitically altered, and has stockwork veining. Entire zone, FW to HW, is about 4m, with another 3m of weakly-veined rock in the footwall

REMARKS: Sample 6144 collected from upper dump, sample 6213 collected from lower dump

REFERENCES:

SAMPLE SITE: 6144, 6213

EXAMINER: J. V. Tingley, 4/15/99; L. J. Garside, 8/13/92

PROPERTY NAME: Moongold No. 6 Claim

FORM DATE: 4/29/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 28

TOWNSHIP: 22N

RANGE: 23E

UTM North: 4401670

UTM East: 294750

PRODUCTION: unknown

HISTORY: unknown

DEVELOPMENT: Shallow shaft with dump; shaft 2m by 3m at collar, about 6.5m deep; stub drift, 1.5m long, extends from bottom of shaft to east.

GEOLOGY: Shaft sunk in argillized, silicified dacitic welded tuff, slightly greenish tinge, N-S quartz veining-3-4 stringers 18cm to .5m thick, iron-oxide-stained.

REMARKS: Shaft is open and is not fenced, has old timbers lying against shaft wall. Sample collected from shaft dump. Location monument for Moongold No. 6 is on the dump.

REFERENCES:

SAMPLE SITE: 6145

EXAMINER: J. V. Tingley, 4/16/99

PROPERTY NAME: Sample Site 6146

FORM DATE: 4/29/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 11

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4398010

UTM East: 296920

PRODUCTION: unknown

HISTORY: unknown

DEVELOPMENT: Two small prospect pits on north side of saddle, one 2m x 4m x 1.5m deep, a second about 6m to NE, about 3m diameter.

GEOLOGY: At first pit, N15°W, 80°SW-dipping shear zone exposed, about 2m wide zone of rubble and gouge. No structure is visible at second pit but dump is composed of argillized, bleached, silicified tuff, and lots of crystalline gypsum litters dump. Some white quartz vein material with vugs, limonite-stained.

REMARKS: Sample 6146 collected at second dump.

REFERENCES:

SAMPLE SITE: 6146

EXAMINER: J. V. Tingley, 4/16/99

PROPERTY NAME: Sample Site 6147 **FORM DATE:** 4/29/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 11

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4397900

UTM East: 296500

PRODUCTION: unknown

HISTORY: unknown

DEVELOPMENT: Small prospect pit, 3m x 4m into slope

GEOLOGY: Pit dug into propylitized tuff, iron-oxide stained rock present in SW end of pit, cannot clearly see structure, but N35°W, 80°NE fractures cut altered rock, possible N40°E strike to iron-oxide-stained zone. Vuggy vein quartz with gossan clots present on dump.

REMARKS:

REFERENCES:

SAMPLE SITE: 6147

EXAMINER: J. V. Tingley, 4/16/99

PROPERTY NAME:	Stud Horse Prospect	**FORM DATE:**	4/29/99
OTHER NAMES:			
MINING DISTRICT:	Olinghouse		
COUNTY:	Washoe		
COMMODITIES:	Au, Ag		
100K SHEET:	Reno		
DEPOSIT TYPE:	vein		
7 1/2' QUAD:	Olinghouse		
OWNERSHIP:			
SECTION:	33		
TOWNSHIP:	22N		
RANGE:	23E		
UTM North:	4400880		
UTM East:	294030		
PRODUCTION:	none		
HISTORY:	unknown		

DEVELOPMENT: Small prospect cut into slope, 6m long x 2m wide, about 0.75m deep at NE end.

GEOLOGY: Prospect dug on iron-oxide-stained fractures cutting moderately propylitized dacitic ash-flow tuff. No outcrops, some argillically-altered rock on prospect dump, minor quartz-veined material.

REMARKS: Sample collected from dump.

