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001564

CYPRUS ANVIL MINING CORPORATION

TYPE A INVESTIGATION

COMPARISON OF DICHROMATE AND DEXTRINE EFFECTS

SUMMARY

The use of high molecular weight organic regulators to depress naturally hydrophobic gangue minerals is recommended when treating graphitic quartzites. Results to date suggest that regulator additions to regrinding and cleaner flotation do improve galena - gangue selectivity.

Future work should be concentrated on a detailed examination of the best points of addition and the determination of the optimal quantities of regulators. Of some importance, too, is the choice of a specific regulator, from the large array available, for use in the Cyprus Anvil Concentrator.

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KM094

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INTRODUCTION

In mid-June we were contacted by Mr. W. N. Wallinger of Cyprus Anvil Mines and requested to continue our studies of various flotation schemes for the treatment of graphitic quartzites. In particular, Mr. Wallinger directed that we closely examine the effects of dichromate at various concentrations and pH levels and compare the results with those obtained using dextrine.

The work was to be performed on a blend of samples of graphitic quartzites originating from test programs described in our reports KM080 of May 12th and KM087 dated June 14th. The blended sample was thoroughly mixed and divided into 2 kg charges in preparation for testing. A head sample was removed and assayed to determine the average chemical composition.

TABLE 1

Chemical Composition of Sample

Sample	Assays %		
	Pb	Zn	Fe
Blended Sample	1.59	3.43	4.69

During the execution of the work described in this report, frequent telephone conferences were convened between Faro and Kamloops. Based on consensus arising from these conferences, the test program was altered to meet specific objectives.

The tests were based exclusively on the standard open circuit cleaner test in which a rougher scavenger concentrate was floated in a soda ash-cyanide circuit at about 50 um K_{80}. Regrinding of the rougher scavenger concentrates, generally in a soda ash-cyanide circuit, to approximately 20 um K_{80} preceded four stages of lead cleaning.

In some tests, the lead third cleaner concentrates were conditioned with dichromate at various pH levels and a graphite rich component floated. Other tests probed the use of dextrine to totally depress galena and graphite and then the galena was reactivated with xanthate. Finally, a preliminary study was performed to determine the best addition point for dextrine. The study compared the results of additions to the primary grind, conditioning or regrinding circuits with additions to the fourth cleaner stage.

ANALYSIS AND DISCUSSION OF RESULTS

Characteristic of the behaviour of the graphitic quartzites is the abnormally low grade lead rougher-scavenger concentrate: The principal diluent being non-sulphide, naturally flotable gangue. However, lead recovery into the rougher-scavengers is excellent as is lead-zinc selectivity.

Any treatment strategy must be based on schemes designed to remove non-sulphides while maintaining lead recovery at acceptable levels. Methods aimed at the removal of iron or zinc minerals from the lead circuit may be considered of no metallurgical significance when treating graphitic quartzites.

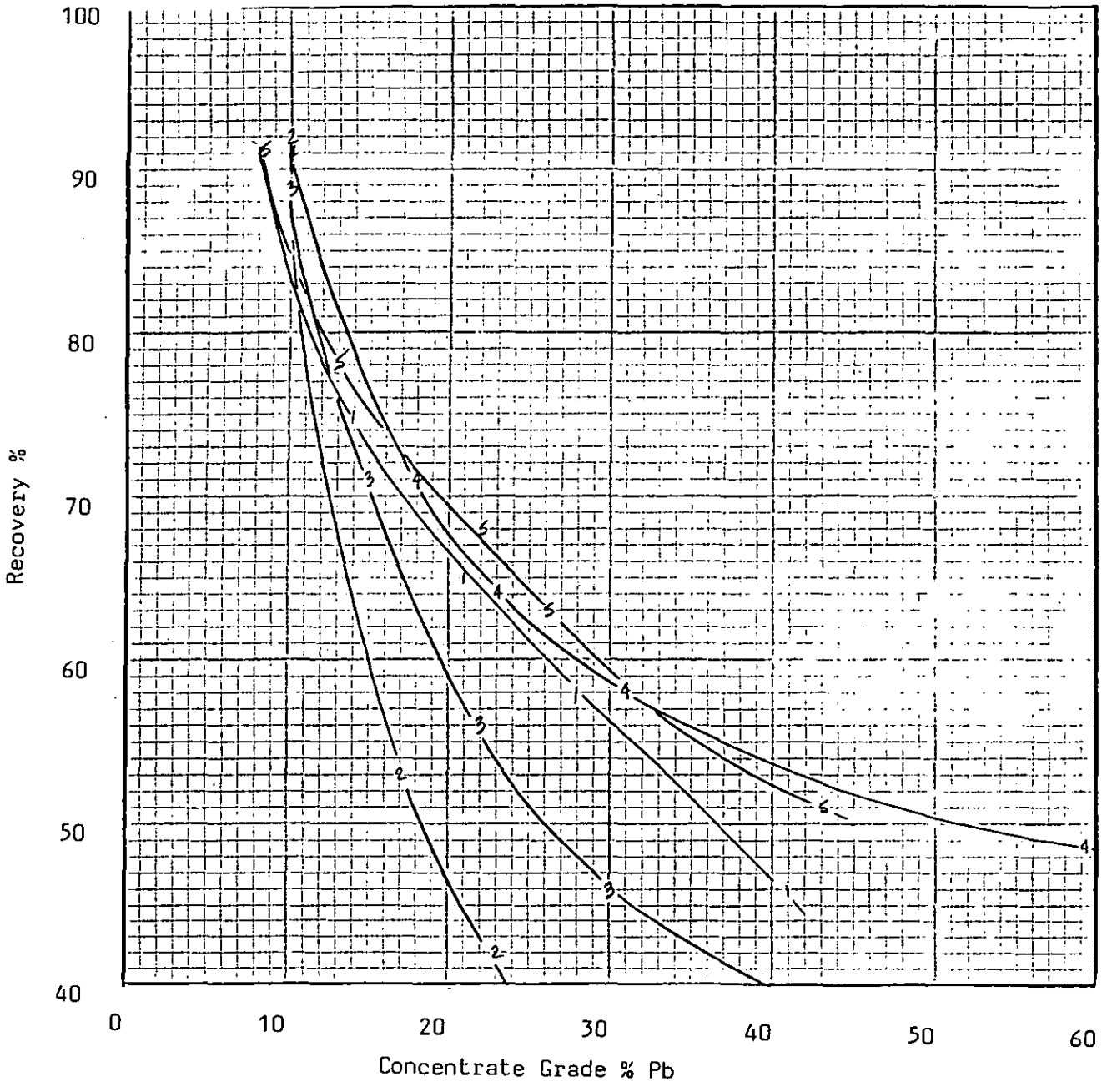
1. Comparison of Treatment Schemes

Graph No. 1 demonstrates the effects of the various schemes on lead metallurgy, assuming treatment of the third cleaner concentrate in a special one-pass fourth cleaner operation. Clearly, the use of dextrine (test 4) or its close relative, carboxy methyl cellulose (test 5) provide the best metallurgical performance.

Potassium dichromate with soda ash appeared to offer some encouragement (test 1) but attempts to use a lime-dichromate system resulted in severe lead losses (test 2 and 3). These losses were attributed to galena depression by lime following regrinding.

