GOLDEN QUEEN MINING COMPANY, INC.

# SOLEDAD MOUNTAIN PROJECT

## MOJAVE, KERN COUNTY, CALIFORNIA

DRAFT
ENVIRONMENTAL IMPACT REPORT /
ENVIRONMENTAL IMPACT STATEMENT

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BAKERSFIELD, CALIFORNIA

BUREAU OF LAND MANAGEMENT
RIDGECREST RESOURCE AREA
RIDGECREST, CALIFORNIA

**VOLUME 4 OF 6**

Appendix IV

WZI INC.

# GOLDEN QUEEN MINING COMPANY, INC.

## MINERAL RESOURCE EVALUATION
## OF ALTERNATIVE PROJECT SITES
## SOLEDAD MOUNTAIN PROJECT
## MOJAVE, CALIFORNIA

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## 1.0 EXECUTIVE SUMMARY

WZI Inc. (WZI) conducted a Mineral Resource Evaluation of Alternative Project Sites for the Golden Queen Mining Company, Inc. (Golden Queen) Soledad Mountain Project in eastern Kern County, California. The principal objective of this investigation was to determine if viable alternative project sites were present within a distance of 100 miles of the proposed Soledad Mountain Project.

A review of the geology, gold mineralization, and proposed mine development of the Soledad Mountain Project was conducted. Alternative project siting criteria developed from review of the Soledad Mountain Project geological and mineralization conditions included the following: (1) proximity to known past gold producing districts; (2) presence of potential ore-body host rock that consists of fractured Cretaceous granitic or Tertiary volcanic rock; (3) proximity to area(s) where a potential ore reserve or resource base of 40 to 50 million tons of gold bearing ore can be developed with grades of 0.01 to 0.05 oz/ton with stripping ratios of overburden to ore below 8:1 and gold recoverable with heap-leaching production methods; and (4) proximity to established utility and infrastructure support.

Database review of the regional geology was accomplished by review of existing surface geologic and geophysical maps from both published and unpublished sources. Mining districts with past gold production were reviewed from published literature and the individual districts described with respect to known geologic and gold mineralization trends that are similar to those at the proposed Soledad Mountain Project. Favorable areas where potential gold deposits similar to that of the Soledad Mountain Project were identified. A review of known exploration activities by private companies that have occurred during the past 10 years within the favorable areas was conducted by interviewing active and past active operators. Land status of the area of investigation was identified using existing federal and state maps that depict restricted areas where mineral development is prohibited. In addition, recent legislation by the U.S. Congress established the California Desert Protection Act, by which a large portion of the California desert area has been withdrawn from mineral exploration and/or production.

The investigation concluded:

- Forty mining districts were found to exist within the area of investigation of the alternative project sites where gold mineralization in commercial quantities was determined to have existed;
- A total of 14 of the alternate project site mining districts evaluated are located either within or immediately adjacent to state of California or federal lands that have been designated as Primitive or Wilderness Areas and are not available for mineral exploration or development;
- An additional three sites are located within or immediately adjacent to federal military lands and are not available for mineral exploration or development;
- Alternate project sites that represent the best potential alternative sites are: (1) the operating Yellow Aster Mine owned by Glamis Gold Ltd. located in Kern and San Bernardino Counties and within the Randsburg District; (2) the Zenda Mine Project owned by Claim Staker Resources, Inc. located in Kern County and within the Loraine District; and (3) the Big Horn Mine Project, owned by Siskon Gold, Inc., located in Los Angeles County and within the Mount Baldy District.

The three alternate sites represent the best potential alternate project site options available to the Soledad Mountain Project within the area of investigation. These three sites have reported potential ore reserves of less than 25 percent of the projected ore resources of the Golden Queen Soledad Mountain Project (2.3 million ounces of gold equivalent). In addition, in each of these sites, a mining company has already established controlling interest in the identified mining properties.

