

PROPERTY NAME: Bell Mine
 OTHER NAMES: Jerritt Canyon
 MINERAL COMMODITY(IES): Au, (Sb)
 TYPE OF DEPOSIT: Disseminated
 ACCESSIBILITY:
 OWNERSHIP: Joint venture - Freeport Au Co. (70%) & FMC (30%)
 PRODUCTION:
 HISTORY: In mid 1970's FMC showed an initial interest in the area due to the occurrence of antimony deposits in Burns Basin as cited by Lawrence, 1963 (NBMG BU11. 61).

County: Elko ^{79A} Item 10
 Mining District: Burns Basin (Jerritt Canyon)
 AMS Sheet: McDermitt
 Quad Sheet: California Mtn. 7 1/2
 Sec. 34, T 41N, R 53E
 Coordinate (UTM):
 North 4 5 8 4 5 0 0 m
 East 0 5 8 4 1 0 0 m
 Zone +11

When gold was discovered by sampling surface exposures & drilling, FMC asked Freeport Au Co. to ~~develop~~ joint venture with them. Construction of the mine began in June 1980. The estimated cost for the mine is \$105 million dollars.

DEVELOPMENT:

~~XXXXXXXXXXXXXXXXXXXX~~ Two existing and adjoining open pit mines; the Generator & Marlboro Canyon. One projected pit will be completed in the future south-east of the existing two to explore the defined Alchem ore body. The claim block encompasses the mines & includes 374 sections ~~XXXXXXXX~~ located along the ridge of the range. The claims are on Forest Service land; the mill is on BLM land.

ACTIVITY AT TIME OF EXAMINATION: Actively mining the Generator pit & stripping the Marlboro pit. The ore is hauled 7 1/2 miles to the millsite located near the base of the east side of the Independence Range. The ore is crushed, treated or cyanide leached at the millsite. Exploration (drilling) on other portions of their large claim block continues enthusiastically. GEOLOGY: At the time of our August visit, most all of the ore was coming from the Generator pit which has reserves of 35,000-37,000 tons of ore at 0.2 oz/ton^{Au/ton} or better. The cut-off is 0.08-0.1 oz/ton & hi-grade values reach 0.5 oz/ton. There is no visible gold within the ore zone & very little Ag is associated with the Au mineralization. Fifty to sixty percent of the ore mined is carbonaceous, the remaining is oxidized. Removal of the Au from the carbonaceous ore is essential since there is not enough oxide ore to pay for the mine & the carbonaceous ore is generally the highest grade. Bell Labs developed a technique for processing the carbonaceous ore (heating in sealed tank to 110° F & treating with chlorine gas) & as a result this is the 1ST large scale operation for processing carbonaceous ore. The oxide ore is treated by conventional cyanide leaching. The output from the mill is 800 oz Au/day. A mine life of 10 years is projected but will (probably) be extended with the discovery of new ore bodies. A cone crusher was added to existing jaw, sag & ball crushing equipment to accommodate the jasperoid associated with & accounting for part of the ore.

A drilling program ensued in the area after soil geochemistry indicated Au anomalies in the Marlboro Canyon area. To target the drill roads, sampling was done on 50' intervals along roadcuts. Indicator elements for gold mineralization were found to be arsenic, antimony, barium, mercury & thallium.

^{stratigraphic} The pits & claim block are located in the ridgecrest area of the Independence Range. The section includes lower plate Ordovician & Silurian miogeosynclinal carbonate sediments & upper ~~plate~~ plate siliceous sediments (quartzites, argillites, etc.) ~~the former~~ are exposed in several windows within the claim block. Jasperoids & jasperoid breccias are abundant & well exposed in the claim block & at the mine sites. The presence of jasperoids is important in prospecting but not all of the exposed bodies are mineralized. According to the company geologists, there is no obvious way to discern a Au-bearing jasperoid from a barren one. The jasperoids sitting above the Marlboro & Generator Pits are anomalous in Au, in addition to Sb & Ba. (continued*)

REMARKS: Sample 1577 was taken from an outcrop of jasperoid above the Generator Pit, i.e. Generator Pit Jasperoid.