GRAPH NO. 1

Comparison of Treatment Schemes



KEY

Test	Conditions
1	Soda ash cleaning circuit - 3000 g/tonne Cr2O7 to 3CC - pH 10.5
2	Lime cleaning circuit - 3000 g/tonne Cr2O7 to 3CC - pH 11.5
3	Lime cleaning circuit - 3000 g/tonne Cr2O7 to 3CC - pH 11.0
4	Soda ash cleaning circuit - 20 g/tonne dextrine to 3CC - pH 9.8
5	Soda ash cleaning circuit - 20 g/tonne CMC to 3CC - pH 10.3

2. Dichromate Effects

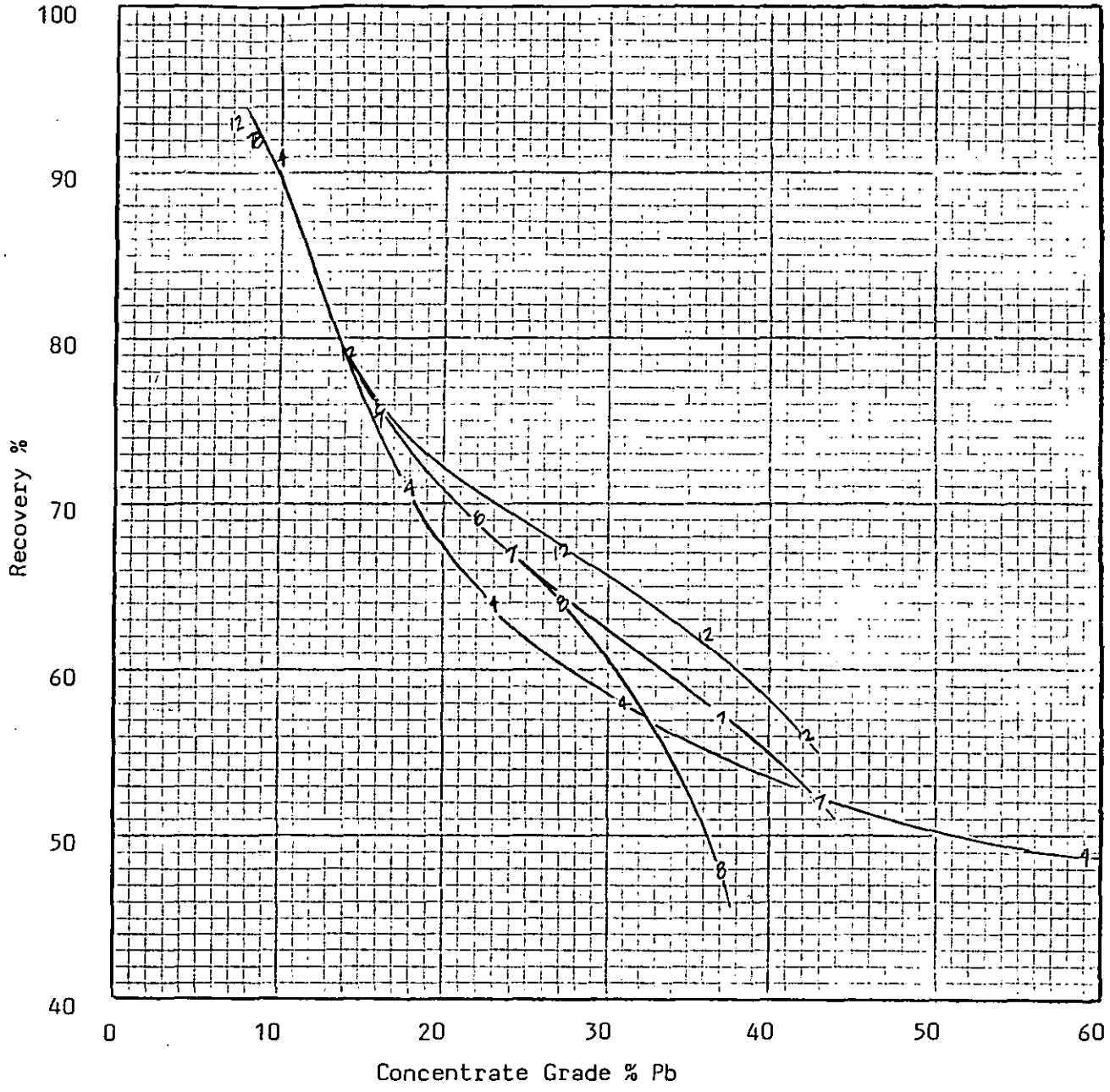
In order to investigate the efficiency of dichromate as a means of depressing galena two series of tests were performed. In both cases, standard flotation techniques preceded a reverse flotation stage in the lead fourth cleaner. Here dichromate was used to depress galena, while the non-sulphides were allowed to float free and were removed as a froth product.

The first test series was designed to determine if an optimum lime pH existed for the reverse flotation stage. The results, displayed in Graph No. 2, suggest that optimum process pH probably lies below pH 11.5 (test 7 and 12). Values above 11.5 appear to result in disproportionate lead losses (test 8).

The second test series was intended to determine the minimum dichromate additions rate for a successful galena suppression at a fixed pH of 11.5. The data shown in Graph No. 3 is inconclusive, although it could be argued that dichromate has no significant influence on reverse circuit metallurgy at pH 11.5.

GRAPH NO. 2

Dichromate Effects - pH Effects

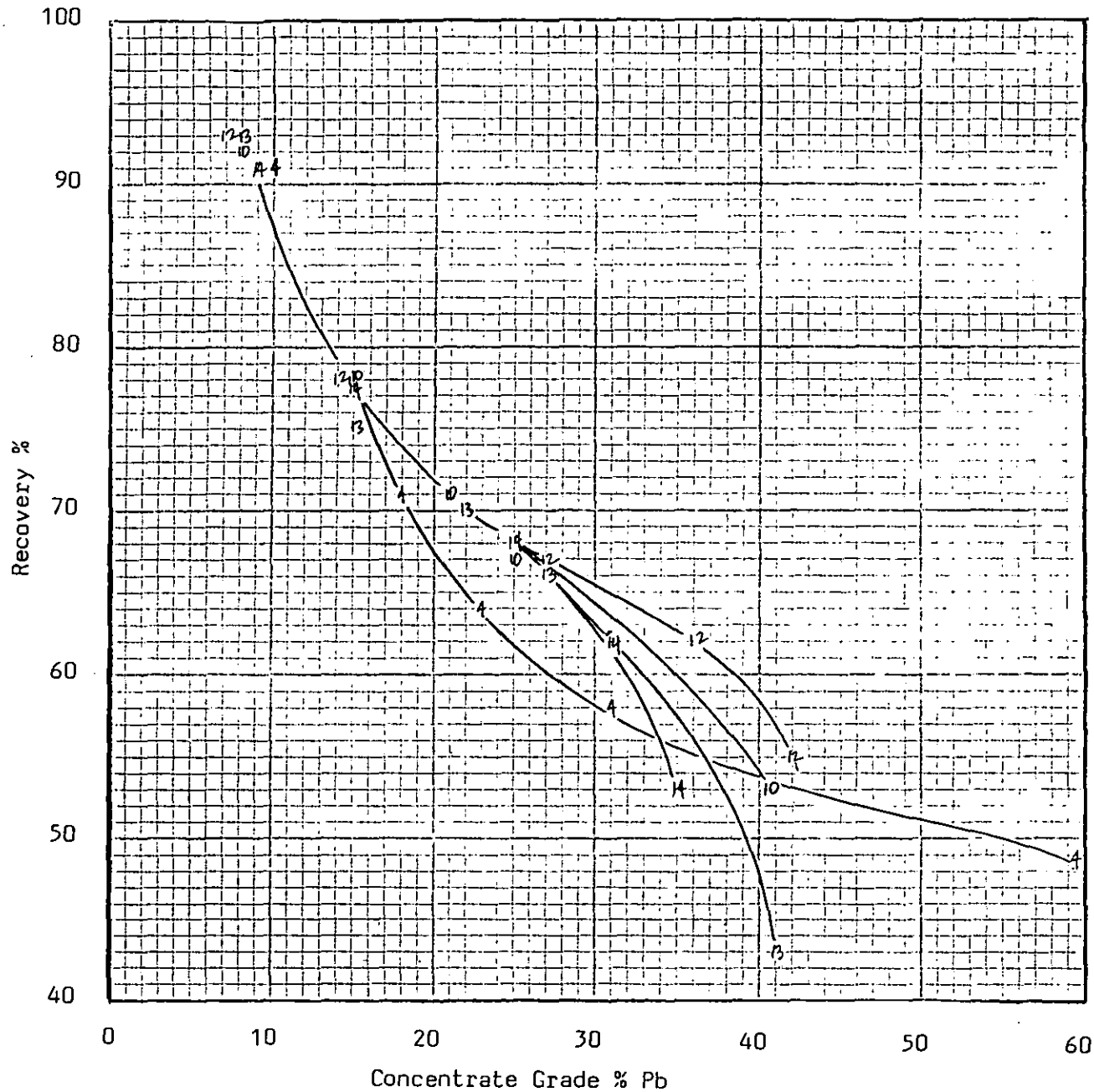


KEY

Test	Conditions
4	Dextrine to third cleaner concentrate
7	3000 g/tonne Cr2O7 - Lime pH 11.0
8	3000 g/tonne Cr2O7 - Lime pH 12.0
12	3000 g/tonne Cr2O7 - Lime pH 11.5

GRAPH NO. 3

Dichromate Effects - Addition Rate



KEY

Test	Conditions
4	Dextrine to third cleaner concentrate
10	500 g/tonne Cr2O7 - Lime pH 11.5
12	3000 g/tonne Cr2O7 - Lime pH 11.5
13	1500 g/tonne Cr2O7 - Lime pH 11.5
14	Ø g/tonne Cr2O7 - Lime pH 11.5

3. Dextrine Point of Addition

A final series of tests were designed and executed to determine the effect of dextrine addition point of subsequent metallurgy. In these tests, the objective was to depress the hydrophobic non-sulphide early in the flotation process and realize a good grade final lead concentrate using standard flotation procedures.