## 2.0 INTRODUCTION

### 2.1 Project Background

Golden Queen Mining Company, Inc., has proposed the development of the Soledad Mountain Project. The proposed project consists of an open pit precious metals (gold and silver) mining and heap leach processing facility to be developed at Soledad Mountain, approximately five miles southwest of the unincorporated town of Mojave in Kern County, California (Exhibit 1).

The project area consists of approximately 1,600 acres, of which 1,165 acres are privately owned land and 435 acres are unpatented mining claims on public lands administered by the U.S. Bureau of Land Management, Ridgecrest Resource Area Office of the California Desert District (BLM). The Kern County Planning Department is the lead agency for compliance with the California Environmental Quality Act (CEQA) and will oversee Golden Queen's implementation of and compliance with the Surface Mining and Reclamation Act of 1975 (SMARA), which is applicable to all mining operations within the State of California. BLM is the lead agency for compliance with the National Environmental Policy Act (NEPA) and will oversee compliance with the standards and procedures in the BLM regulations for surface mining of public land under the general mining law.

The project is located within an unincorporated area of eastern Kern County and is on and around Soledad Mountain, west of State Route 14 and south of Silver Queen Road. The project area includes portions of Sections 5, 6, 7 and 8 in Township 10 North, Range 12 West and Sections 1 and 12 in Township 10 North, Range 13 West, San Bernardino Base and Meridian (Exhibit 1).

The objective of the Soledad Mountain Project is to develop an open pit precious metals (gold and silver) mine and heap leach processing operation with the potential for the production of aggregate and construction materials. Up to 60 million tons of ore and 230 million tons of overburden materials will be mined. The anticipated life of the project is up to 15 years with employment expected for approximately 230 people. Processing operations will continue for approximately two years after the cessation of mining, at which time the project will begin closure and reclamation.

The closest electrical power lines that are capable of providing power requirements to the Soledad Mountain Project are located at the northeast corner of the project site. A new substation will be constructed on the project site with overhead and underground distribution network to serve the various operations on the project site.

The Soledad Mountain Project is estimated to require water at the average rate of 750 gallons per minute. This water will be supplied from groundwater that will be pumped from three water supply wells. This water will be used for mining and leaching operations and dust control.

Project operations will be followed by closure and reclamation of the site. The objectives of reclamation are: (1) to assure that adverse environmental effects are prevented or minimized and that mined lands are reclaimed to a level consistent with current use; (2) to encourage the production and conservation of minerals while giving consideration to values relating to recreation, watershed, wildlife, range and forage, and aesthetic enjoyment; and (3) to assure that residual hazards to the public health and safety are eliminated.

A total of 930 acres will be disturbed by the project, approximately 215 of which have been disturbed as a result of prior activities on the site. Except for the open pit mine, which covers 265 acres, and 20 acres of process area highwall and side slope, all disturbed acreage will be subject to reclamation and/or stabilization processes.

As part of the CEQA requirements for alternative locations, WZI conducted an Alternative Site Location Investigation. As a consequence, WZI staff reviewed regional geological and mining data to determine the possible locations for an alternative project site.

## 2.2 Area of Investigation

The area of investigation for data collection of the alternative project site is depicted on Exhibit 2. All geological and mining data publicly available was reviewed to a distance of 75 or 100 miles from the proposed Soledad Project location near Mojave. The investigation also included evaluation of alternative sites in mining districts located in portions of Los Angeles, Ventura, Inyo, San Bernardino, Riverside and Kern Counties.

## 2.3 Database Utilized

The database utilized to conduct the investigation included:

- All publicly accessible and pertinent geological and geophysical data for this portion of California. U.S. Geological Survey, U.S. Bureau of Land Management, U.S. Forest Service, U.S. Bureau of Mines and California Division of Mines and Geology reports and maps were reviewed;
- Proprietary geological and geophysical data owned by individuals and companies that was made available to WZI staff to conduct the investigation; and
- Discussions with active and previously active mineral exploration company personnel familiar with the geology and gold deposits of the area of investigation was also conducted.

