

B-7-207

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To S. Chmelyk

From Ron Martel and Rhonda Martel

Date October 13, 1982

Subject INFLUENCE OF PRIMARY GRIND ON ZINC METALLURGY WITH OXIDIZED ORE

PURPOSE: To determine the effect that coarser grinding has on zinc metallurgy.

CONCLUSIONS: The 25 minute grind gave the best grade-recovery curve and a best final grade of 21% and recovery of 64% (see graph 1) App. A.

The p80 was also the smallest size at 75 u for the 25 minute grind. (see table 7, App. B).

RECOMMENDATIONS: More testwork should be done in the area of primary grind. For example, finer grinds and reagent optimization should be looked at.

DISCUSSION: Methods of reducing operating costs are now being looked at. One area of interest is primary grinding. Test work was carried out to see if shorter grinding time would yield the same or better zinc metallurgy. It was found that the finest grind, ie. 25 minute grind, had the best results. There was, however, no specific trend apparent when looking at the grade-recovery curves (see graph 1). (See appendix A for Flotation test procedures).

The p80 was determined for the heads of each flotation test. As well, size analysis, distribution and recovery by size was calculated. Because of the lack of a definite trend in flotation, these calculations should be looked at closely. These calculations did not take into account Zinc losses incurred in the Pb circuit and are based on zinc recovered from the heads to the flotation test. The tables in Appendix B, show the expected pattern of Zn distribution as grinding time increases, the metal is distributed to the lower size fractions. For our purposes, we will compare the 10 minute grind (154 u - table 1) and the 25 minute grind (75 u - table 7). In the 25 minute grind, the zinc is concentrated in the -75 u range of both the heads and tails. Whereas, in the 10 minute grind it is concentrated in the -150 u range. The recovery of the zinc increases as the mean particle size decreases.

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DISCUSSION: (cont'd)

For more conclusive results, the test should be repeated. Some suggestions might be:

- 1) That each technician do only one stage of the test (either roughing or cleaning) to increase consistent results (see graphs 2 and 3);
- 2) At least 3 tests done for each grind at standard reagent additions for both the roughing and cleaning stages;
- 3) At least 3 tests done for each grind and altering the reagent additions to the cleaning stages only to get optimum metallurgical performance.

Summary of Achieved Grades and Recoveries (wt'd Averages)

Primary Grinding Time (min)	HEADS ASSAYS		LEAD (CC ₁) CUMMULATIVE			ZINC CUMMULATIVE		TAILS ASSAYS	
	% Pb	% Zn	% Pb	% Rec	% Zn	% Gr	% Rec	% Pb	% Zn
10	2.97	4.69	20.18	77.64	13.9	50.7	37.8	0.58	0.67
15	2.90	4.73	21.17	80.19	14.29	47.7	34.6	0.48	0.47
20	2.81	4.67	19.92	80.6	15.63	49.5	30.9	0.48	0.41
25	2.69	4.58	23.95	78.58	15.25	50.3	37.7	0.48	0.37

APPENDIX A

STANDARD OXIDE ORE PROCEDURE
(Rougher-Scavenger)

GRIND:

2.0 Kg Oxide Ore
600 Mls of H₂O
4.0 Kg/T Lime
50 g/T NaCN
VARIABLE - Grinding Time
60 g/T Z-11 added during last 2 min. of grind

Pb ROUGHER - SCAVENGER:

FROTH COLLECTION

Pb R ₁ & R ₂		3 minutes	2 drops MIBC
Pb S ₁ & S ₂	20 g/T Z-11	4 minutes	2 drops MIBC
Pb S ₃	20 g/T Z-11	3 minutes	2 drops MIBC

CONDITIONING STAGE:

pH to 11.0 with Lime Slurry		8 minutes	
	300 g/T Cu SO ₄	1 minute	
	60 g/T Z-11	1 minute	

Zn ROUGHER - SCAVENGER:

Zn R ₁ & R ₂		3 minutes	No Frother
Zn S ₁ & S ₂	20 g/T Z-11	4 minutes	" "
Zn S ₃	20 g/T Z-11	3 minutes	" "

SPECIFIC FLOAT TEST CONDITIONS (CLEANING)

