

MEMORANDUM

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TO: P. J. Brown FROM: P. Dyas
SUBJECT: PRELIMINARY METALLURGICAL TESTING OF DATE: November 30, 1972
DRILL SAMPLES FROM LOW GRADE STOCKPILE

Summary:

All the tests in this memo were performed in the normal standard test routine.

Results to date are not very encouraging; with lead roughing recoveries ranging from 21.3 to 80.3% at grades of 9.6% Pb to 24.3% Pb. Lead feed grades vary from 2.0% to 3.7% Pb.

Zinc roughing recoveries range from a 49.6% low to a 72.7% high, while grades assay from 8.5 to 21.2% Zn in the rougher concentrates. Zinc feed grades are also wide, ranging from 2.98 to 5.26% Zn.

Technical Data:

1000 g samples were ground in the laboratory rod mill for a standard time, with water, soda ash, collector and cyanide. Pulp was transferred to a laboratory cell, pH adjusted to 9.4 with soda ash and a concentrate collected for 4½ mins. Further collector was added and a lead scavenger concentrate collected for 5 mins.

After conditioning pulp at pH 10.4 for 10 mins., with copper sulphate and collector, a zinc rougher concentrate was collected for 5 mins. Extra collector was added and a scavenger concentrate collected for 6 mins.

All samples were treated in a like manner.

Results:

<u>Sample #</u>	<u>Feed %</u>		<u>Rough. Conc. Grades</u>		<u>Rough. Conc. Recovery</u>	
	<u>Pb</u>	<u>Zn</u>	<u>Pb %</u>	<u>Zn %</u>	<u>Pb %</u>	<u>Zn %</u>
581	2.0	4.4	14.0	14.3	68.8	67.0
586	2.5	5.0	19.4	16.7	67.6	71.3
583	2.6	4.4	<u>9.6</u>	<u>21.2</u>	<u>21.3*</u>	<u>72.7</u>
590	2.4	3.0	18.1	10.9	51.2	<u>50.0</u>
593	3.7	5.3	16.4	15.9	<u>80.3</u>	61.0
589	2.9	4.1	<u>24.3</u>	10.7	55.6	57.8
585	2.8	3.6	19.6	<u>8.5</u>	56.8	49.6
594	2.7	4.3	18.4	18.5	57.3	64.9
Normal Std. Test	4.7	6.3	45.6	45.2	81.8	67.7

* 44.5% in Scav. Conc.

Conclusions:

The above results show that the atmospheric oxidation of the low grade stockpile has converted an already complex ore into a metallurgical monster, and as our present "best" method gives such gross variations in results, then obviously before this material is milled, a large amount of testwork would appear to be necessary in the laboratory.

P. Dyas

P. Dyas
Senior Metallurgical Technician

PD/mua

PETE DYMS

ANVIL MINING CORPORATION LIMITED

MEMORANDUM

TO: N. G. Cornish FROM: P. J. Brown

SUBJECT: Temporary Authorization for an Extra Metallurgical Technician DATE: December 8, 1972

In reviewing the potential work program for the metallurgical group for 1973 I have noted that we do not have sufficient manpower to ensure completion of all projects. In particular, the metallurgical investigation aimed at solving the problems associated with the milling of the low grade stockpile will have to be deleted from the proposed program.

Since the stockpile will have to be processed sometime during 1974 - 75, it is imperative that detailed laboratory test work be carried out in order to develop a suitable metallurgical technique for stockpiled ore treatment. It is estimated that a minimum of six-man months will be needed to develop an acceptable technique in the Anvil laboratory for a cost of about \$11,000.00 The cost breakdown is as follows:

Cost Breakdown

(1) Salaries:		\$
Technician for six months-	$\$675.00 \times 6 \times 1.15 =$	4,600
Supervisor, Equivalent one month	$\$1000.00 \times 1 \times 1.15 =$	1,150
(11) Assays and Bucking:		
For test work an estimated 3500 determinations		
at \$1.50	=	5,250
<u>Total</u>		<u>\$ 11,000</u>

It has been suggested that an outside laboratory be utilized to carry out this test program. I would suggest that, based on previous experience of Galigher and Hazen test reliability, it would be more advantageous to hire an extra technician immediately to allow this investigation to continue.

ANVIL MINING CORPORATION LIMITED

MEMORANDUM

TO: N. G. Cornish FROM: P. J. Brown

SUBJECT: PROPOSED TEST PROGRAM FOR INVESTIGATION OF THE OXIDE ORE PROBLEM DATE: January 5, 1973

Summary:

Preliminary test work on samples of the low grade stockpile material has indicated that severe metallurgical problems may be expected if we attempt to treat this material with the present plant parameters.

A detailed investigation outlined in Appendix I of this memorandum indicates that seven man months of technician time and approximately six man months of assayer time will be needed to satisfactorily complete the investigation. The total project cost is expected to be of the order of \$12,000.00 broken down as follows:

Technician and Metallurgist's Time	\$ 6,500
Assayer's Time and Materials	<u>5,500</u>
TOTAL	<u>\$12,000</u>

Since our projected work load for this year is even now too high for the manpower available, it is essential that we increase the Metallurgical Technician authorization temporarily to four men. In addition, an extra assayer will probably be needed to cope with the tremendous increase in assay load.