## 2.4 Limitations

WZI has prepared this investigation in accordance with the accepted standard of care which exists in California at the time the investigation was conducted. It should be recognized that the evaluation of published and unpublished technical reports and data from which conclusions of this investigation were based, were accepted as being technically correct.

## 3.0 INVESTIGATION PROCEDURES

### 3.1 Geology and Gold Mineralization at the Soledad Mountain Project

Regional Geological Background

The tectonic history of the western United States is complex, with subduction-related orogenic events occurring from the Late Cretaceous Period (74.5 million years ago) to the middle Miocene time (16 million years ago) (Mabey and others, 1978). Principal magmatic arcs present in the area of investigation include the Sierra Nevada Mountain Range and the San Gabriel- San Bernardino Mountain Ranges (Exhibit 2). These ranges are relatively narrow, with well-defined zones of calc-alkaline volcanic and plutonic activity that was inferred to have occurred above subduction zones. The deposits of base and precious metals within the area of investigation appear to be closely associated with these orogenic events.

A possible source of the Tertiary-age calc-alkaline volcanic rocks at Soledad Mountain is the partial melting of oceanic and crustal material as it descended into the subduction zone (Coney, 1978). The fracture pattern within the deep crystalline basement rock is inferred by regional magnetic and gravity data (Mabey and others, 1978). These fractures may have developed in response to easterly-directed compressional forces related to subduction of the oceanic plate and may have acted as preferred pathways above which subsequent volcanic vents or centers occurred.

Miocene volcanic flows and volcaniclastic sediments at Soledad Mountain rest unconformably on Late Cretaceous quartz monzonite of the Sierra Nevada batholith (Jennings, 1977).

Geology of the Soledad Mountain Project

Soledad Mountain is a moderately eroded, complex-shaped silicic volcanic center that is postulated to have formed during middle to late Miocene time (16.9 to 21.5 million years) (Troxel and Morton, 1962; Perez, 1978). Soledad Mountain can be interpreted as being the remnant portion of a caldera or irregular-shaped volcanic center. Volcanic rock composed of felsic flows, tuffs, and breccias with rock types ranging in composition from quartz latite to rhyolite are present in the Soledad Mountain Project area (Dibblee, 1967).

The oldest rocks at Soledad Mountain are the Late Cretaceous quartz monzonite. Overlying the quartz monzonite are the Tertiary volcanics. The oldest Tertiary volcanic unit is the early Miocene age quartz latite flows which represent the oldest eruptive sequence. These flows are postulated to have originated from at least three separate vent centers and form a broad platform that underlies a large portion of the Soledad Mountain and immediate surrounding area (Perez, 1978).

Overlying the quartz latite flows is a middle unit comprised of pyroclastic units. This middle pyroclastic flow unit is a thick, near-vent accumulation of coarse pyroclastic debris, thin bedded distal airfall tuff, and pyroclastic flows that rests on both the underlying quartz latite flows and quartz monzonite.

Overlying the quartz latite flows and the middle pyroclastic units is a sequence of flow-banded rhyolite. This flow-banded rhyolite is inferred to have had a single vent source. The rhyolite is restricted mainly to outcrops along the northern edge of the complex.

Rocks of the upper pyroclastic unit (middle Miocene) lie unconformably on the flow-banded rhyolite. This unit represents a near-vent accumulation of interbedded sequences of poorly sorted chaotic breccias and moderately sorted layers of coarse ash and lapilli tuffs.

The youngest and most widespread of the volcanic units is the porphyritic rhyolite. The largest exposure of this unit is present west and southeast of the Soledad Mountain summit, where it forms three moderately eroded and coalescing lava domes. This unit was emplaced through, and locally overlies, all other volcanic units of the complex.

The other gold-producing mines located in the district have similar lithologic and volcanogenic characteristics to those of Soledad Mountain (Clark, 1970). Common features include: epithermal hot spring-style of mineralization; host rocks consisting of calc-alkaline volcanics; and structurally controlled alteration and mineralization.