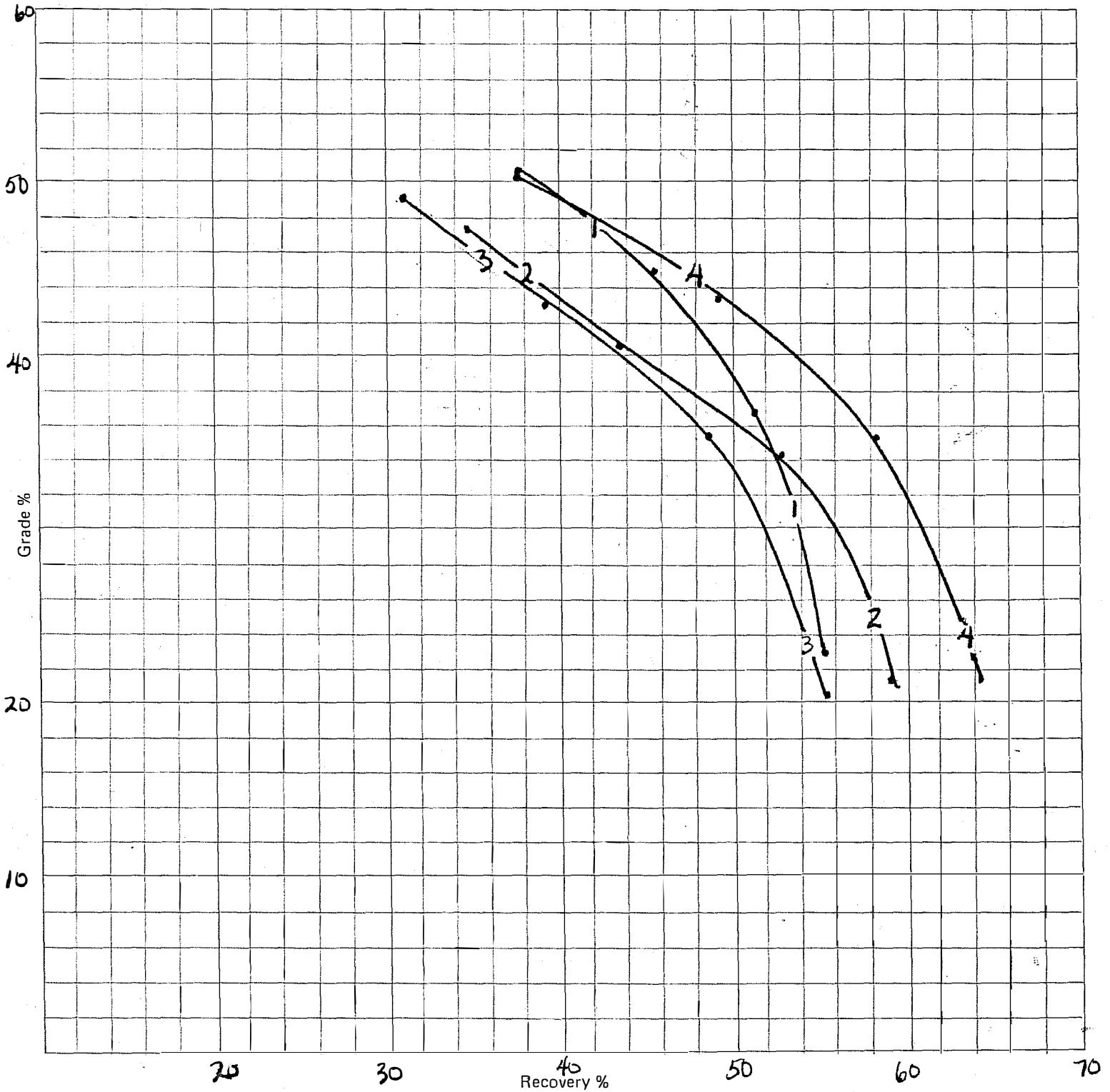
Prim. Grind Time	Stage of Test	g/Tonne				pH	Time (min)
		Lime	Z-11	NaCN	CuSO ₄		
10	Pb Regrind	250 g/T	-	15 g/T	-	10.0	5
	Pb CC ₁	-	25 g/T	-	-	10.0 - 10.2	5
	Zn Regrind	500 g/T	-	-	50 g/T	11.0	5
	Zn CC ₁	Slurry	28 g/T	-	-	10.9 - 11.1	5
	Zn CC ₂	Slurry	12 g/T	-	-	11.4 - 11.6	4
	Zn CC ₃	Slurry	-	-	-	11.8 - 12.0	3
15	Pb Regrind	250 g/T	-	15 g/T	-	10.0	5
	Pb CC ₁	-	30 g/T	-	-	10.0 - 10.2	5
	Zn Regrind	500 g/T	-	-	50 g/T	11.0	5
	Zn CC ₁	Slurry	30 g/T	-	-	10.9 - 11.1	5
	Zn CC ₂	Slurry	20 g/T	-	-	11.4 - 11.6	4
	Zn CC ₃	Slurry	12 g/T	-	-	11.8 - 12.0	3
20	Pb Regrind	250 g/T	-	15 g/T	-	10.0	5
	Pb CC ₁	-	35 g/T	-	-	10.0 - 10.2	5
	Zn Regrind	250 g/T	-	-	50 g/T	11.0	5
	Zn CC ₁	Slurry	30 g/T	-	-	10.9 - 11.1	5
	Zn CC ₂	Slurry	18 g/T	-	-	11.4 - 11.6	4
	Zn CC ₃	Slurry	12 g/T	-	-	11.8 - 12.0	3
25	Pb Regrind	250 g/T	-	15 g/T	-	10.0	5
	Pb CC ₁	-	38 g/T	-	-	10.0 - 10.2	5
	Zn Regrind	250 g/T	-	-	50 g/T	11.0	5
	Zn CC ₁	Slurry	35 g/T	-	-	10.9 - 11.1	5
	Zn CC ₂	Slurry	18 g/T	-	-	11.4 - 11.6	4
	Zn CC ₃	Slurry	12 g/T	-	-	11.8 - 12.0	3

