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Mine Management
Mine Production

Licensed
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Development
Exploration

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AUGUST 1, 1967

TYBO TAILINGS ECONOMICS

LOCATION : Hot Creek Range, some 70 miles from Tonopah, Nye County Nevada, off of the Tonopah-Ely , Nevada Highway.

The area is one of generally mild Winters, so an all year operation could safely be anticipated

OWNERSHIP: Nevada Silver Producers, Inc. own the tailings operating rights , held under a liberal mining-treatment lease.

TYBO MINE MILLING :

One of the first selective flotation plants in U. S. was installed at the Tybo Mine, commencing operation May 13, 1929 and continued until September 1937, during which period 503,131 dry tons of ore was milled. The best metallurgical study of the Tybo Tailings is contained in the comprehensive, " U. S. Bureau Of Mines Information Circular No. 6430", which delt in detail in the technical summary of over 150,000 tons of the tailings and milling phases of the Tybo ores which at that time recovered only part of the values losing slightly over 25% of all values now impounded in the tails.The tailings were stacked in a confined area at the mouth of Tybo Canyon.They can easily be picked up for retreatment with use of one tractor pulling an 18 or 20 Cu. Yd. scraper producing well over 1,000 tons dry weight per eight hour day. One manshift per day will produce the treatment plant feed. Some $7,000,000 was produced out of the 503,131 dry tons treated, with a tailings loss of 25%. As silver was priced less than one third of the present price, lead sales were down as low as 3.5¢ and part of the gold was sold at $20.67 , the present calculation of $4,440,000 in tailings loss is accurately supported by the U. S. Bureau Of Mines data and private studies similar to the one herewith done by R. E. Simpson.

EXCERPTS; U. S. BUREAU OF MINES DATA IN I. C. NO. 6430 :

AVERAGE MILLHEADS :

	SILVER	LEAD	ZINC	IRON
HEADS UPPER Lvs.	8.6	5.7	5.0	11.1
Lead Conc'ts.	96.4	69.5	4.3	6.1
Zinc Conc'ts.	12.4	1.6	48.6	11.7
Tailings	2.0	.87	1.03	12.9

NOTE : Gold not reported. Estimated @ 0.035 head average, due to Fe S. tails are probably .01 to .015 Oz.

NOTE: The above 12.9 Iron is chiefly in form of Pyrite, Fe S = 46.6 iron and 53.4% sulphur.

TYBO MINE TAILINGS DATA :

AVERAGE MILLHEADS, Continuation :

	SILVER	LEAD	ZINC	IRON
Heads lower Lvs. = 50% Upper Lvs. = 50%, feed ratio	9.1	5.8	4.3	12.5
Lead Concentrates	82.8	63.2	4.2	8.7
Zinc concentrates	13.3	2.4	47.9	11.0
Tailings	3.0	1.6	0.95	13.2

NOTE: Gold in heads not reported but probably was .035.

NOTE : 13.2 % iron is practically all Iron pyrites , FeS_2.

Iron pyrites' composition = 46.6 iron and 53.4 sulphuf. Therefore, some 25% of the 350,000 tons of tailings is iron pyrites plus the gold, silver, lead and zinc in the heavy fraction. Calculation = 87,500 tons plus other heavy fraction.

TAILINGS COMPOSITE :

	SILVER	LEAD	ZINC	IRON	
Composite	2.76	1.1	1.3	11.6	
Slime 500-mesh	2.30	0.4	0.6	7.7	
Bromo Fl. Sand	0.50	Trace	trace	---	
Pyrite, FeS_2	10.25	1.5	0.1	--	Probable .010 gold.
Economic recovery	74.9%	74.0%	72.4%		25% of head product in tailings.

SILVER VALUE IN MINERALS :

	Ounces per ton
GALENA.....	110.0 to 130.0
SPHALERITE, U.P...	12.0 to 20.0
SPHALERITE, L.P...	7.0 to 10.0
Pyrite, U. P.	8.0 t0 11.0
Pyrite, L. P.	1.0 to 6.0

ECONOMICS :

Tailings gross value.

Gold .015 @ $35 = .525¢, Silver 2.76 @ $1.29 = $3.585, Zinc 1.3 @ .14¢ = $3.64, lead 1.1% @ .14¢ = $3.08. Gross value total $10.83 per ton.

There is almost 50,000 tons of sulphur in the iron pyrite. The mineral iron pyrite's chief commencial use is in the manufacture of sulphuric acid. An acid market survey would disclose if it would be practical to make acide out of the rougher product tonnage as noted above, the isolated iron pyrite has only 0.1% zinc combined, but also carries 10.25 Ozs. silver per ton, 1.5 % lead and an estimated 0.01 gold.

TYBO MILL TAILINGS DATA :

ECONOMICS , Continuation :

As the zinc is very low in the iron pyrite, a metallurgical possibility exists whereby making sulphuric acid would leave a residue of iron oxide containing gold, silver, lead and less than 0.50% zinc, which would be a highly acceptable product at the AS&R Selby, California smelter as they need iron for flux. The Mountain Copper Company , Ltd. of San Francisco for many years has been making sulphuric acid out of iron pyrite tonnage, shipped all of the way from Shasta County, California, with a very low gold content in the pyrite. Their iron oxide residue with some concentration of gold is then sold AS&R's Selby Smelter.