The Standard Hill Mine is located northeast of Soledad Mountain. The geology at Standard Hill Mine consists of high-angle faults that contain quartz veins that cross-cut quartz monzonite and quartz latite volcanics (Gardner, 1954). The veins strike north to northwest with shallow dip angles to the east and northeast, respectively.

The Tropico Mine is located approximately seven miles to the south of Soledad Mountain. The geology at the Tropico Mine has quartz monzonite that is overlain by quartz latite, flow-banded rhyolites and rhyolite porphyry similar to the volcanics of the Soledad Mountain (Gardner, 1954). The gold-bearing veins at the Tropico Mine strike east-west and dip 65 to 70 degrees to the south. Quartz veins fill pre-mineral faults, with movement continuing during and after mineralization (Clark, 1970; Clark, 1980).

The Cactus Mine, located approximately five miles west of Soledad Mountain consists of quartz latite to rhyolite flows resting unconformably on quartz monzonite. The strike pattern of the veins varies from southeast to northeast. Mineralization is associated with quartz-filled faults, fault breccia and zones of solidification and argillization of the wall rock (Clark, 1970).

Gold Mineralization

The gold mines within the Mojave-Rosamond mining district appear to line the rim of a collapsed volcanic center. The center of the volcanic center is postulated to have been located southeast of Soledad Mountain, north of the Tropico Mine, and southeast of the

Cactus Mine. Volcanism waned approximately 16 million years ago at Soledad Mountain and allowed meteoric waters to flow back into the volcanic complex and mix with upward migrating magmatic fluids. Magma chamber(s) at depth are inferred to have supplied a continuing heat source and migrating fluids at depth formed geothermal convection cells with cooler, near-surface meteoric water. Precious metal-bearing solutions probably migrated upward along the pre-existing fault and fracture surfaces until physical and chemical changes encountered near the ground surface caused precipitation of metals into the host rocks (Berger and Eimon, 1981; Buchanan, 1981).

Gold mineralization has occurred at the Soledad Mountain area as a series of epithermal veins, filling faults and shear zones (Perez, 1978). A series of these veins are present at Soledad Mountain and are exposed at the surface within a northwest-trending belt approximately 4,000 feet wide and 6,500 feet long. Vein widths vary from three feet to 50 feet and are consistent along strike and down dip. Some of the veins have been mined to a vertical depth of 1,000 feet below ground surface.

The lateral extent of mineralization of the volcanic units at Soledad Mountain is variable (Perez, 1978). Mineralization of the volcanic flow units of quartz latite, flow-banded rhyolite and porphyritic rhyolite is reported to be generally confined to faults and fault breccias and shows a weak potential for mineralization into the wall rock. Where mineralized faults and veins cross-cut the middle and upper pyroclastic units, a wider halo of mineralization into the host rock occurs. This halo indicates a possible leaking of hydrothermal solution into the more permeable and porous tuffaceous units of the Soledad Mountain volcanic complex.

Published mining production records indicate the Mojave-Rosamond District has produced approximately 1,046,000 ounces of gold or gold equivalent from over two dozen mines (Clark, 1970).

The largest known producers in the Mojave-Rosamond District included:

| Mine | Gold Produced |
|---|---|
| Golden Queen: | 483,792 ounces |
| Cactus Gold: | 241,896 ounces |
| Standard Group: | 169,327 ounces |
| Tropico: | 114,000 ounces |

Much of the past gold produced at the Mojave-Rosamond District was from underground mines that typically had gold ore concentrations that ranged from 0.25 to 0.5 oz/ton (Clark, 1970). During the 1980's, heap leach projects were started by several mining companies to rework old mine tailings or to conduct open-pit mining operations. These operations were conducted over some of the older underground mines and are similar to many projects across the western United States (Bonham, 1981; Silberman, 1982). These projects included the Standard Hill Project conducted by Billiton Minerals, USA and the Cactus Gold Project conducted by Cactus Gold Mining Company.