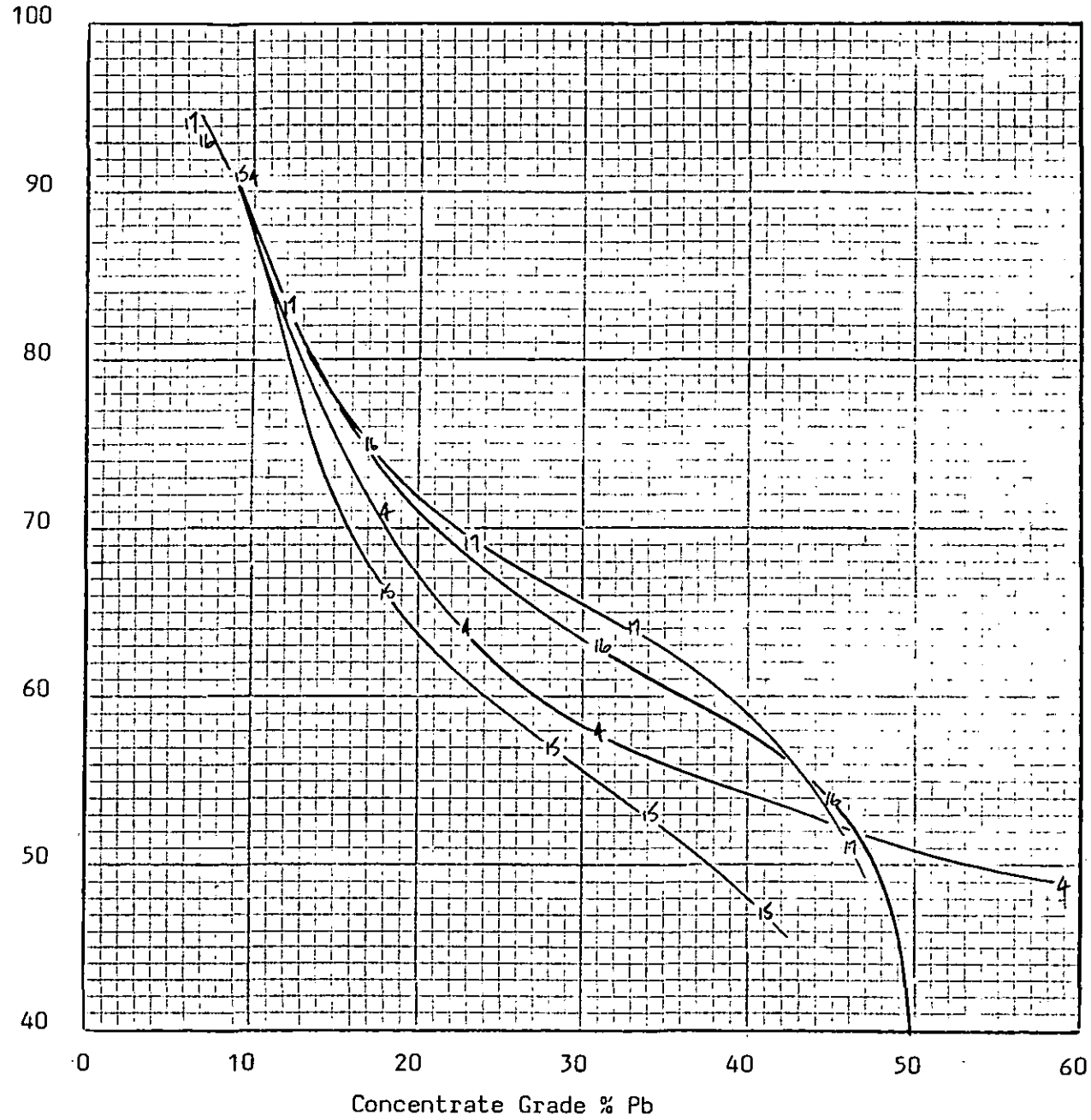
On the first test series, shown in Graph No. 4, some of the test data (tests 16 and 17) indicated that significant non-sulphide rejection was taking place following small dextrine additions (30 - 50 g/tonne) to the regrind mill. Dextrine additions of only 20 g/tonne to the regrind appeared ineffectual in suppression of the non-sulphide (test 15).

A second test series investigated the effect of dextrine additions to the primary grinding circuit. The data in Graph No. 5 shows that dextrine additions in the 10 - 30 g/tonne range result in marginal gangue rejection (tests 18 and 19). Additions in the 50 - 100 g/tonne range caused small but significant galena losses in each cleaner stage (tests 20 and 21). The reasons for these losses is not known.

A third test series involved adding relatively large amounts of dextrine ahead of lead flotation. Minor rougher recovery losses were noted in Graph No. 6 with resultant grade advantages.

GRAPH NO. 4

Dextrine to Regrind Mill



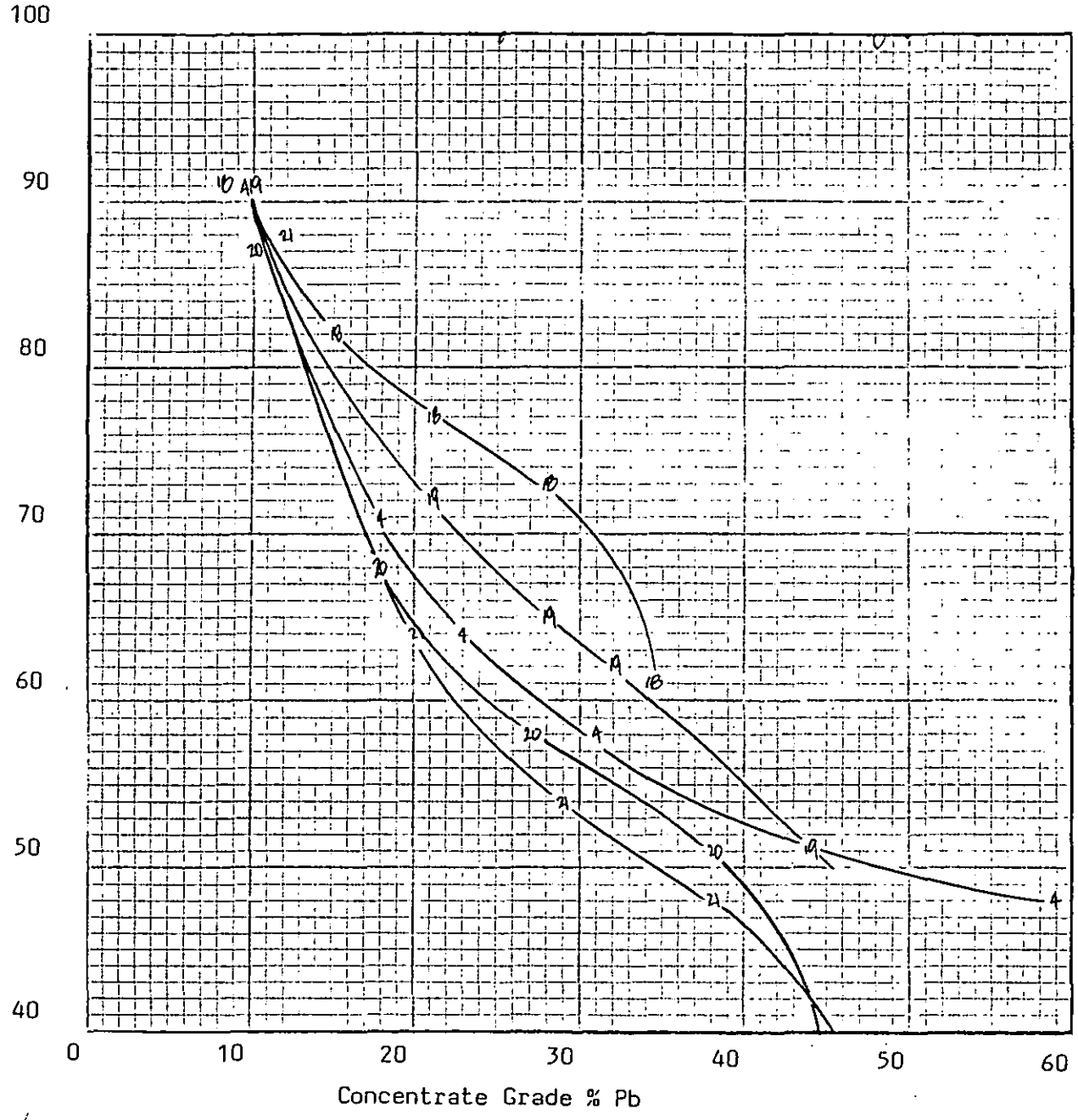
KEY

Test	Conditions	% Passing 10 Microns *
4	20 g/tonne Dextrine to third cleaner concentrate	48
15	20 g/tonne Dextrine to Regrind	57
16	50 g/tonne Dextrine to Regrind	49
17	30 g/tonne Dextrine to Regrind	46

