



# United States Department of the Interior

## BUREAU OF MINES

1605 EVANS AVENUE

RENO, NEVADA 89520

NM Mine File No. 207

June 28, 1977

Mr. Richard Manning  
Winna Mining Co.  
Deming, New Mexico 88030

Dear Mr. Manning:

This concerns the sample of ore that you submitted to this Center to determine if the precious metal contents were leachable by heap leach techniques. A head sample was split from the submitted material and was assayed for gold and silver by conventional fire assay method. Results were:

Gold 0.06 oz/ton Silver 3.60 oz/ton.

Preliminary agitation cyanidation tests were conducted to determine if this ore was amenable to cyanidation and to determine the effect of the mesh-of-grind on the extraction of the precious metal values. Charges of ore ground to a nominal 3/8 inch, 10-mesh, and 100-mesh were agitated for 24 hours with a solution containing 2.0 pounds of sodium cyanide per ton and lime to maintain the alkalinity at a pH of about 11. The results are shown in table 1.

TABLE 1. - Recovery of gold and silver by cyanidation

Feed Size	Gold extraction, pct	Silver extraction, pct
3/8 inch	31.0	19.5
10 mesh	55.6	38.0
100 mesh	82.3	66.7

Additional agitation cyanidation tests were conducted on the 100-mesh feed. Reagent concentrations were the same as the previous tests but the agitation time was increased from 24 to 48 hours. Results of duplicate tests are shown in table 2.

TABLE 2. - Recovery of gold and silver by cyanidation  
agitation time 48 hours

Feed size	Gold extraction, pct	Silver extraction, pct
100 mesh	94.9	84.8
"	95.2	84.6

It is apparent from the above results that the gold and silver contents of your ore are leachable with dilute cyanide solution; however, fine grinding and longer leaching periods are required for optimum recovery.

A percolation cyanide test was conducted on a 50-pound charge of the ore sample crushed to about 1/4 inch to determine the recoverable values obtainable by heap leach cyanidation treatment. The ore charge was mixed with 5 pounds of lime per ton and then transferred to a 5.5 inch I.D. leach column to make a bed of about 3 feet in height. Twelve liters of leach solution containing 2.0 pounds of sodium cyanide per ton was circulated through the charge controlling the rate so that the solution trickled slowly downward through the bed. The effluent from the leach column was pumped upward through three adsorption columns in series, each containing 30 grams of 6x16 mesh activated carbon for recovery of the gold and silver cyanide values. The barren solution was fortified periodically to maintain the strength of the leach solution at 2 pounds of NaCN per ton, and was recycled to the top of the column for further leaching of the ore.

The ore charge was leached for 23 days. At the end of this period the pregnant effluents contained less than 0.003 ounce of gold per ton and 0.014 ounce of silver per ton indicating that essentially all of the leachable gold and silver had been extracted. The loaded carbons and leached residue were assayed for gold and silver. Results indicated that 82.5 percent of the total gold and 69.0 percent of the total silver were extracted. This represents a recovery of 0.052 ounce of gold and 2.52 ounce of silver per ton. The leached residue assayed 0.01 ounce of gold and 1.13 ounce of silver per ton. Cyanide consumption was 1.04 pound per ton of ore. The average percolation rate was 3.48 gallon per hour per square foot of cross sectional area. These results show that acceptable recoveries of the precious metals may be expected from this ore by heap leach cyanidation practice. We suggest further testing be done on a tonnage lot sample to optimize feed size, to study percolation characteristics, and to check recoveries before proceeding to a commercial heap leach operation. Precaution should be taken to prevent discharge of cyanide-containing solutions to the environment. Many local water quality boards have established regulations regarding maximum allowable quantities of cyanide that may be discharged.

It should be noted that these analyses are based on the sample as received at this Center. The Federal Bureau of Mines claims no knowledge as to the geographic source, type of deposit, or means of sample preparation.

We trust this information will be helpful in evaluating the feasibility of heap leaching your gold-silver ore.

Sincerely yours,

*Harold J. Heinen*

Harold J. Heinen  
Metallurgist