Numerous geological and geochemical data were utilized by Golden Queen staff to construct cross-section diagrams of the Soledad Mountain Project. These data included geochemical analysis of drill hole, subsurface workings, and surface rock samples. These data indicate that approximately 60 to 70 million tons of ore with a gold-equivalent concentration of 0.030 oz/ton and a cut-off grade of 0.008 oz/ton remain as a proven reserve and resource base for gold at the Soledad Mountain Project. With a heap leach recovery of 80 percent of mined ore placed on the heap leach pad, a total of approximately 1.45 million ounces of gold are estimated to be recoverable at the Soledad Mountain Project.

## 3.2 Gold Mining Districts in Area of Investigation

Published reports and publicly available literature describing the known gold districts that are present within the Area of Investigation were reviewed. The geology, mineralization systems, known past producing mines and their gold production, and land status were evaluated for each of the districts investigated. A discussion of each district was made that outlined known recent exploration activity.

Each gold mining district is plotted on Exhibit 2. There are four distinct geomorphic provinces within the area of investigation: Sierra Nevada Province; Basin and Range Province; Mojave Desert Province; and Transverse Range Province. Each of these provinces has different geologic structure elements and stratigraphy. Each of the provinces has mineralized areas within it where base and precious metals have been produced. A tabulation of significant historical events of gold mining in California is presented as Table 1.

Production records for the mining districts are generally incomplete or nonexistent. Many of the older references would record only the dollar amount of gold produced and not volume, which would have been reported in ounces. WZI staff utilized the old price standard for an ounce of gold of $20.67/ounce to convert the reported dollar amount of production to ounces for production reported until 1932. Between 1932 and 1968, the conversion price of gold was estimated to be $35.00/ounce. No price conversion was required after 1968 for reported gold production because most production was reported in ounces.

Many of the mining districts within the area of investigation were indicated to have produced gold from lode or placer mines but had no dollar amounts or volumes of gold reported. Where no specific gold production was identified, WZI staff assigned an inferred production base for volume of gold produced in ounces. This inference of gold produced from these districts is based on geological similarities and known gold production from other districts with similar geology and mineralization. WZI staff also estimated remaining reserve or resource potential available for several of the mining districts where past exploratory drilling data was made available for review.

A brief summary of each mining district is presented within Table 2. The mines within the four provinces are described below:

### 3.2.1 Sierra Nevada Geomorphic Province

The Sierra Nevada mountain range is the main source of the state of California past gold production and contains the greatest number of small-size mining districts of all the provinces. The main rock type of the Sierra Nevada is a large batholith of Mesozoic granodiorite and related rocks that have intruded into metamorphic rocks of Paleozoic and Mesozoic age (Jennings, 1977). The large batholith is approximately 400 miles long in the north-south dimension and 85 miles wide in the east-west dimension. The Mariposa Formation (Upper Jurassic) and the Kernville Series (Jurassic or older) of the southern Sierra Nevada contain slates, schists, phyllites, and quartzites which are present in many of the mining districts (Clark, 1970).

In addition to the main Sierra Nevada granodiorite batholith, there are numerous smaller intrusions of basic and ultra-basic rocks, many of which are serpentinized (Jennings, 1977). The serpentine bodies apparently have been structurally important in the localization of gold bearing deposits in some of the mining districts and often are parallel to or occur within the belts of gold mineralization (Clark, 1970). Also, there are numerous dioritic and aplitic dikes that are closely associated with gold bearing veins.

#### 3.2.1.1 Clear Creek Mining District (Kern County, Exhibit 2, Location #1)

<u>Location and History</u>

The Clear Creek or Havilah District is located in east-central Kern County, about 26 miles east-northeast of Bakersfield and five miles south of Bodfish. It is located in an large area that includes Red Mountain and Walker Basin. This district is also considered a tungsten district (Dibblee and Chesterman, 1958).

Gold was discovered in Clear Creek in 1863 or 1864 and by 1865 the town of Havilah was established (Brown, 1916). Mining activity in the area declined during the 1880's, but has been reported to have been intermittently active for many years (Tucker and Sampson, 1933).