* particle size of the regrind discharge

GRAPH NO. 5

Dextrine to Primary Grinding Mill



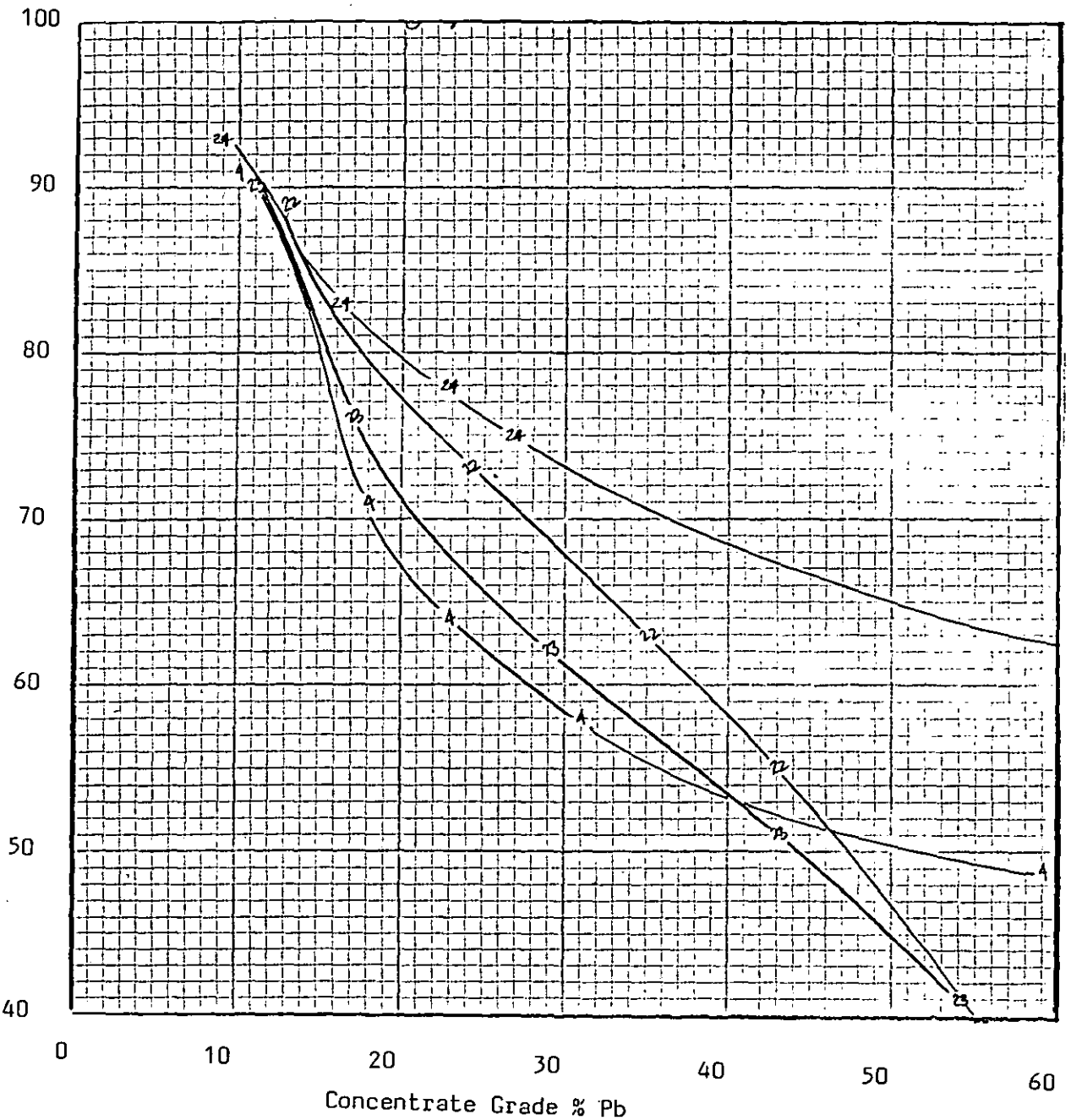
KEY

Test	Conditions	% Passing 10 Microns *
4	20 g/tonne Dextrine to third cleaner concentrate	48
18	10 g/tonne Dextrine to grind	50
19	30 g/tonne Dextrine to grind	51
20	50 g/tonne Dextrine to grind	51
21	100 g/tonne Dextrine to grind	57

* particle size of the regrind discharge

GRAPH NO. 6

Dextrine to Conditioners



KEY

Test	Conditions	% Passing 10 Microns *
4	20 g/tonne Dextrine to third cleaner concentrate	48
22	100 g/tonne Dextrine to Conditioner	55
23	200 g/tonne Dextrine to Conditioner	53
24	2 kg feed charge with 40 g/tonne Dextrine to third cleaner concentrate	58

* particle size of the regrind discharge

APPENDIX I

TECHNICAL DETAILS OF FLOTATION TESTS 1 - 24 INCLUSIVE

Details of each test are shown indicating reagents used, essential test parameters, assays and a metallurgical balance.

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TEST NO. 1

PURPOSE: Test the effects of Potassium Dichromate as a lead depressant

PROCEDURE: Grind and float lead - graphite - regrind and clean three times
Then use $K_2Cr_2O_7$ to depress galena - float graphite

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dich*		Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.1
Lead Conditioning			20				2		10.1	10.1
Lead Ro/Sc			50					7	10.1	9.9
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.5
Lead 2nd Cleaner	x		40				2	4	10.5	10.5
Lead 3rd Cleaner	x		30				2	3	10.5	10.5
Conditioning	x			3000			5		6.2	10.3
Lead 4th Cleaner			-					2	10.3	10.4

*Dichromate

Test No. 1

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	1.78	41.10	2.40			45.50	1.26		
Pb Cleaner Tails 4	1.50	12.90	4.78			12.02	2.11		
Pb Cleaner Tails 3	1.78	6.94	2.93			7.68	1.54		
Pb Cleaner Tails 2	3.51	4.67	3.17			10.21	3.29		
Pb Cleaner Tails 1	10.89	2.37	3.37			16.07	10.85		
Tails	80.55	0.17	3.40			8.53	80.95		
Calculated Head	100.00	1.61	3.38			100.00	100.00		

KM094

TEST NO. 2

PURPOSE: Dichromate Effects - Lime based Cleaner Circuit

PROCEDURE:

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	CaO	Dich*	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.2
Lead Conditioning			20				2		10.2	10.2
Lead Ro/Sc			50					7	10.2	9.9
Lead Regrind		200		500		20				11.6
Lead 1st Cleaner			100				2	5	11.6	11.4
Lead 2nd Cleaner			50	x			2	4	11.5	11.3
Lead 3rd Cleaner			40	x			2	3	11.5	11.3
Conditioning				x	3000		5		6.1	11.4
Lead 4th Cleaner			-					2	11.4	11.3

*Dichromate

Test No. 2

Product	Weight %	Assays %				Distribution			
		Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	1.43	38.10	2.90			32.12	1.23		
Pb Cleaner Tails 4	0.84	8.57	4.83			4.21	1.19		
Pb Cleaner Tails 3	0.83	10.80	3.20			5.27	0.79		
Pb Cleaner Tails 2	2.37	8.47	3.30			11.78	2.31		
Pb Cleaner Tails 1	10.85	6.00	3.50			38.26	11.22		
Tails	83.68	0.17	3.37			8.36	83.27		
Calculated Head	100.00	1.70	3.39			100.00	100.00		