CALCULATIONS :

According to the U. S. Bureau of Mines factors, of pyrite value content excepting zinc and sulphur, at present gross prices , 10.25 Ozs. silver = $13.21 per ton @ $1.29 market, 1.5% lead @ .14¢ per Lb. = $4.20 and an estimate of 0.01 gold = .35¢ for a total per ton value of $17.76. Upon the assumption of mechanical and metallurgical losses to 10% the gross value per ton of recovered value out of the pyrite would be $15.98. 87,500 pyrite tons X $15.98 = $ 1,398,250. With the sulphur tonnage deducted a smelter product of 38,010 tons would remain with a value of $36.78 per ton.

It is probable that a special flux smelting rate could be established with AS&R.

Sulphuric acid volume sales markets would have to be worked out. A very good acceptance market would be any Nevada copper leaching operation due to the fact that as far as the writer knows the nearest sources of the acid are, San Francisco, Los Angeles and the Salt Lake City areas. Sulphuric acid sales may pay a major percentage of the total production costs, if low amortization can be established for acid plant installation.

The slime fraction could easily be settled out, if metallurgy proves that it would be economical to treat that fraction containing 2.30 Ozs. silver, 0.40% lead and 0.60% zinc, plus some minor gold values.

There are probably some other values in form of galena and sphalerite which was lost by the early operation, which metallurgical tests will prove the economics of recovery outlook.

METALLURGY :

The first recommended steps would be to run gravity tests with rougher and cleaner jigs, maybe Humphrey Spirals too. The slime fraction at the same time could be settled out to determine if treatment would be profitable.

TYBO MILL TAILINGS DATA :

METALLURGY, Continuation :

Jig or spiral concentrates could be studied relative to if a flotation product would be economical to make as far as galena and sphalerite in the talings are concerned. The plus slime fractions of Pb S and Zn S , however, will probably gravity concentrate along with the iron pyrite, so a determination could be made to see if the free sphalerite percentage will be enough to bring about a penalty condition at the smelter on the acid plant residue.

OPERATION :

Any contemplated operation on these tailings would necessarily have to hold treatment installation to a bare minimum with object of high tonnage treated per manshift worked. At least 1,000 tons of tailings pond treatment head product will be required. 1,000 tons per day or more can be delivered to the intake conveyor loading unit by one D-8 Caterpillar and heavy scraper. The slucing and pumping of tailings into a plant as formerly done is not as efficient and more costly than the above method.

Much normal cost will not be experienced in treating these tailings. As the crushing - primary and secondary, grinding and classification has already been done, no heavy concrete pours will be necessary, as a matter of fact practically all gravity treatment units can be set on timbers. Concrete pours at the Tybo site would cost at least $50 per cubic yard after excavation, form building and supplies were added. H ousing other than over some units of the aci d plant and the dry concentrate bin, is unnecessary. Power factor will be low as normally 90% of the electrical power in a milling plant is used for crushing, grinding and classification. A diesel-electric plant would furnish power requirements at about 2-1/2 to 3 cents per kilowatt hour. Assaying facilities during production are mandatory for the operation. Very low labor requirements are necessary for this project but the operation should be supervised by a graduate metallurgist with gravity concentration roughing and acid production experience.

The direct cost from tailings loading through the cleaner jigs will probably be less than 50¢ per ton concentrated, not inclusive of an installation amortization charge.

SUMMARY :

The tailings have been looked at previously, but chiefly by unqualified people. At least one major mining company casually checked the available tonnage but it evidently would not fit in with its overhead picture. Several expdriencdd men have been conscious of the possibilities but have not carried out a detailed methods and economic analysis of the project as far as the writer knows.

TYBO MILL TAILINGS DATA :

The Tybo Mill Tailings hold greater value per ton than any other similar tonnage volume of the writer's knowledge. That knowledge, incidentally, covers an area from Alaska to Bolivia, South America.

The U. S. Bureau of Mines technical information is of immense assistance relative to the present economic study of the values contained in the tailings. It was compiled accurately under actual operating treatment conditions in a strictly non-promotional manner and the calculations were arrived at in an unguarded effort. There are quite a number of thousands of dollars in form of laboratory work represented in the " Information Circular No. 6430".

Complete evaluation of the proposed project is merely a simple matter of arithmetic. The added possibility of an acid byproduct from the iron pyrite should be followed out as the some 50,000 tons of sulphur contained in the Fe S holds some considerable potential value along with the gold, silver and lead.

Total payment due to the property owners is 65¢ per dry ton for the ore treated aside from the minimum requirements 90 days from July 1, 1967. This is far better than the terms open at the time of the Simpson Report when the owners were to receive over $1,000,000 of estimated net income before the operators end was paid.

Exhibits herewith include : The R. E. Simpson Report of December 1962. This was accomplished by the engagement of Simpson as an unprejudiced professional, with a total cost of over $5,000.00.

Exhibits on file in Reno, Nevada include : U. S. Bureau of Mines Information Circular No. 6430. Cargold Corporation Tybo Tailings Data. Tailings pond photos.

Yours very truly,
J. H. WREN & COMPANY,

BY James H. Wren
JAMES H. WREN.
Aug. 1, 1967.