Sample 1578A consist of stibnite-bearing jasperoid. Sample B consists of bleached shale & gouge material. Both samples were taken from the NW end of the Generator Pit.

*Continued on another sheet- attached.

REFERENCES: Tour guides Roger Banghart & John Wilbanks of Freeport.

EXAMINER: Bentz/Garfish/Smith/Brooks

DATE VISITED: 8/82

Geology:

The outcrops of jasperoid contain abundant barite, stibnite & calcite occurring in pods & filling vugs. The rocks show open spaced textures, with many vugs & crosscutting veinlets of drusy quartz. The E-W trending "Generator" jasperoids show multiple brecciation, or fracturing & are cut by numerous, open spaced quartz veinlets. Barite crystals up to 1/2 inch in length commonly fill Fe-stained, quartz encrusted vugs. The "Marlboro" jasperoids reportedly ran .1-.04 oz/ton gold. They cover the entire hillside north of the Marlboro pit. The jasperoids occur over, under, adjacent to & far away from the ore bodies. In the Generator pit, the jasperoids are mined but account for less than 5% of the total gold from the mine. These jasperoids generally have a hard-pan clay zone beneath them. It is interesting to note that the jasperoids located between the two pits are "barren" of gold mineralization. Drilling continues in other portions of the claim block near Au-bearing jasperoids. (i.e. Seval & Steer Canyons.)

Volcanic rocks (andesite tuffs & flows) occur on the east flank of the range near the millsite & south of the claim block. These rocks do not show any signs of alteration. No intrusives are found within or near the mined areas.

The Generator open pit explores lower plate rocks of the Roberts Mountain Thrust. The youngest unit exposed in the pit is the Silurian Roberts Mountain Fm. The lower portion of this formation is mineralized & contributes, along with the jasperoids, to part of the total volume of ore. However, the most favorable horizon for gold mineralization is the chert-carbonate unit in the upper portion of the Ordovician Hansen Creek Fm. The mineralization extends along bedding strike for several thousand feet, but, more importantly is enhanced or cut-off by high-angle structures.

Argillites & greenstones of the Ordovician Snow Canyon Fm (upper plate) surround the mined lower plate rocks. The upper plate rocks are intensely folded & fractured & contain some antimony. Some structures in upper plate rocks are anomalous in Au. The origin of the two ore types, carbon & oxide, are not well understood. The carbonaceous ore, which accounts for the major portion & highest grade of total mined ore, is thought to be remobilized along structures by hydrothermal fluids. The carbon may be derived from the Roberts Mountain Formation. Areas dominated by carbonaceous ore in the Generator Pit are characterized by bleaching & limonite staining. We observed irregular & discontinuous lenses & pods of carbonaceous ore which had been deposited along the E-W striking Bell Fault. The fault zone is exposed at the base of the jasperoids at the north end of the Generator pit. Realgar was found in the carbonaceous material. Oxide ore was more abundant in the south-west part of the pit. Whether the oxidation occurred during supergene or hypogene processes is not known.

Although Au mineralization extends laterally along favorably hosted horizons, the most important control for the Jerritt ore bodies is structure. The highest grade ore is generally located at structural intersections, especially those involving N or NE striking faults. In many cases, N-NE striking faults truncate older E-W structures with the Au mineralization concentrated along & extending outward from the younger N-striking structures. Thrust faults are also responsible for enhancement of the ore zones.

At the time of our visit, active drilling was occurring on other portions of the claim block south of the open pits. Within various parts of the claim block, Freeport has found mineralized structures cutting the section as far down as the Eureka quartzite & as much as .5 oz/ton Au in drill core(?) of upper plate rocks.

[INSERT ABOVE] - (The Hansen Creek Fm. conformably overlies the Roberts Mtn. Fm.)