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TEST NO. 3

PURPOSE: Dichromate - Low lime Cleaner Circuit

PROCEDURE:

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	CaO	Dich*	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.2
Lead Conditioning			20				2		10.2	10.2
Lead Ro/Sc			50					7	10.2	10.2
Lead Regrind		200		200		20				11.0
Lead 1st Cleaner			50				2	5	11.0	10.1
Lead 2nd Cleaner			40	x			2	4	11.0	10.5
Lead 3rd Cleaner			30	x			2	3	11.0	10.5
Conditioning				x	3000		5		6.4	11.0
Lead 4th Cleaner			-					2	11.0	10.5

*Dichromate

Test No. 3

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	1.54	42.30	2.80			39.44	1.29		
Pb Cleaner Tails 4	1.08	11.30	4.81			7.38	1.55		
Pb Cleaner Tails 3	1.66	10.00	3.60			10.07	1.79		
Pb Cleaner Tails 2	3.75	6.50	3.60			14.75	4.04		
Pb Cleaner Tails 1	7.35	3.84	3.50			17.09	7.70		
Tails	84.62	0.22	3.30			11.27	83.62		
Calculated Head	100.00	1.65	3.34			100.00	100.00		

KM094

TEST NO. 4

PURPOSE: Dextrine Effects

PROCEDURE:

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dext*		Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.2
Lead Conditioning			20				2		10.2	10.2
Lead Ro/Sc			50					7	10.2	10.1
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.2
Lead 2nd Cleaner	x		40				2	4	10.5	10.3
Lead 3rd Cleaner	x		30				2	3	10.5	10.3
Conditioning				20			5		9.8	9.5
Lead 4th Cleaner			20					3	9.5	9.0

*Dextrine

Test No. 4

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	1.36	59.20	3.35			48.63	1.35		
Pb Cleaner Tails 4	1.73	8.57	4.00			8.92	2.04		
Pb Cleaner Tails 3	1.55	6.94	3.37			6.50	1.54		
Pb Cleaner Tails 2	1.98	5.88	3.10			7.03	1.81		
Pb Cleaner Tails 1	7.92	4.22	3.57			20.16	8.34		
Tails	85.46	0.17	3.37			8.76	84.93		
Calculated Head	100.00	1.66	3.39			100.00	100.00		

KM094

TEST NO. 5

PURPOSE: Test Effectiveness of CMC - Soda Ash Circuit

PROCEDURE:

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	CMC		Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.2
Lead Conditioning			20				2		10.2	10.2
Lead Ro/Sc			50					7	10.2	10.1
Lead Regrind	1000	200				20				10.2
Lead 1st Cleaner			50				2	5	10.2	10.0
Lead 2nd Cleaner	x		40				2	4	10.5	10.3
Lead 3rd Cleaner	x		30				2	3	10.5	10.3
Conditioning	x			20			2		10.3	10.3
Lead 4th Cleaner			50					2	10.3	10.3

Test No. 5

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	1.84	43.10	4.14			50.84	2.32		
Pb Cleaner Tails 4	1.89	9.64	3.20			11.68	1.84		
Pb Cleaner Tails 3	1.21	7.15	3.47			5.54	1.27		
Pb Cleaner Tails 2	4.15	3.68	3.63			9.80	4.58		
Pb Cleaner Tails 1	9.44	2.19	3.73			13.26	10.71		
Tails	81.47	0.17	3.20			8.88	79.28		
Calculated Head	100.00	1.56	3.29			100.00	100.00		

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TEST NO. 6

PURPOSE: Test Dichromate Lime Effects

PROCEDURE: Standard soda ash float with regrind. Cleaning three times in soda ash circuit: Use dichromate with lime

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dich*	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.2
Lead Conditioning			20				2		10.2	10.2
Lead Ro/Sc			50					7	10.2	10.0
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.4
Lead 2nd Cleaner	x		40				2	4	10.5	10.4
Lead 3rd Cleaner	x		20				2	3	10.5	10.2
Conditioning				3000	x		5		5.9	11.5
Lead 4th Cleaner			-					2	11.5	11.5

*Dichromate

Test No. 6

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	2.63	39.60	3.41			64.05	2.65		
Pb Cleaner Tails 4	0.78	17.20	4.90			8.28	1.13		
Pb Cleaner Tails 3	1.32	4.74	3.34			3.85	1.30		
Pb Cleaner Tails 2	2.56	3.15	3.22			4.97	2.43		
Pb Cleaner Tails 1	12.16	1.33	3.34			9.94	11.98		
Tails	80.54	0.18	3.39			8.91	80.51		
Calculated Head	100.00	1.63	3.39			100.00	100.00		

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TEST NO. 7

PURPOSE: Same as Test No. 6

PROCEDURE: Same as Test No. 6 but reduce pH in cleaner 4 to 11.0

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dich*	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.2
Lead Conditioning			20				2		10.2	10.2
Lead Ro/Sc			50					7	10.2	10.5
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.4
Lead 2nd Cleaner	x		40				2	4	10.5	10.3
Lead 3rd Cleaner	x		20				2	3	10.5	10.2
Conditioning				3000	x		5		6.1	11.0
Lead 4th Cleaner			-					2	11.0	11.0

*Dichromate

Test No. 7

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	2.09	42.60	2.91			52.18	1.77		
Pb Cleaner Tails 4	0.55	16.20	5.05			5.19	0.80		
Pb Cleaner Tails 3	2.17	7.80	3.52			9.91	2.22		
Pb Cleaner Tails 2	2.99	4.49	3.31			7.87	2.88		
Pb Cleaner Tails 1	12.90	2.18	3.49			16.48	13.08		
Tails	79.31	0.18	3.44			8.37	79.26		
Calculated Head	100.00	1.71	3.44			100.00	100.00		

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TEST NO. 8

PURPOSE: Same as Test No. 6

PROCEDURE: Same as Test No. 6 by increasing pH in cleaner 4 to 12.0

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dich*	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.3
Lead Conditioning			20				2		10.3	10.3
Lead Ro/Sc			50					7	10.3	10.0
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.5
Lead 2nd Cleaner	x		40				2	4	10.5	10.5
Lead 3rd Cleaner	x		20				2	3	10.5	10.5
Conditioning				3000	x		5		6.1	12.0
Lead 4th Cleaner			-					2	12.0	12.0

*Dichromate

Test No. 8

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	2.08	37.40	3.45			48.29	2.12		
Pb Cleaner Tails 4	1.81	14.80	4.42			16.64	2.36		
Pb Cleaner Tails 3	1.30	5.58	2.93			4.51	1.12		
Pb Cleaner Tails 2	2.66	4.09	2.98			6.76	2.34		
Pb Cleaner Tails 1	10.40	2.43	3.36			15.69	10.31		
Tails	81.74	0.16	3.39			8.12	81.74		
Calculated Head	100.00	1.61	3.39			100.00	100.00		

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TEST NO. 9

PURPOSE: Determine Effects of Varying Dichromate at pH 11.5 - Blank Test

PROCEDURE: Standard except add only lime to third cleaner conc.

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dich*	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.2
Lead Conditioning			20				2		10.2	10.2
Lead Ro/Sc			50					7	10.2	10.1
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.5
Lead 2nd Cleaner	x		40				2	4	10.5	10.4
Lead 3rd Cleaner	x		20				2	3	10.5	10.3
Conditioning				-	x		5		11.5	11.5
Lead 4th Cleaner			-					2	11.5	11.5

*Dichromate

Test No. 9

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	2.11	35.30	3.11			43.23	1.96		
Pb Cleaner Tails 4	0.61	16.30	4.56			5.80	0.83		
Pb Cleaner Tails 3	1.17	9.96	3.18			6.77	1.11		
Pb Cleaner Tails 2	4.71	6.13	3.36			16.74	4.71		
Pb Cleaner Tails 1	9.50	3.43	3.49			18.90	9.88		
Tails	81.89	0.18	3.34			8.55	81.50		
Calculated Head	100.00	1.72	3.36			100.00	100.00		

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TEST NO. 10

PURPOSE: Same as Test No. 9 but use .5 kg Dichromate

PROCEDURE:

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dich*	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.3
Lead Conditioning			20				2		10.3	10.3
Lead Ro/Sc			50					7	10.3	10.1
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.4
Lead 2nd Cleaner	x		40				2	4	10.5	10.3
Lead 3rd Cleaner	x		20				2	3	10.4	10.2
Conditioning				500	x		5		7.5	11.5
Lead 4th Cleaner			-					2	11.5	11.5

*Dichromate

Test No. 10

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	2.07	40.40	3.16			53.15	1.89		
Pb Cleaner Tails 4	2.12	10.40	4.23			14.04	2.60		
Pb Cleaner Tails 3	1.23	4.75	2.84			3.71	1.01		
Pb Cleaner Tails 2	3.14	3.70	3.11			7.41	2.83		
Pb Cleaner Tails 1	10.22	2.06	3.39			13.41	10.04		
Tails	81.22	0.16	3.47			8.28	81.63		
Calculated Head	100.00	1.57	3.45			100.00	100.00		

KM094

TEST NO. 11

PURPOSE: Same as Test No. 9 but use 1.5 kg Dichromate

PROCEDURE:

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dich*	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.2
Lead Conditioning			20				2		10.2	10.2
Lead Ro/Sc			50					7	10.2	10.1
Lead Regrind	1000	200				20				10.6
Lead 1st Cleaner			50				2	5	10.6	10.5
Lead 2nd Cleaner	x		40				2	4	10.5	10.5
Lead 3rd Cleaner	x		20				2	3	10.5	10.5
Conditioning				1500	x		5		6.8	11.5
Lead 4th Cleaner			-					2	11.5	11.5

*Dichromate

Test No. 11

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	1.99	44.10	2.83			50.29	1.59		
Pb Cleaner Tails 4	0.84	18.80	4.81			9.04	1.14		
Pb Cleaner Tails 3	1.47	8.07	3.62			6.79	1.51		
Pb Cleaner Tails 2	4.28	4.48	3.73			10.99	4.52		
Pb Cleaner Tails 1	8.34	3.09	3.83			14.78	9.05		
Tails	83.09	0.17	3.49			8.10	82.19		
Calculated Head	100.00	1.57	3.45			100.00	100.00		

KM094

TEST NO. 12

PURPOSE: Repeat Test No. 6

PROCEDURE:

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dich*	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.1
Lead Conditioning			20				2		10.1	10.1
Lead Ro/Sc			50					7	10.1	10.0
Lead Regrind	1000	200				20				10.3
Lead 1st Cleaner			50				2	5	10.6	10.3
Lead 2nd Cleaner	x		40				2	4	10.5	10.4
Lead 3rd Cleaner	x		20				2	3	10.5	10.4
Conditioning				3000			5		6.1	11.6
Lead 4th Cleaner					x			2	11.6	11.5

* Dichromate

Test No. 12

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	2.09	41.90	2.86			55.16	1.73		
Pb Cleaner Tails 4	0.65	17.40	5.12			7.12	0.96		
Pb Cleaner Tails 3	1.15	6.43	3.27			4.64	1.09		
Pb Cleaner Tails 2	5.10	3.75	3.43			12.05	5.07		
Pb Cleaner Tails 1	11.90	1.87	3.43			14.03	11.83		
Tails	79.12	0.14	3.46			6.99	79.33		
Calculated Head	100.00	1.59	3.45			100.00	100.00		

KM094

TEST NO. 13

PURPOSE: Repeat Test No. 11

PROCEDURE:

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dich*	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.3
Lead Conditioning			20				2		10.2	10.1
Lead Ro/Sc			50						10.1	10.0
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.3
Lead 2nd Cleaner	x		40				2	4	10.5	10.4
Lead 3rd Cleaner	x		20				2	3	10.5	10.4
Conditioning				1500	x		5		6.8	11.5
Lead 4th Cleaner								2	11.5	11.5

* Dichromate

Test No. 13

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	1.61	40.60	4.56			42.75	2.13		
Pb Cleaner Tails 4	2.13	16.80	4.84			23.48	3.01		
Pb Cleaner Tails 3	1.05	4.80	3.27			3.32	1.00		
Pb Cleaner Tails 2	2.78	3.25	2.92			5.92	2.36		
Pb Cleaner Tails 1	10.97	2.37	3.16			17.05	10.10		
Tails	81.46	0.14	3.43			7.48	81.39		
Calculated Head	100.00	1.53	3.43			100.00	100.00		

KM094

TEST NO. 14

PURPOSE: Repeat Test No. 9

PROCEDURE:

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dich*	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.0
Lead Conditioning			20				2		10.0	10.0
Lead Ro/Sc			50					7	10.0	9.9
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.3
Lead 2nd Cleaner	x		40				2	4	10.5	10.4
Lead 3rd Cleaner	x		20				2	3	10.5	10.5
Conditioning				-	x		2		11.5	11.5
Lead 4th Cleaner			-					2	11.5	11.5

* Dichromate

Test No. 14

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	2.49	34.80	3.10			53.56	2.27		
Pb Cleaner Tails 4	0.74	18.20	4.62			8.38	1.01		
Pb Cleaner Tails 3	1.23	7.89	3.46			6.02	1.26		
Pb Cleaner Tails 2	3.93	4.05	3.38			9.85	3.91		
Pb Cleaner Tails 1	8.87	2.37	3.59			12.99	9.36		
Tails	82.73	0.18	3.38			9.20	82.19		
Calculated Head	100.00	1.62	3.40			100.00	100.00		

KM094

TEST NO. 15

PURPOSE: Effects of variable dextrine in Regrind Mill

PROCEDURE: Standard soda ash - cyanide with variable amounts of dextrine WC9524 added to regrind mill

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dext*		Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.0
Lead Conditioning			20				2		10.0	10.0
Lead Ro/Sc			50					7	10.0	9.9
Lead Regrind	1000	200		20		20				10.4
Lead 1st Cleaner			50				2	5	10.4	10.2
Lead 2nd Cleaner	x		40				2	4	10.5	10.3
Lead 3rd Cleaner	x		20				2	3	10.5	10.3
Conditioning										
Lead 4th Cleaner	x		-				2	2	10.5	10.3

* Dextrine

Test No. 15

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	1.86	40.50	3.32			46.73	1.85		
Pb Cleaner Tails 4	0.61	16.20	3.45			6.18	0.63		
Pb Cleaner Tails 3	0.82	7.37	3.48			3.76	0.86		
Pb Cleaner Tails 2	2.66	5.73	3.50			9.48	2.79		
Pb Cleaner Tails 1	11.08	3.64	3.72			25.08	12.35		
Tails	82.97	0.17	3.28			8.77	81.52		
Calculated Head	100.00	1.61	3.34			100.00	100.00		

KM094

TEST NO. 16

PURPOSE: Same as Test No. 15

PROCEDURE: Same as Test No. 15 - Increase Dextrine to 50 g

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dext*		Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.1
Lead Conditioning			20				2		10.1	10.1
Lead Ro/Sc			50					7	10.1	9.8
Lead Regrind	1000	200		50		20				10.4
Lead 1st Cleaner			50				2	5	10.4	10.2
Lead 2nd Cleaner	x		40				2	4	10.5	10.3
Lead 3rd Cleaner	x		20				2	3	10.5	10.3
Conditioning										
Lead 4th Cleaner	x		-				2	2	10.5	10.4

* Dextrine

Test No. 16

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	0.89	51.20	3.12			28.57	0.83		
Pb Cleaner Tails 4	1.00	40.30	4.17			25.35	1.25		
Pb Cleaner Tails 3	1.36	11.10	3.98			9.45	1.62		
Pb Cleaner Tails 2	3.64	5.12	3.52			11.69	3.83		
Pb Cleaner Tails 1	12.91	2.21	3.57			17.90	13.79		
Tails	80.20	0.14	3.28			7.04	78.68		
Calculated Head	100.00	1.59	3.34			100.00	100.00		

KM094

TEST NO. 17

PURPOSE: Same as Test No. 15

PROCEDURE: Same as Test No. 15 - Increase Dextrine to 30 g

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dext*		Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.1
Lead Conditioning			20				2		10.1	10.1
Lead Ro/Sc			50					7	10.1	9.8
Lead Regrind	1000	200		30						10.4
Lead 1st Cleaner			50				2	5	10.4	10.2
Lead 2nd Cleaner	x		40				2	4	10.5	10.3
Lead 3rd Cleaner	x		20				2	3	10.5	10.3
Conditioning										
Lead 4th Cleaner	x		-				2	2	10.5	10.4