REFERENCES:

SAMPLE SITE: 6148

EXAMINER: J. V. Tingley, 4/16/99

PROPERTY NAME: Sample Site 6149 **FORM DATE:** 4/29/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 33

TOWNSHIP: 22N

RANGE: 23E

UTM North: 4401340

UTM East: 293970

PRODUCTION: none

HISTORY: unknown

DEVELOPMENT: Small prospect cut, 4-5m long downslope, 2m wide, about 1m deep

GEOLOGY: No outcrop visible, covered with slope wash. Dump material brecciated dacitic tuff, replaced by quartz, laced with hairline quartz veinlets.

REMARKS: Old sample tag on sagebrush, #1725

REFERENCES:

SAMPLE SITE: 6149

EXAMINER: J. V. Tingley, 4/16/99

PROPERTY NAME: Sample Site 6150 **FORM DATE:** 4/29/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 33

TOWNSHIP: 22N

RANGE: 23E

UTM North: 4401115

UTM East: 294150

PRODUCTION: none

HISTORY: unknown

DEVELOPMENT: none

GEOLOGY: Outcrop of silicified dacitic ash-flow tuff along N30°W, 35°SE-dipping shear zone that cuts across saddle. Also N10°W, 70°NE and N50°E, 75°SE fractures present. Outcrop stained hematite-red, silicified ledge, brecciated and cemented with quartz.

REMARKS: Sheared, silicified zone is exposed over a width of about 14m in saddle.

REFERENCES:

SAMPLE SITE: 6150

EXAMINER: J. V. Tingley, 4/16/99

PROPERTY NAME: Site OG131g **FORM DATE:** 5/4/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 33

TOWNSHIP: 22N

RANGE: 23E

UTM North: 4401070

UTM East: 294570

PRODUCTION: unknown

HISTORY: unknown

DEVELOPMENT: Adit, caved at portal, small dump

GEOLOGY: Adit follows N45°W, 90° to 70°NE-dipping silicified fracture zone, 2m-wide, in silicified dacitic ash-flow tuff, pyrite and oxidation products (jarosite, hematite) present; a hornblende andesite porphyry dike (?) is found in the footwall, closely associated with the vein. Uphill to the NW (sample site 6206), the silicified zone is about 50m wide with central zone of more intense shearing, wide zone is rubbleized and recemented with quartz; disseminated pyrite present. Pale yellow and greenish-yellow oxide staining locally.

REMARKS: Adit is caved at the portal, but is open beyond, could be possible to dig out and crawl in. Sample 6214 is grab from adit dump.

REFERENCES:

SAMPLE SITE: 6206, 6214

EXAMINER: L. J. Garside, 8/13/92; J. V. Tingley, 4/16/99

PROPERTY NAME: Site OG192g **FORM DATE:** 5/4/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au, Ag

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 11

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4397920

UTM East: 296320

PRODUCTION: unknown

HISTORY: unknown

DEVELOPMENT: Two adits, both caved at portal

GEOLOGY: Adits driven on N50°W, 90° to 75°SW-dipping, brecciated, rubbly quartz vein in diorite porphyry intrusive (Miocene). Bands of vein quartz plus iron-oxide boxworks total about 1m in thickness, surrounded outward by a 0.5m-wide envelope of argillic alteration, beyond this, rock is propylitized. Vein is mainly on hangingwall of structure, with gouge and clay on the footwall, are crusts of limonite 1-2cm thick in the gouge zone.

REMARKS: Both adits are caved at their portals, but the northwestern adit is open beyond the caving, could squeeze through.

REFERENCES:

SAMPLE SITE: 6207, 6208

EXAMINER: L. J. Garside, 8/6/93; J. V. Tingley, 4/16/99

PROPERTY NAME:	Moongold No. 5 Claim	**FORM DATE:**	4/29/99
OTHER NAMES:	Location OG132g		
MINING DISTRICT:	Olinghouse		
COUNTY:	Washoe		
COMMODITIES:	Au, Ag		
100K SHEET:	Reno		
DEPOSIT TYPE:	vein		
7 1/2' QUAD:	Olinghouse		
OWNERSHIP:			
SECTION:	28		
TOWNSHIP:	22N		
RANGE:	23E		
UTM North:	4401640		
UTM East:	294880		
PRODUCTION:	unknown		
HISTORY:	unknown		
DEVELOPMENT:	Large dump from cut and adit into hillslope, all caved.		
GEOLOGY:	Mineralized structure, approx. N50°W, 90°, in argillized and silicified dacitic ash-flow tuff. Rock on dump contains veins and veinlets of calcite and drusy quartz; sericite present in wall rock adjacent to the vein. A N10° to 20°W, 70°e-dipping fracture zone is exposed in bleached, argillized rock at the mouth of the cut.		
REMARKS:	Location monument, Moongold No. 5, Garside sample site OG132g		
REFERENCES:			
SAMPLE SITE:	6210		
EXAMINER:	L. J. Garside, 8/13/92		

PROPERTY NAME: Site OG144g | **FORM DATE:** 5/4/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES:

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 4

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4399710

UTM East: 294090

PRODUCTION: none

HISTORY:

DEVELOPMENT: none

GEOLOGY: Outcrop, dacitic welded tuff cut by narrow, white chalcedonic veins and veinlets; tuff has sericite and limonite pseudomorphic after pyrite; adularia present in vein material.

REMARKS: Adularia collected from vein at this site dated by K-Ar method at 17.8 ± 0.5 Ma

REFERENCES:

SAMPLE SITE: 6211

EXAMINER: L. J. Garside, 8/18/93

PROPERTY NAME: Green Hill Mine **FORM DATE:**

OTHER NAMES: Olinghouse Mine

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES: Au

100K SHEET:

DEPOSIT TYPE: Au placer

7 1/2' QUAD: Olinghouse

OWNERSHIP: Cliff Resources, Green Hill Mining Venture

SECTION: NE1/4 Sec. 29

TOWNSHIP: T20N

RANGE: R23E

UTM North: 4392790

UTM East: 292800

PRODUCTION: Estimated at 20,000 ounces

HISTORY: The Olinghouse Mine, operated in 1985-1987 was a joint venture between Peter Kiewit Mining Group and Nevada Pacific Mining Co. Cliff Resources acquired the property in 1987 and operated it at an increased production rate for about 1 year.

DEVELOPMENT: Open pit mine.

GEOLOGY: Free gold occurs in eluvial placers in the canyon on the southeast flank of Green Hill. Quartz vein deposits occur in andesite and basalt flows of Tertiary age on Green Hill. Gold was recovered by gravity means; fine tailings were piped to the east in the Truckee River Valley. Fine gold was apparently not recovered during the pre-Cliff Resources efforts. Cliff installed spiral riffle bowls to recover +400 mesh gold. Scheelite and cinnabar were noted in the heavy mineral fractions during gravity concentration (Mitch Fanning, oral commun., 1989).

REMARKS: Photo 8 is of dump from open pit. Photo 10 is similar. Photo 13 is of dragline. Operated by Wytana, Inc., in 1986(?)

REFERENCES: Jones, 1987; MASMILS 0320310088, 0320310089; MRDS M231128; Quade and others, 1990

SAMPLE SITE:

EXAMINER: L. J. Garside, 6/27/89

PROPERTY NAME: Site OG193g **FORM DATE:** 5/4/99

OTHER NAMES:

MINING DISTRICT: Olinghouse

COUNTY: Washoe

COMMODITIES:

100K SHEET: Reno

DEPOSIT TYPE: vein

7 1/2' QUAD: Olinghouse

OWNERSHIP:

SECTION: 11

TOWNSHIP: 21N

RANGE: 23E

UTM North: 4397730

UTM East: 296250

PRODUCTION: unknown

HISTORY: unknown

DEVELOPMENT: Small shaft and adit

GEOLOGY: Silicified tuff (?) containing disseminated pyrite; possible alunite (?) present.

REMARKS:

REFERENCES:

SAMPLE SITE: 6212

EXAMINER: L. J. Garside, 8/6/93