Cyprus Anvil Mining Corporation
METALLURGICAL TEST REPORT

Grade-Recovery Curve

Test No.: -1- 10 min Primary Grind
Objective: -2- 15 min Primary Grind
Reagents: -3- 20 min Primary Grind

Date: -4- 25 min Primary Grind
Key: Zn in Zn Conc.

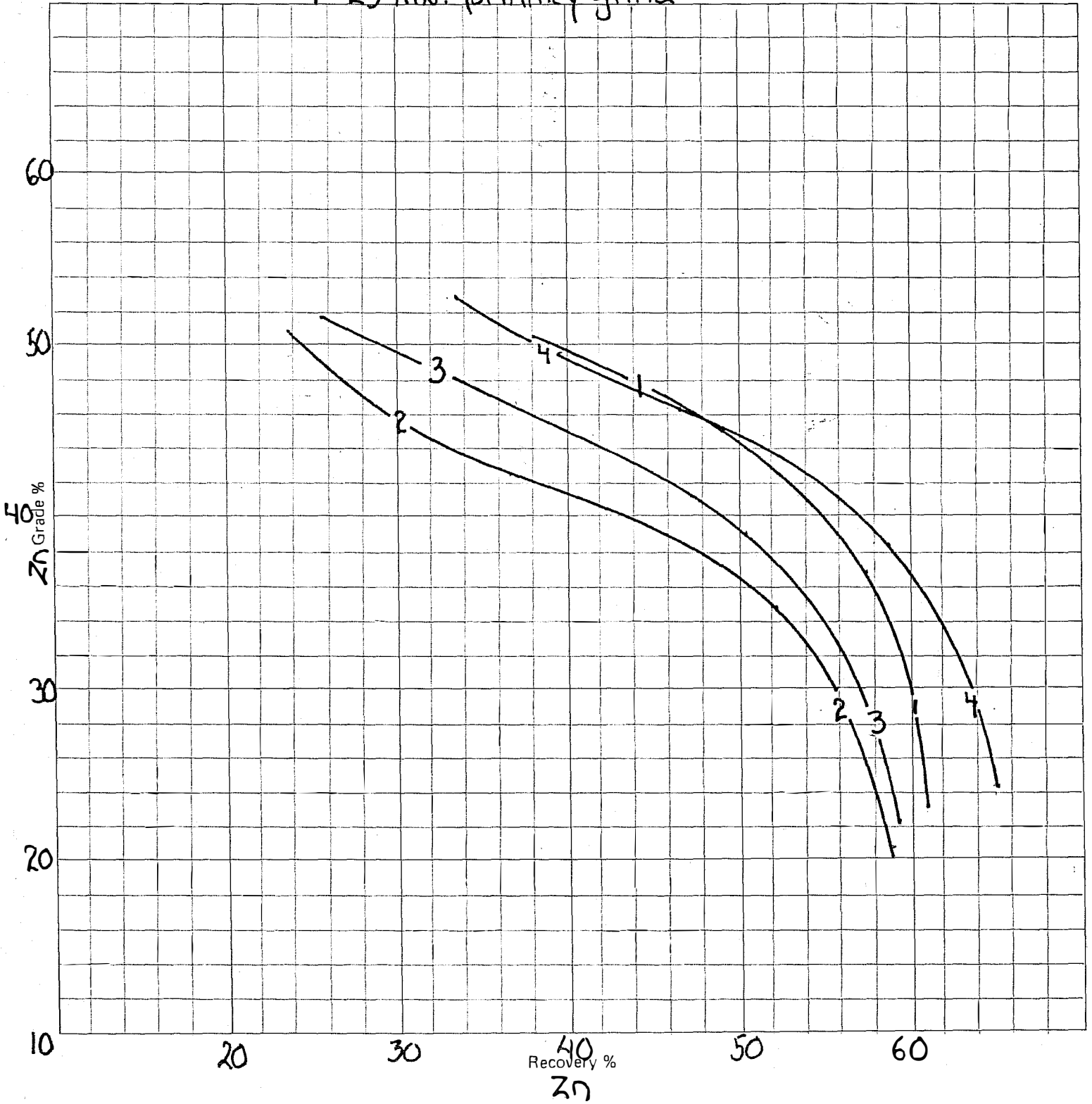


Cyprus Anvil Mining Corporation
METALLURGICAL TEST REPORT

Grade-Recovery Curve

Test No.: -1- 10 min. PRIMARY grind
Objective: -2- 15 min. PRIMARY grind
Reagents: -3- 20 min. PRIMARY grind
 -4- 25 min. PRIMARY grind