The Test Program:

An outline of the proposed laboratory test program (divided into five phases) is shown in Appendix I. A number of side investigations which management may elect to pursue are also noted, but no allowance has been made for these investigations in computing manpower requirements. A summary of the manpower distribution by phase to assure minimum coverage of the scope of work is shown below.

LOW GRADE STOCKPILE (OXIDIZED ORE) TEST PROGRAM

MANPOWER REQUIREMENT

<u>Phase</u>	<u>Shifts Required</u>		
	<u>Jr. Tech.</u>	<u>Sr. Tech. + Metallurgists</u>	<u>Assayers</u>
1. Ore Characteristics	8	5	21
2. Standard Test Development	13	5	13
3. Preliminary Survey of Flotation Response	25	7	27
4. Investigation of Flotation Parameters	20	5	21
5. Cleaner Test Program	<u>45</u>	<u>16</u>	<u>50</u>
Totals	<u>111</u>	<u>38</u>	<u>132</u>

Notes: Costs used based on Jr. Technician \$ 750/man month
 Sr. Technician \$1250/man month
 Metallurgist \$1500/man month
 Assayer \$ 900/man month

Provided the laboratory test program proceeds as planned, management could expect an interim report on possible treatment schemes within five calendar months of the start of the project. At that time it may be possible to present an approximate metallurgical balance for the circuit operating on oxide ore, and hence generate a production and cost estimate for the treatment of the stockpiled material.

Plant testing with stockpiled material should commence as soon as possible after the development of suitable treatment schemes. It is recommended that two-three day tests be carried out separated by a week of normal operation. Subsequent testing should be for five to ten day periods until the operators are experienced enough to handle the new circuit. This testing schedule will allow the metallurgical group to modify or refine the proposed parameters prior to continuous treatment of low grade stockpiled ore.

Initial test results suggest that the stockpiled ore will exhibit a completely new flotation response. It is therefore mandatory that the operators and metallurgists be allowed an adequate opportunity to become accustomed to the new circuit conditions and appearance.

Conclusion:

The successful treatment of the low grade stockpile ore will be directly dependant upon the accuracy and reliability of the laboratory test work. Any attempts to reduce or shortcut the program could result in metallurgical chaos when the plant is used to treat the low grade stockpile ore.

A decision will have to be made after the completion of the interim report to determine if the treatment of the stockpile material is economically feasible at that time and conforms to the corporate objectives.

P. J. Brown

P. J. Brown
Plant Metallurgist

RJB/mm

cc. R. L. Haffner (2)
J. Keily
P. Dyas (2)
D. Blundell (2)
H. L. Ames
P. Taggart (2)

APPENDIX I

OUTLINE OF OXIDIZED ORE TEST PROGRAM

PRELIMINARY WORK:

1. Ore Characteristics:

Each bore hole sample to be separately assayed for lead, zinc, iron, copper metals and oxides and an estimate made of the amount of soluble metals present. A natural pH of the pulp at the appropriate flotation density would also be determined.

A subsidiary test would investigate the change in oxidation with increasing depth in the stockpile for a few special bore holes. This information will yield valuable data to permit best selection of stockpile reclamation method.

Screen analysis of the ground samples will be performed on selected samples to determine the metal distribution by size and some microscope work is contemplated.

2. Standard Test Development:

In attempting to resolve this problem an entirely new standard test will have to be developed. The test design work is critical and cannot be short-circuited - especially in the latter stages. Once reproducibility has been established, the standard test can be modified in attempts to improve metallurgy.

A conservative estimate of the number of tests required suggests that 50 complete batch tests will be needed for satisfactory completion of this phase. In addition a considerable amount of time will have to be allocated to crude laboratory tests aimed at improving the standard test design.

3. Preliminary Survey of Flotation Response:

Samples from each bore hole will be separately treated in the newly developed standard batch flotation tests. It is expected that problems will arise during this phase since we expect very considerable changes in flotation response from sample to sample. Where necessary, the tests will be repeated and details of the flotation response of the ore superimposed on a map of the stockpile.

(At this time, management may elect to investigate the possibility of reclaiming the stockpiles in two layers, since we believe that the lower section could be more extensively oxidized. This investigation can be more easily achieved if, during the sampling phase, the upper half of the stockpile be separately sampled and subjected to the standard batch tests.)

Approximately 100 batch tests should permit the bore hole samples to be divided into two or three major groups depending on flotation response. Each group of samples can then separately be treated and a rough idea of the treatment schedule determined.

4. Investigation of Flotation Parameters:

Each of the major groups of samples would undergo detailed flotation testing in this phase of the project. Effects of grind, pH and various reagent combinations would all need investigation. A minimum of 80 flotation tests would be needed, assuming that no unusually difficult problems occur and that just two groups of samples would be involved.

5. Cleaner Test Program:

Some locked cycle tests will have to be performed initially to allow personnel to become familiar with the locked-cycle test peculiarities: (These tend to change with ore type). Subsequent locked cycle tests to investigate the effects of pH, regrinding middlings products and various reagent effects could proceed quite rapidly provided that the initial locked tests are successful. It is estimated that a total of 20 locked-cycle tests will be needed.

An ancillary test program utilizing the microscope for detailed analysis of cleaner products would be advisable at some point during this phase of the project.