* Dextrine

Test No. 17

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	1.84	45.60	3.44			51.26	1.85		
Pb Cleaner Tails 4	1.34	15.40	3.67			12.59	1.44		
Pb Cleaner Tails 3	1.70	5.32	3.18			5.53	1.58		
Pb Cleaner Tails 2	6.87	3.31	3.40			13.92	6.85		
Pb Cleaner Tails 1	12.88	1.30	3.37			10.24	12.72		
Tails	75.37	0.14	3.42			6.46	75.55		
Calculated Head	100.00	1.63	3.41			100.00	100.00		

KM094

TEST NO. 18

PURPOSE: Effects of variable dextrine in Primary Grind

PROCEDURE: Standard soda ash - cyanide with variable amounts of dextrine WC 9524 added to primary grind

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dext*		Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300		10		20				10.0
Lead Conditioning			20				2		10.0	10.0
Lead Ro/Sc			50					7	10.0	9.8
Lead Regrind	1000	200				20				10.3
Lead 1st Cleaner			50				2	5	10.3	10.0
Lead 2nd Cleaner	x		40				2	4	10.5	10.4
Lead 3rd Cleaner	x		20				2	3	10.4	10.4
Conditioning										
Lead 4th Cleaner	x		-				2	2	10.5	10.2

* Dextrine

Test No. 18

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	2.88	34.20	3.68			61.17	3.05		
Pb Cleaner Tails 4	1.26	15.40	3.84			12.02	1.39		
Pb Cleaner Tails 3	1.66	4.01	2.91			4.14	1.39		
Pb Cleaner Tails 2	3.08	2.44	3.33			4.67	2.95		
Pb Cleaner Tails 1	9.27	1.54	3.75			8.86	10.00		
Tails	81.84	0.18	3.45			9.14	81.21		
Calculated Head	100.00	1.61	3.48			100.00	100.00		

KM094

TEST NO. 19

PURPOSE: Same as Test No. 18

PROCEDURE: Same as Test No. 18 - Increase Dextrine to 30 g

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dext*		Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300		30		20				10.0
Lead Conditioning			20				2		10.0	10.0
Lead Ro/Sc			50					7	10.0	9.8
Lead Regrind	1000	200				20				10.4
Lead 1st Cleaner			50				2	5	10.4	10.1
Lead 2nd Cleaner	x		40				2	4	10.5	10.5
Lead 3rd Cleaner	x		20				2	3	10.5	10.5
Conditioning										
Lead 4th Cleaner	x		-				2	2	10.4	10.2

* Dextrine

Test No. 19

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	1.95	43.80	3.49			51.75	2.00		
Pb Cleaner Tails 4	1.28	13.50	4.35			10.48	1.63		
Pb Cleaner Tails 3	0.65	7.77	3.28			3.07	0.63		
Pb Cleaner Tails 2	1.71	6.62	3.45			6.84	1.73		
Pb Cleaner Tails 1	9.53	3.22	3.80			18.60	10.62		
Tails	84.88	0.18	3.35			9.26	83.40		
Calculated Head	100.00	1.65	3.41			100.00	100.00		

KM094

TEST NO. 20

PURPOSE: Effects of Dextrine to Primary Grind

PROCEDURE: Standard test with 50 g Dextrine WC 9524 to Primary Grind

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dext*		Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300		50		20				10.0
Lead Conditioning			20				2		10.0	10.0
Lead Ro/Sc			50					7	10.0	9.8
Lead Regrind	1000	200				20				10.4
Lead 1st Cleaner			50				2	5	10.4	10.1
Lead 2nd Cleaner	x		40				2	4	10.5	10.2
Lead 3rd Cleaner	x		20				2	3	10.5	10.3
Conditioning										
Lead 4th Cleaner	x		-				2	2	10.5	10.4

* Dextrine

Test No. 20

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	1.30	48.20	4.10			39.25	1.53		
Pb Cleaner Tails 4	0.79	25.80	3.90			12.88	0.89		
Pb Cleaner Tails 3	1.26	9.30	3.80			7.34	1.38		
Pb Cleaner Tails 2	2.54	5.90	3.70			9.43	2.72		
Pb Cleaner Tails 1	8.26	3.60	3.90			18.69	9.29		
Tails	85.85	0.23	3.40			12.41	84.19		
Calculated Head	100.00	1.59	3.47			100.00	100.00		

KM094

TEST NO. 21

PURPOSE: Same as Test No. 20

PROCEDURE: Standard with 100 g/t Dextrine 9524 to Primary Grind

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dext*		Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300		100		20				10.0
Lead Conditioning			20				2		10.0	10.0
Lead Ro/Sc			50					7	10.0	9.8
Lead Regrind	1000	200				20				10.4
Lead 1st Cleaner			50				2	5	10.4	10.1
Lead 2nd Cleaner	x		40				2	4	10.5	10.2
Lead 3rd Cleaner	x		20				2	3	10.5	10.3
Conditioning										
Lead 4th Cleaner	x		-				2	2	10.5	10.4

* Dextrine

Test No. 21

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	1.20	50.10	3.20			35.58	1.11		
Pb Cleaner Tails 4	0.90	23.50	4.10			12.58	1.07		
Pb Cleaner Tails 3	0.96	11.00	3.80			6.26	1.05		
Pb Cleaner Tails 2	2.19	7.40	3.80			9.61	2.40		
Pb Cleaner Tails 1	7.50	5.40	4.00			24.05	8.67		
Tails	87.25	0.23	3.40			11.91	85.70		
Calculated Head	100.00	1.68	3.46			100.00	100.00		

KM094

TEST NO. 22

PURPOSE: Determine effect of adding dextrine after grinding

PROCEDURE:

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dext*		Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.3
Lead Condition 1				100			5		10.3	10.3
Lead Condition 2			50				2		10.3	10.2
Lead Ro/Sc			50					7	10.2	10.1
Lead Regrind	1000	200								10.4
Lead 1st Cleaner			50				2	5	10.5	10.2
Lead 2nd Cleaner	x		40				2	4	10.5	10.4
Lead 3rd Cleaner	x		20				2	3	10.4	10.4
Lead 4th Cleaner	x		-				2	2	10.3	10.1

* Dextrine

Test No. 22

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	1.16	56.20	3.63			40.07	1.20		
Pb Cleaner Tails 4	0.92	27.80	4.22			15.62	1.10		
Pb Cleaner Tails 3	0.88	14.90	3.84			8.02	0.96		
Pb Cleaner Tails 2	1.95	7.92	4.21			9.48	2.34		
Pb Cleaner Tails 1	6.55	3.97	4.55			15.96	8.49		
Tails	88.54	0.20	3.41			10.86	85.91		
Calculated Head	100.00	1.63	3.51			100.00	100.00		

KM094

TEST NO. 23

PURPOSE: Repeat Test No. 22 but with more dextrine

PROCEDURE:

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 20 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dext*		Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				10.3
Lead Condition 1				200			5		10.3	10.3
Lead Condition 2			50				2		10.3	10.2
Lead Ro/Sc			50					7	10.2	9.9
Lead Regrind	1000	200				20				10.3
Lead 1st Cleaner			50				2	5	10.5	10.2
Lead 2nd Cleaner	x		40				2	4	10.5	10.3
Lead 3rd Cleaner	x		20				2	3	10.5	10.4
Lead 4th Cleaner	x		-				2	2	10.5	10.4

* Dextrine

Test No. 23

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	1.23	53.60	3.34			40.42	1.17		
Pb Cleaner Tails 4	0.72	23.70	4.15			10.44	0.85		
Pb Cleaner Tails 3	1.59	11.30	4.21			11.02	1.90		
Pb Cleaner Tails 2	3.64	6.10	4.33			13.57	4.47		
Pb Cleaner Tails 1	6.70	3.42	4.33			14.01	8.23		
Tails	86.12	0.20	3.41			10.54	83.38		
Calculated Head	100.00	1.63	3.52			100.00	100.00		

KM094

TEST NO. 24

PURPOSE: Effects of dextrine on Lead Third Cleaner

PROCEDURE: Use 2.0 kg charge, proceed through to third cleaner and perform a dextrine separations

FEED: 1.0 kg Blended Ore Sample - Type A

GRIND: 40 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	Dext*		Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				40				10.3
Lead Conditioning			20				2		10.3	10.3
Lead Ro/Sc			50					5	10.3	10.0
Lead Regrind	1000	200				40				10.6
Lead 1st Cleaner			50				2	5	10.5	10.4
Lead 2nd Cleaner	x		40				2	4	10.5	10.5
Lead 3rd Cleaner	x		20				2	3	10.4	10.2
Conditioning				40			5		9.5	9.4
Lead 4th Cleaner			-					2	9.4	9.2