Date: Aug-82
Key: Roan - ROUGHER
 Rhonda - CLEANER

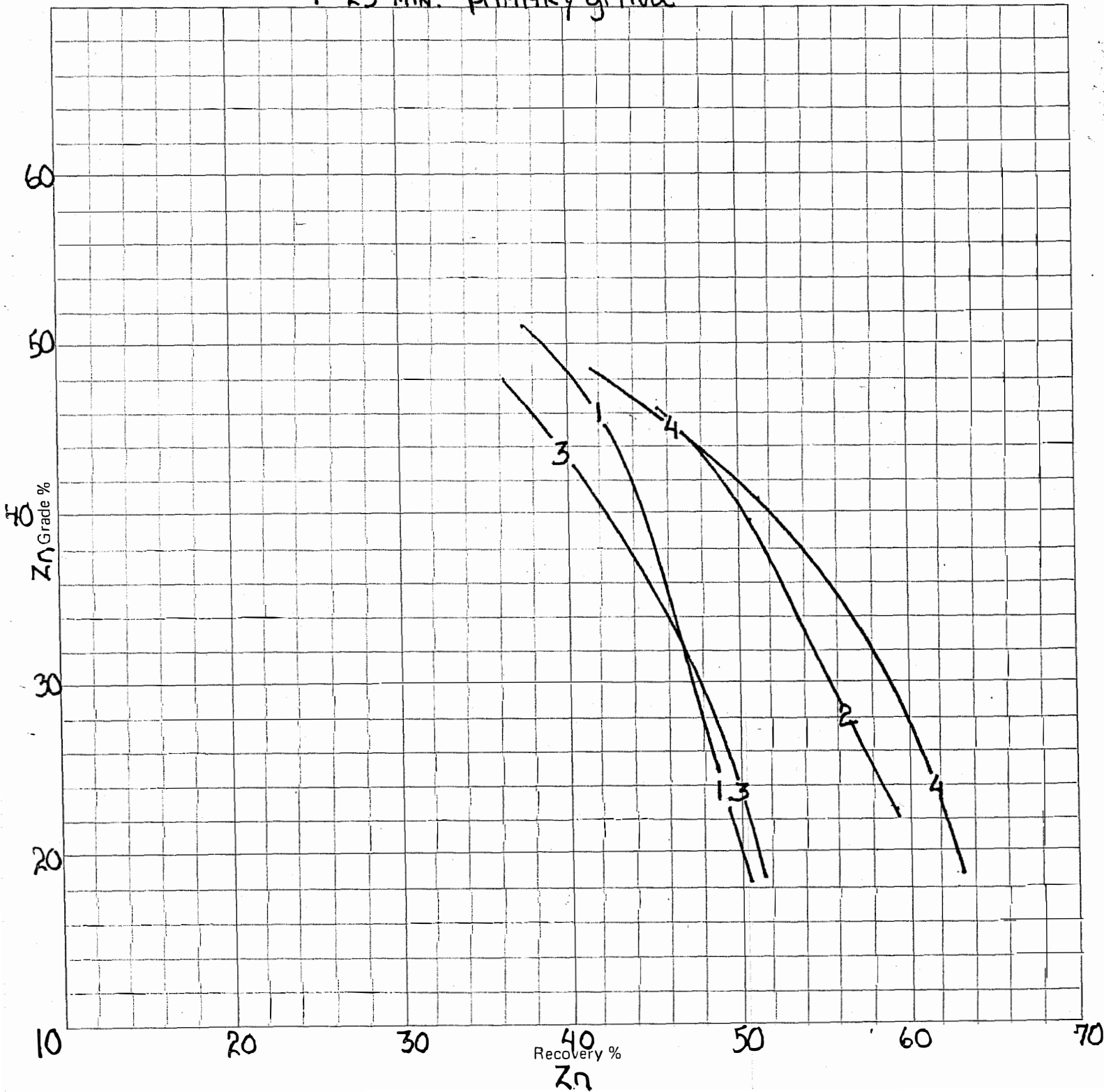


Cyprus Anvil Mining Corporation
METALLURGICAL TEST REPORT

Grade-Recovery Curve

Test No.: -1- 10 min. PRIMARY grind
Objective: -2- 15 min. PRIMARY grind
Reagents: -3- 20 min. PRIMARY grind
 -4- 25 min. PRIMARY grind

Date: Aug - 82
Key: Rhonda-Rougher
 Ron - CLEANER



APPENDIX B

10 MIN. PRIM. GRIND

HEADS

TABLE 1

SIZE M	% WEIGHT RETAINED	% CUMULATIVE PASSING	% Zn	% DISTRIBUTION (BY SIZE)	METAL UNITS	% RECOVERY (BY SIZE)
212	4.11	95.89	1.62	1.50	0.0666	-
150	17.01	78.89	2.56	9.81	0.4355	-
106	14.52	64.38	3.45	11.29	0.5009	-
74	13.56	50.82	4.25	12.99	0.5763	-
37.5	13.98	36.83	6.62	20.86	0.9255	-
26.9	6.27	30.56	6.36	8.99	0.3988	-
18.5	6.92	23.64	6.54	10.20	0.4526	-
12.5	5.70	17.94	5.74	7.37	0.3272	-
9.1	3.68	14.26	6.15	5.10	0.2263	-
< 9.1	14.26	-	3.70	11.89	0.5276	-
		P80 = 154 _M	TOTAL METAL UNITS		4.4373	

TAILS

TABLE 2

SIZE M	% WEIGHT RETAINED	% CUMULATIVE PASSING	% Zn	% DISTRIBUTION (BY SIZE)	METAL UNITS	% RECOVERY (BY SIZE)