## Geology

The Clear Creek District and surrounding area is underlain by Mesozoic age quartz diorite with roof pendants of Paleozoic metasediments present in the north and south portions of the district (Jennings, 1977). An intrusive body of gabbro is present to the northeast. The gold deposits are reported to be mostly confined to the quartz diorite intrusive body located west of Havilah and in the Walker Basin (Troxel and Morton, 1962). These ore bodies reportedly consist of quartz veins up to six feet thick and contain free gold and varying amounts of sulfides (Tucker and Sampson, 1933).

## Mines and Gold Production

Mines located in the Clear Creek District include: Friday; Jackpot; Joe Walker ($600,000 or more of gold produced); Porter; Rand group ($125,000 of reported gold production); Rochfort; Southern Cross; Washington. It is estimated that approximately 35,000 ounces of gold were produced from this district.

## Recent Exploration Activity

No recent exploration activity is known to have occurred. This area is within lands administered by the U.S. Forest Service and may have significant mineral exploration and/or development restrictions.

### 3.2.1.2 Cove Mining District (Kern County, Exhibit 2, Location #2)

Location and History

The Cove District is located in the northeastern portion of Kern County, between the towns of Kernville and Isabella, on the west side of the Lake Isabella Reservoir. The upper Kern River here was reportedly mined for gold in placer occurrences during the 1850's (Miller and Webb, 1940). The Big Blue vein was discovered in 1860 (Crawford, 1893), and a significant period of mining activity followed during the 1870's and early 1880's. The mines were worked intermittently from the 1880's through the 1930's with the Big Blue group reported as having been operated on a large scale from 1934 until 1943 (Troxel and Morton, 1962). Since 1943 there has been only minor activity reported in the district.

Geology

The Cove Mining District is underlain primarily by Mesozoic granodiorite (Jennings, 1977). East and south of the district outcrops of schist, phylite, quartzite and marble of the pre-Cretaceous Kernville Series are present. Aplite dikes are reportedly often associated with the gold-bearing veins (Clark, 1970).

The ore deposits consist of extensive vein systems, with some being reported as much as 150 feet wide. These vein systems are reported to occur within shear zones in the granodiorite (Prout, 1940). The ore reportedly consists of quartz with finely disseminated free gold, arsenopyrite, pyrite, chalcopyrite and galena. The milling ore grade was reported as averaging 0.1 to 0.33 oz/ton of gold with some localized higher grade streaks (Troxel and Morton, 1962). The veins have been reportedly mined to depths of about 500 feet. There are two main vein systems: the Big Blue-Sumner and the Lady Belle groups.

Mines and Gold Production

The mines in the Cove Mining District included the Big Blue Group, the Big Blue-Sumner Group and the Lady Belle Group. The district has an estimated past gold production valued at $8 million. It is estimated that approximately 387,034 ounces of gold were produced from this district.

Recent Exploration Activity

No recent exploration activity is known to have occurred. This area is within lands administered by the U.S. Forest Service and may have significant mineral exploration and/or development restrictions.

3.2.1.3 Erskine Creek District (Kern County, Exhibit 2, Location #3)

Location and History

The Erskine Creek District is located in Kern County, approximately 38 miles northeast of Bakersfield and south of Lake Isabella Reservoir. The district forms an area approximately five miles long and two miles wide and also includes the mining area known as the Pioneer District. Antimony and gold deposits were productive in the early 1890's and intermittently afterward (Tucker and Sampson, 1933).

Geology

Two northwest-trending roof pendants of pre-Cretaceous metamorphic rocks are surrounded by Mesozoic granitic rock in this district (Jennings, 1977). The ore deposits reportedly consist of quartz veins containing free gold and varying amounts of sulfides. Gold and varying amounts of silver, antimony, tungsten, copper and uranium have been produced from the Erskine Creek District (Troxel and Morton, 1962).

Mines and Gold Production

The principal sources of gold in the district has been reported to have been the Glen Olive Mine, which reportedly yielded $500,000 of gold and the Iconoclast Mine (Tucker and Sampson, 1933). Other properties include the Golden Bell, Laurel, Valley View, Faust and King Solomon Mines (Clark, 1970). It is estimated this district has produced 24,189 ounces of gold.