* Dextrine

Test No. 24

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	1.62	62.60	3.30			62.83	1.54		
Pb Cleaner Tails 4	2.81	7.34	4.50			12.80	3.65		
Pb Cleaner Tails 3	1.03	4.90	3.70			3.13	1.10		
Pb Cleaner Tails 2	2.62	2.50	2.70			4.07	2.05		
Pb Cleaner Tails 1	10.85	1.50	3.80			10.12	11.93		
Tails	81.07	0.14	3.40			7.05	79.73		
Calculated Head	100.00	1.61	3.46			100.00	100.00		

APPENDIX II

SPECIAL ASSAYS

Special Assays on Concentrates

Test No.	Assay % Fe
6	3.82
7	3.94
8	4.07
9	2.22
10	2.96
11	2.46
12	2.18
13	3.46
14	2.00
15	2.40
16	1.75
17	1.99
18	2.40
19	2.32
20	2.40
21	1.80
22	2.88
23	2.36
24	1.97

APPENDIX III

WARMAN CYCLOSIZER RESULTS

Cyclosizing tests were performed on weighted composites of the final concentrate and cleaner tails for each test, i.e. a regrind discharge sample.

KAMLOOPS RESEARCH AND ASSAY LABORATORY LTD.

WARMAN CYCLOSIZER RESULTS

CLIENT: Cyprus Anvil Mining Corp. DATE: June 30, 1982.

SAMPLE NUMBER	094-4	094-15	094-16	094-17
SAMPLE WEIGHT	50.00	25.40	25.68	25.86
TEMPERATURE °C	16.8	17.0	16.8	16.8
SAMPLE SPECIFIC GRAVITY	3.12	3.23	3.12	3.06
FLOWRATE mm	180.	180.	180.	180.
ELUTRIATION TIME min	20.	20.	20.	20.
CORRECTION FACTORS (temp.)	1.043	1.04	1.043	1.043
(sp. gr.)	.885	.860	.885	.895
(flow)	1.012	1.012	1.012	1.012
(time)	.955	.955	.955	.955
OVERALL CORRECTION FACTOR	.892	.864	.892	.902
SAMPLE WT. CYCLONE NO. 1	2.40	.41	.80	1.03
NO. 2	2.98	.85	1.52	1.86
NO. 3	6.01	2.41	3.34	3.61
NO. 4	8.27	3.87	4.29	4.28
NO. 5	5.92	3.19	3.04	3.02
% RETAINED CYCLONE NO. 1	4.80	1.61	3.12	3.98
NO. 2	5.96	3.35	5.92	7.19
NO. 3	12.02	9.49	13.01	13.96
NO. 4	16.54	15.24	16.71	16.55
NO. 5	11.84	12.56	11.83	11.86
% PASSING CYCLONE NO. 1	95.2	98.39	96.88	96.02
NO. 2	89.24	95.04	90.96	88.83
NO. 3	77.22	85.55	77.95	74.87
NO. 4	60.68	70.31	61.24	58.32
NO. 5	48.84	57.75	49.41	46.64
de CYCLONE NO. 1	39.9	38.6	39.9	40.3
NO. 2	27.9	27.0	27.9	28.2
NO. 3	19.4	18.7	19.4	19.6
NO. 4	13.6	13.1	13.6	13.7
NO. 5	10.6	10.3	10.6	10.7

CALIBRATION DATA	
di CYCLONE NO. 1 =	44.7
NO. 2 =	31.3
NO. 3 =	21.7
NO. 4 =	15.2
NO. 5 =	11.9

REMARKS:

P_{80} = 21 P_{80} = 17 P_{80} = 21 P_{80} = 23

KAMLOOPS RESEARCH AND ASSAY LABORATORY LTD.

WARMAN CYCLOSIZER RESULTS

CLIENT: Cyprus Anvil Mining Corp. DATE: June 30, 1982.

SAMPLE NUMBER	094-18	094-19	094-20	094-21
SAMPLE WEIGHT	25.47	26.43	25.00	24.70
TEMPERATURE °C	16.8	16.8	16.3	16.3
SAMPLE SPECIFIC GRAVITY	3.30	3.24	3.23	3.32
FLOWRATE mm	180.	180.	180.	180.
ELUTRIATION TIME min	20.	20.	20.	20.
CORRECTION FACTORS (temp.)	1.043	1.043	1.048	1.048
(sp. gr.)	.850	.860	.862	.845
(flow)	1.012	1.012	1.012	1.012
(time)	.955	.955	.955	.955
OVERALL CORRECTION FACTOR	.856	.867	.873	.856
SAMPLE WT. CYCLONE NO. 1	.60	1.15	1.02	.76
NO. 2	1.46	1.47	1.30	.99
NO. 3	3.40	3.04	2.86	2.27
NO. 4	4.11	3.98	3.86	3.53
NO. 5	2.94	3.12	2.98	3.00
% RETAINED CYCLONE NO. 1	2.36	4.35	4.08	3.07
NO. 2	5.73	5.56	5.20	4.01
NO. 3	13.35	11.50	11.44	9.19
NO. 4	16.14	15.06	15.44	14.29
NO. 5	11.54	11.80	11.92	12.14
% PASSING CYCLONE NO. 1	97.64	95.65	95.92	96.93
NO. 2	91.91	90.09	90.72	92.92
NO. 3	78.56	78.59	79.28	83.73
NO. 4	62.42	63.53	63.84	69.44
NO. 5	50.88	51.73	51.92	57.30
de CYCLONE NO. 1	38.3	38.8	39.0	38.3
NO. 2	26.8	27.1	27.3	26.8
NO. 3	18.6	18.8	18.9	18.6
NO. 4	13.0	13.2	13.3	13.0
NO. 5	10.2	10.3	10.4	10.2

CALIBRATION DATA	
di CYCLONE NO. 1 =	44.7
NO. 2 =	31.3
NO. 3 =	21.7
NO. 4 =	15.2
NO. 5 =	11.9

REMARKS:

P_{80} = 20 P_{80} = 20 P_{80} = 19 P_{80} = 17

KAMLOOPS RESEARCH AND ASSAY LABORATORY LTD.

WARMAN CYCLOSIZER RESULTS

CLIENT: Cyprus Anvil Mining Corp. DATE: June 30, 1982.

SAMPLE NUMBER		094-22	094-23	094-24	
SAMPLE WEIGHT		29.30	25.52	50.00	
TEMPERATURE	°C	16.5	16.5	16.5	
SAMPLE SPECIFIC GRAVITY		3.39	3.37	3.04	
FLOWRATE	mm	180.	180.	180.	
ELUTRIATION TIME	min	20.	20.	20.	
CORRECTION FACTORS	(temp.)	1.046	1.046	1.046	
	(sp. gr.)	.832	.832	.898	
	(flow)	1.012	1.012	1.012	
	(time)	.955	.955	.955	
OVERALL CORRECTION FACTOR		.841	.841	.908	
SAMPLE WT. CYCLONE NO. 1		1.46	1.14	1.07	
NO. 2		1.47	1.41	1.21	
NO. 3		2.82	2.75	3.93	
NO. 4		4.00	3.67	7.60	
NO. 5		3.31	2.93	6.74	
% RETAINED CYCLONE NO. 1		4.98	4.47	2.14	
NO. 2		5.02	5.53	2.42	
NO. 3		9.62	10.78	7.86	
NO. 4		13.65	14.39	15.20	
NO. 5		11.30	11.49	13.48	
% PASSING CYCLONE NO. 1		95.02	95.53	97.86	
NO. 2		90.00	90.00	95.44	
NO. 3		80.38	79.22	87.58	
NO. 4		66.73	64.83	72.38	
NO. 5		55.43	53.34	58.90	
de CYCLONE NO. 1		37.6	37.6	40.6	
NO. 2		26.3	26.3	28.4	
NO. 3		18.2	18.2	19.7	
NO. 4		12.8	12.8	13.8	
NO. 5		10.0	10.0	10.8	

CALIBRATION DATA	
di CYCLONE NO. 1 =	44.7
NO. 2 =	31.3
NO. 3 =	21.7
NO. 4 =	15.2
NO. 5 =	11.9

REMARKS:

P_{80} = 18 P_{80} = 19 P_{80} = 17