PROPERTY NAME: Bell Mine
OTHER NAMES: Jerritt Canyon, Jerritt
MINERAL COMMODITY(IES): Au, (Sb)
TYPE OF DEPOSIT: Disseminated Au
ACCESSIBILITY: Haul road from North Fork Valley
OWNERSHIP: Freeport Gold Co. (70%) FMC (30%)
PRODUCTION:
HISTORY: Discovery, early 1970's

County: Elko
Mining District: "Jerritt Canyon" Burns
AMS Sheet: McDermitt BASIN
Quad Sheet: California Mtn. 7 1/2'
Sec. 34, T 41N, R 53E
Coordinate (UTM):
North 4 5 8 4 5 0 0 m
East 0 5 8 4 1 0 0 m
Zone +11

DEVELOPMENT: Two open pit mines (adjoining), numerous drill roads and drill holes. The area of geochemical targets covers an area of approximately 16 X 24 km. in the central part of the Independence Range. Mill located in S33, T41N, R54E.
ACTIVITY AT TIME OF EXAMINATION: Mining; mill now at 4000 fpd, total cost of mine, mill, housing etc. is \$105 million. Mine tour conducted by Roger Banghart and John Willbanks. Five exploration drill rigs currently active.

GEOLOGY: The geology is well described in Hawkins (1982) and other references cited in that article. The average grade ore is presently 0.2 oz/ton or better. Carbonaceous ore is treated by patented chlorine gas & heat process. This includes any ore which has a AA Au determination (with cold cyanide leach) of less than 70% of the fire assay value. Ore contains very low to essentially no Ag; high in Sb, As, Hg, some samples have Tl. Stibnite is usually present in jasperoids (including old mines in the area). Barite occurs in cavities in jasperoid in crystals up to 1cm. Chert-carbonate unit of Hanson Creek Fm (Silurian) is favorable for mineralization. Most of ore is not in jasperoid. Nearby Tertiary volcanic rocks are only slightly altered. Au is probably best exploration indicator element, Sb second best. Soil geochem samples are useful. Jasperoids may occur over or under ore; they usually have a clay zone directly underneath. There are mineralized faults (with Au) which cut overlying upper plate rocks (See Hawkins, 1982, for geology). There are no hot-spring deposits immediately associated with mineralization. Mineralization at Bell Mine is controlled by high-angle fault intersections, the thrust fault is not an ore control. (favorable rocks are mostly in the lower plate.). Jasperoids have quartz-pyrite veins, vuggy quartz, stibnite, barite, calcite and consist of porous to massive chalcedony. Hydrothermal? breccia zones were rarely noted in the jasperoid on Generator Hill. Realgar and orpiment occur mainly in the areas of remobilized carbonaceous matter which is concentrated along faults. Pyrite is reportedly quite high in this material also. Freeport geologists have varying opinions on the oxidized ore -whether it is supergene or hypogene oxidation.

A sample of stibnite-bearing jasperoid from the Marlboro pit wall, when broken, had a 1.5cm diameter stain of a fetid hydrocarbon? (which came out of a 1-2mm cavity. This stain evaporated from the surface in about 15 seconds.

~~XXXXX~~ Roger Banghart reports that stains somewhat like this were noted at the Gold Acres Au deposit. These could be like large, hydrocarbon-filled fluid inclusions, and should be studied further. Also, it would be interesting to know if methane is common in the rocks.

Remarks:

Sample 1577 is jasperoid from outcrop on Generator Hill; Sample 1578 A is fault gouge from the Marlboro pit, Sample 1578 B is jasperoid with stibnite from the Marlboro pit. Photo G 822-17, mill; 18 & 19 Marlboro & Generator pits; 19 drill rig near pits; 20 jasperoid on Generator Hill-1; 21 & 22, remobilized carbon along fault in pit wall; 23, oxide ore, Marlboro pit; 24, mill building.

REFERENCES: Hawkins, R. B. (1982) Discovery of the Bell gold mine, Jerritt district, Elko County, Nevada: Mining Congress Journal, Feb.82, p. 28-32. Also, references listed therein.