212	5.33	94.67	1.31	9.83	0.0698	-4.80
150	16.43	78.24	1.20	27.77	0.1972	54.72
106	16.04	62.20	0.82	18.52	0.1315	73.75
74	13.46	48.74	0.44	8.34	0.0592	89.73
37.9	14.05	34.69	0.24	4.75	0.0337	96.36
27.2	6.40	28.29	0.18	1.62	0.0115	97.12
18.8	6.63	21.66	0.18	1.68	0.0119	97.37
12.6	5.26	16.40	0.22	1.63	0.0116	96.45
9.2	2.96	13.44	0.26	1.08	0.0077	96.60
< 9.2	13.44	-	1.31	24.80	0.1761	66.62
		P80 = 157 _M	TOTAL METAL UNITS		0.7102	

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15 MIN. PRIM. GRIND

HEADS

TABLE 3

SIZE M	% WEIGHT RETAINED	% CUMULATIVE PASSING	% Zn	% DISTRIBUTION (BY SIZE)	METAL UNITS	% RECOVERY (BY SIZE)
212	0.18	99.82	1.73	0.07	0.0031	-
150	4.20	95.63	1.73	1.66	0.0727	-
106	15.44	80.19	2.54	8.98	0.3922	-
74	16.34	63.85	3.48	13.02	0.5686	-
36.7	17.89	45.96	5.72	23.43	1.0233	-
26.3	7.85	38.11	5.52	9.92	0.4333	-
18.1	8.52	29.59	6.00	11.70	0.5112	-
12.2	7.13	22.46	6.09	9.94	0.4342	-
8.9	4.57	17.89	5.78	6.05	0.2641	-
< 8.9	17.89	-	3.72	15.26	0.6655	-
					TOTAL METAL UNITS	4.3682
		P80 = 106 _M				