Recent Exploration Activity

No recent exploration activity is known to have occurred. This area is adjacent to lands administered by the U.S. Forest Service and may have significant mineral exploration and/or development restrictions.

### 3.2.1.4 Greenhorn Mountains District (Kern County, Exhibit 2, Location #4)

Location and History

The Greenhorn Mountains District is located in Kern County about 28 miles northeast of Bakersfield. The initial reported discovery of gold was made in Greenhorn Creek in 1851 by a member of the John Fremont expedition (Brown, 1916). A gold rush soon followed and the town of Petersburg was established. Gold mining activity declined before 1890. Since 1890 there has been minor prospecting reported in the district. Most of the gold output has been from lode deposits (Brown, 1916).

Geology

The Greenhorn Mountains District is underlain by quartz diorite (Troxel and Morton, 1962). Several roof pendants that are comprised of Mesozoic or Paleozoic age metamorphic rocks and pegmatite dikes are also present (Jennings, 1977).

Mines and Gold Production

The chief placer gold deposits were in Greenhorn, Fremont, Bradshaw, and Black Gulch Creeks (Brown, 1916). Numerous small, poorly-mineralized quartz veins are present in the district. Most of these quartz veins are located a few miles east of David Guard Station (Troxel and Morton, 1962). The gold is reported to be present in a free state and there is very little sulfide mineralization. An unknown volume of gold was produced from this district. Based on similar geological environments, it is estimated that approximately 1,000 to 5,000 ounces of gold was produced from the district.

Recent Exploration Activity

No recent exploration activity is known to have occurred. This area is adjacent to lands administered by the U.S. Forest Service and may have significant mineral exploration and/or development restrictions.

3.2.1.5 Jawbone Canyon District (Kern County, Exhibit 2, Location #5)

Location and History

The Jawbone Canyon district encompasses an area between Emerald Mountain and the El Paso Mountains, north of the Garlock Fault. The district is centered about 14 miles north of the town of Mojave. Placer gold deposits were reportedly discovered in this district in approximately 1900 (Troxel and Morton, 1962). Lode gold deposits were reportedly developed at several mines including the Skyline and San Antonio during the late 1930's (Tucker and Sampson, 1940).

Geology

The Jawbone Canyon-Butterbread Peak area is underlain by Cretaceous granitic rocks containing minor roof pendants of Mesozoic metasediments (Jennings, 1977). Tertiary sediments and interbedded volcanic rocks unconformably overlie the granitic rocks in places. These sediments, as well as the granitic rocks, are intruded by Tertiary age rhyolite dikes and plugs that are believed to be of the same age as those in the nearby Mojave District (Miocene) (Troxel and Morton, 1962). A variety of mineral deposits occur in the district, including gold, antimony, clay and mercury. Most of the gold occurrences worked in the past consisted of west- to northwest-trending narrow, gold-bearing quartz stringers cutting the Cretaceous quartz monzonite. Many of the quartz stringers are often associated with rhyolite dikes. At the Hub Mine, however, a gold-bearing quartz vein cuts altered rhyolite on the west side of the district. In addition, some of the rhyolite bodies are widely altered to clay minerals, and cinnabar has reportedly been recognized in at least one rhyolite body (Troxel and Norton, 1962).

Mines and Gold Produced

The mines that were reported to be in this district included: Hub, Skyline, and San Antonio. No published gold production value or volume was reported for this district. It is estimated that the total volume of gold produced from this district was 1,000 to 5,000 ounces based on similar geological environments and known past production from other mining districts.

Recent Exploration Activity

It appears that some limited exploration for precious metals has occurred in this district in the past ten years. No announced discovery of an ore body has been made within this district.

3.2.1.6 Kern River District (Kern County, Exhibit 2, Location #6)

Location and History

The Kern River District is located in the upper Kern River, between Bakersfield and Bodfish. This district was the scene of a rush soon after the discovery of gold at