EXAMINER: L.J. Garside, J. Bentz, P Smith

DATE VISITED: 13 Aug. 82

Please Return to: D. L. Stevens
133 South Van Gordon St., Suite 300
Lakewood, Colorado 80228

Respondent Robert B. Hawkins
Address Freeport Exploration Company
Lakewood, Colorado Phone: 988-0224
Property Name Jerritt Canyon (Bell Mine) Location S34 T41N R53E
Published Reserves: Oxide Ore 6.25 million tons grading 0.23 oz/T
Carbonaceous Ore 6.25 million tons grading 0.23 oz/T
Annual Production: Mill (TPY) 962500
Leach (TPY) _____

1. Regional Geology (10 mile radius)

- A. Structure; faulting, folding, age: Antler/Late Devonian,
early Miss. folding, uplift & thrusting, Tertiary Basin and
Range normal faulting
- B. Intrusives; age, composition, geometry, alterations,
mineralization: 7 mile south small qtz monzonite dike or plug
(100' diameter outcrop) several small andesitic intrusives as
dikes w/closest to Bell Mine 2 miles south - probably
mid-Tertiary (Tuscarora Age?)
- C. Volcanics; age, composition, type (flow, tuff, etc.),
proximity, depth of mineralization relative to pre-volcanic
surface: mid-Tertiary (Tuscarora equiv) ryodacitic ash flow
tuff - 7 miles east of Bell Mine assoc. w/Basin and Range
faulting (3 mile diameter outcrop) Depth of min. 1000-3000'

D. Basement lithology; stratigraphic section - thickness and lithology, known or inferred basement lithology: inferred - Precambrian Granite

2. Local Geology (1 mile radius)

A. Host rock(s); age, lithology, porosity, permeability, pyrite (syngenitic) and organic content: Roberts Mountains Formation - Silurian

laminated calcareous siltstone w/good porosity .5-1% syng. py., <2% organic carbon

Hanson Creek Form. - Ordovician thin bedded, banded silty dolomite & limestone w/<.5% syng. py., <2% organic carbon, low porosity, permeability

B. Structure; folding, faulting, control on mineralization, age(s): mid-late Tertiary normal faulting - NE trends
control mineralization, earlier east-west trend breaks host rocks to provide porosity
possible Roberts Mtns. Thrust fault as preparer of host permeability

C. Igneous rocks; type, chemistry, geometry, age and relationship to mineralization: none identified to date

3. Geochemistry/Alteration

A. Major elements; % addition/depletion MgO , K_2O , Al_2O_3 , SiO_2 , minerals, spatial/temporal relationship to gold mineralization: Regional relationship of 10-100% silicification of limestones, dolomites, siltstones

(Cont.)

suspected depletion of MgO

suspected addition of K₂O, Al₂O₃

1-5% depletion of MnO

B. Minor elements; value range in ppm Hg, As, Sb, W, Ba, Ag, Cu,

Pb, Zn or other, mineralogy, zoning with ore: _____
(cinnabar)

Hg - 300-3000 ppb Ag - nil

(oprimient-realgar-arsenopyrite)

As - 25-2000 ppm Cu - 50-350 ppm (along major conduits)

(stibnite-antimony oxides)

Sb - 25-500 ppm Pb - 50-350 ppm " " "

W - 10-100 ppm Zn - 50-350 ppm " " "

(Barite)

Ba - 100-5000 ppm (Hg, As, Sb, Ba occur w/ore, others unknown)

C. Principal alteration characterists: silicification, pervasive

argillization in close proximity to conduit faults

remobilized carbon along conduit faults, and as selective

fronts w/in host and ore

probable hydrothermal oxidation - possible related to boiling

decarbonization

D. Organic carbon; evidence of remobilization, carbon and gold

relationships, nature of carbon oxidation, carbon compounds,

metallurgical problems: gold intimately related to organic

carbon probably acted as precipitant, presents metallurgy problems

refining pre-oxidation to normal cyanide circuit

gold tied up in complex organic compounds for which chemistry

is not well known

carbon remobilized along obvious feeder structure, and

within permeable host w/gold ore

5. History of Discovery

Geologists conducting a regional search for antimony
recognized structure, host, and mineralization similar to
that published for the Carlin Mine, 30 miles to the south.
Subsequent soil sampling for gold detected surface anomalies
related to economic gold mineralization at depth, structure,
and alteration.