TAILS

TABLE 4

SIZE M	% WEIGHT RETAINED	% CUMULATIVE PASSING	% Zn	% DISTRIBUTION (BY SIZE)	METAL UNITS	% RECOVERY (BY SIZE)
212	0.35	99.65	0.71	0.54	0.0025	19.35
150	6.56	93.09	0.71	10.10	0.0466	35.90
106	17.36	75.73	0.55	20.69	0.0955	75.65
74	16.72	59.01	0.34	12.31	0.0568	90.01
37.7	17.06	41.95	0.21	7.76	0.0358	96.50
27.1	7.96	33.99	0.16	2.75	0.0127	97.07
18.6	8.31	25.68	0.17	3.06	0.0141	97.24
12.5	6.54	19.14	0.21	2.97	0.0137	96.84
9.2	3.86	15.28	0.25	2.10	0.0097	96.33
< 9.2	15.27	-	1.14	37.72	0.1741	73.84
					TOTAL METAL UNITS	0.4615
		P80 = 117 _M				

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20 MIN. PRIM. GRIND

HEADS

TABLE 5

SIZE M	% WEIGHT RETAINED	% CUMULATIVE PASSING	% Zn	% DISTRIBUTION (BY SIZE)	METAL UNITS	% RECOVERY (BY SIZE)
212	0.23	99.77	1.58	0.08	0.0036	-
150	3.87	95.90	1.58	1.37	0.0611	-
106	15.31	80.59	2.29	7.94	0.3506	-
74	15.66	64.93	3.40	12.00	0.5324	-
37.2	18.05	46.88	5.79	23.55	1.0451	-
26.7	7.42	39.46	5.79	9.68	0.4296	-
18.4	8.27	31.19	6.36	11.85	0.5260	-
12.4	7.14	24.05	6.17	9.93	0.4405	-
9.1	4.75	19.30	5.74	6.14	0.2727	-
< 9.1	19.29	-	4.02	17.48	0.7755	-
					TOTAL METAL UNITS	4.4371
		P80 = 105 _M				

TAILS

TABLE 6

SIZE M	% WEIGHT RETAINED	% CUMULATIVE PASSING	% Zn	% DISTRIBUTION (BY SIZE)	METAL UNITS	% RECOVERY (BY SIZE)
212	0.08	99.92	0.60	0.12	0.0005	87.06
150	2.72	97.20	0.60	3.78	0.0163	73.32
106	14.64	82.56	0.48	16.29	0.0703	79.95
74	17.68	64.88	0.32	13.11	0.0566	89.37
37.4	19.16	45.72	0.20	8.87	0.0383	96.34
26.8	8.64	37.08	0.14	2.80	0.0121	97.18
18.5	9.03	28.05	0.16	3.34	0.0144	97.26
12.4	7.02	21.03	0.21	3.41	0.0147	96.66
9.1	4.07	16.96	0.25	2.36	0.0102	96.26
< 9.1	16.94	-	1.17	45.92	0.1982	74.44
					TOTAL METAL UNITS	0.4316
		P80 = 102 _M				

25 MIN. PRIM. GRIND

HEADS

TABLE 7

SIZE M	% WEIGHT RETAINED	% CUMULATIVE PASSING	% Zn	% DISTRIBUTION (BY SIZE)	METAL UNITS	% RECOVERY (BY SIZE)
212	0.08	99.92	2.52	0.04	0.0020	-
150	0.67	99.25	2.52	0.35	0.0169	-
106	4.59	94.67	1.67	1.58	0.0767	-
74	15.24	79.44	5.09	16.00	0.7757	-
36.9	23.88	55.56	4.77	23.50	1.1391	-
26.4	9.63	45.93	5.27	10.47	0.5075	-
18.2	10.28	35.65	5.72	12.13	0.5880	-
12.3	8.50	27.15	6.10	10.70	0.5185	-
9.0	5.42	21.73	5.96	6.66	0.3230	-
< 9.0	21.73	-	4.14	18.56	0.8996	-
					TOTAL METAL UNITS	4.8470
		P80 = 75 _M				

TAILS

TABLE 8

SIZE M	% WEIGHT RETAINED	% CUMULATIVE PASSING	% Zn	% DISTRIBUTION (BY SIZE)	METAL UNITS	% RECOVERY (BY SIZE)
212	0.04	99.96	0.48	0.06	0.0002	90.00
150	1.03	98.93	0.61	2.04	0.0063	62.72
106	10.07	88.86	0.36	11.77	0.0363	52.67
74	18.96	69.90	0.24	14.76	0.0455	94.13
37.6	18.92	50.98	0.15	9.21	0.0284	97.51
27.0	9.56	41.42	0.11	3.41	0.0105	97.93
18.6	10.18	31.24	0.14	4.64	0.0143	97.57
12.5	8.05	23.19	0.14	3.67	0.0113	97.82
9.2	4.89	18.30	0.19	3.02	0.0093	97.12
< 9.2	18.28	-	0.80	47.42	0.1462	83.75
					TOTAL METAL UNITS	0.3083
		P80 = 92 _M				

APPENDIX C

10 MIN GRIND - 154 u p80
2 TEST AVERAGE

	ASSAY				DISTRIBUTION		
	WT.	Pb	Zn	Fe	Pb	Zn	Fe
Zn 3rd CC	134.1	1.57	50.74	11.79	1.84	37.77	2.04
Zn 3rd CT	48.2	2.68	30.16	17.47	1.13	8.07	1.09
Zn 2nd CT	69.3	2.86	15.08	21.91	1.74	5.80	1.96
Zn 1st CT	176.5	1.98	3.62	21.62	3.06	3.55	4.93
Pb 1st CC	436.5	20.18	13.90	20.13	77.20	33.68	11.35
Zn Sc TAILS	2975.6	0.58	0.67	20.45	15.03	11.13	78.62
HEADS	3840.2	2.97	4.69	20.16			

15 MIN GRIND - 106 u p80
2 TEST AVERAGE

	ASSAY				DISTRIBUTION		
	WT.	Pb	Zn	Fe	Pb	Zn	Fe
Zn 3rd CC	134.4	1.26	47.74	12.75	1.49	34.58	2.12
Zn 3rd CT	63.3	1.51	26.21	15.30	0.84	8.94	1.20
Zn 2nd CT	87.5	1.81	20.18	21.41	1.39	9.52	2.31
Zn 1st CT	218.6	1.74	5.15	27.61	3.33	6.06	6.11
Pb 1st CC	431.8	21.17	14.29	19.12	80.22	33.25	10.19
Zn Sc TAILS	2989.4	0.49	0.47	21.14	12.72	7.65	78.07
HEADS	3925.0	2.90	4.73	20.63			

20 MIN GRIND - 105 u p80
2 TEST AVERAGE

	ASSAY				DISTRIBUTION		
	WT.	Pb	Zn	Fe	Pb	Zn	Fe
Zn 3rd CC	114.2	1.14	49.48	11.28	1.18	30.94	1.58
Zn 3rd CT	51.1	1.65	29.40	16.71	0.77	8.23	1.05
Zn 2nd CT	83.5	1.80	20.29	20.70	1.37	9.28	2.12
Zn 1st CT	249.6	1.60	5.23	22.46	3.63	7.14	6.87
Pb 1st CC	441.2	19.93	15.63	18.04	80.06	37.75	9.75
Zn Sc TAILS	2972.5	0.48	0.41	21.60	12.99	6.67	78.64
HEADS	3912.1	2.81	4.67	20.87			

25 MIN GRIND - 75 u p80
2 TEST AVERAGE

	ASSAY				DISTRIBUTION		
	WT.	Pb	Zn	Fe	Pb	Zn	Fe
Zn 3rd CC	135.1	1.12	50.30	12.17	1.42	37.74	2.08
Zn 3rd CT	68.7	1.64	29.79	18.05	1.06	11.37	1.57
Zn 2nd CT	94.0	1.82	17.83	22.03	1.61	9.31	2.62
Zn 1st CT	245.0	1.59	4.30	23.16	3.68	5.85	7.19
Pb 1st CC	348.0	23.95	15.25	16.40	78.58	29.47	7.23
Zn Sc TAILS	3044.3	0.48	0.37	20.56	13.64	6.27	79.30
HEADS	3935.1	2.70	4.58	20.06			