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KAMLOOPS *RESEARCH & ASSAY* LABORATORY LTD. & MET *ENGINEERS* LTD.

METALLURGICAL RESPONSE OF DY ORE

DY DEPOSIT - VANGORDA PLATEAU

YUKON TERRITORY

SUMMARY

Samples of diamond drill core, representing the five predominant ore facies in the DY deposit were tested utilizing standard metallurgical procedures. Based on the laboratory test results, data was developed indicating that ore from the DY deposit would respond favorably to a treatment scheme utilizing a fine primary grind and fine regrinding of rougher concentrates.

Concentrates produced were of good quality with significant silver and gold concentrations in the lead concentrates. Zinc concentrates, while of good grade, contained appreciable mercury concentrations.

Because of the preliminary nature of this work, no attempt was made to optimize either reagent scheme or grind level.

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KM076

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Ore Type G - Massive Baritic, Pyritic Sulphides

Predicted Metallurgy - Fine Grind

Product	Assays %				Distribution			
	Au*	Ag*	Pb	Zn	Au	Ag	Pb	Zn
Lead Concentrate	4.1	737	53.2	-	25.0	78.0	87.5	-
Zinc Concentrate	-	-	-	58.1	-	-	-	80.4

Lead Concentrate K_{80} 17 µm Zinc Concentrate K_{80} 14 µm

Predicted Metallurgy - Ultra Fine Grind

Product	Assays %				Distribution			
	Au*	Ag*	Pb	Zn	Au	Ag	Pb	Zn
Lead Concentrate	5.2	814	60.3	-	31.7	85.1	86.5	-
Zinc Concentrate	-	-	-	57.3	-	-	-	82.1

Lead Concentrate K_{80} 12 µm Zinc Concentrate K_{80} 14 µm

Approximate Chemical Composition of Concentrates

Product	Assays %									
	Au*	Ag*	Pb	Zn	Fe	Sb	Cd	As	Hg*	Insol
Lead Concentrate	5.2	800	60	9	9	0.15	N.D.	0.1	60	2.1
Zinc Concentrate	N.D.	N.D.	1	57	6	0.01	0.08	0.04	500	1.5

N.D. means "Not Determined" * g/tonne

Ore Type E - Massive Pyritic Sulphides

Predicted Metallurgy - Fine Grind

Product	Assays %				Distribution			
	Au*	Ag*	Pb	Zn	Au	Ag	Pb	Zn
Lead Concentrate	6.8	720	49.7	-	41.4	84.5	85.4	-
Zinc Concentrate	-	-	-	56.7	-	-	-	77.5

Lead Concentrate K_{80} 16 µm Zinc Concentrate K_{80} 14 µm

Predicted Metallurgy - Ultra Fine Grind

Product	Assays %				Distribution			
	Au*	Ag*	Pb	Zn	Au	Ag	Pb	Zn
Lead Concentrate	7.5	742	52.0	-	43.7	83.1	91.4	-
Zinc Concentrate	-	-	-	55.7	-	-	-	87.4

Lead Concentrate K_{80} 15 µm Zinc Concentrate K_{80} 14 µm

Approximate Chemical Composition of Concentrates

Product	Assays %									
	Au*	Ag*	Pb	Zn	Fe	Sb	Cd	As	Hg*	Insol
Lead Concentrate	7.0	725	50	5	12	0.23	N.D.	0.19	90	1.1
Zinc Concentrate	N.D.	N.D.	1	56	7	0.02	0.08	0.08	500	0.4

N.D. means "Not Determined" * g/tonne

Ore Type DC - Pyritic Quartzite

Predicted Metallurgy - Fine Grind

Product	Assays %				Distribution			
	Au*	Ag*	Pb	Zn	Au	Ag	Pb	Zn
Lead Concentrate	3.9	740	55.5	-	30.4	72.3	91.3	-
Zinc Concentrate	-	-	-	55.9	-	-	-	87.1

Lead Concentrate K_{80} 16 µm

Zinc Concentrate K_{80} 16 µm

Approximate Chemical Composition of Concentrates

Product	Assays %									
	Au*	Ag*	Pb	Zn	Fe	Sb	Cd	As	Hg*	Insol
Lead Concentrate	3.9	740	55	10	9	0.16	N.D.	0.31	80	2.3
Zinc Concentrate	N.D.	N.D.	1	56	7	0.01	0.07	0.06	500	1.5

N.D. means "Not Determined"

* g/tonne

Ore Type A - Sulphide Bearing, Ribbon-Banded Graphitic Quartzite

Predicted Metallurgy - Fine Grind

Product	Assays %				Distribution			
	Au*	Ag*	Pb	Zn	Au	Ag	Pb	Zn
Lead Concentrate	2.3	740	52.4	-	20.2	68.2	87.5	-
Zinc Concentrate	-	-	-	56.0	-	-	-	87.1

Lead Concentrate K_{80} 16 μm Zinc Concentrate K_{80} 18 μm

Predicted Metallurgy - Ultra Fine Grind

Product	Assays %				Distribution			
	Au*	Ag*	Pb	Zn	Au	Ag	Pb	Zn
Lead Concentrate	2.7	787	55.6	-	23.8	72.1	90.9	-
Zinc Concentrate	-	-	-	55.0	-	-	-	90.0

Lead Concentrate K_{80} 15 μm Zinc Concentrate K_{80} 16 μm

Approximate Chemical Composition of Concentrates

Product	Assays %									
	Au*	Ag*	Pb	Zn	Fe	Sb	Cd	As	Hg*	Insol
Lead Concentrate	2.5	775	54	10	6	0.25	N.D.	0.17	75	7.9
Zinc Concentrate	N.D.	N.D.	1	55	7	0.01	0.06	0.08	500	2.4

N.D. means "Not Determined" * g/tonne

Ore Type K - Carbonate Bearing Massive Pyritic Sulphides

Predicted Metallurgy - Fine Grind

Product	Assays %				Distribution			
	Au*	Ag*	Pb	Zn	Au	Ag	Pb	Zn
Lead Concentrate	4.9	600	56.1	-	39.2	74.0	86.4	-
Zinc Concentrate	-	-	-	54.2	-	-	-	79.0

Lead Concentrate K_{80} 17 μm

Zinc Concentrate K_{80} 14 μm

Approximate Chemical Composition of Concentrates

Product	Assays %									
	Au*	Ag*	Pb	Zn	Fe	Sb	Cd	As	Hg*	Insol
Lead Concentrate	4.9	600	56	6	10	0.30	N.D.	0.13	40	0.9
Zinc Concentrate	N.D.	N.D.	1	54	9	0.01	0.08	0.06	300	0.8

N.D. means "Not Determined"

* g/tonne

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APPENDICES

INTRODUCTION

The DY ore body lies 6 km to the south and east of the Grum Deposit on the Vangorda Plateau, Yukon Territory. Initial observations suggest that the deposit is formed of two mineralized lobes located in the same inclined plane and situated at a depth of between 600 - 900 m. Approximate reserves are 21 million tonnes at 12.3 percent combined lead and zinc with 85 g/tonne contained silver.

Exploratory drilling commenced in 1977 and continued through 1981 in attempts to delineate the deposit. Core originating from the exploratory work was used to provide material for this metallurgical program. In January of this year, Mr. L. P. Taggart, Manager of Feasibility and Development, requested that we perform a preliminary evaluation of the metallurgical response of the DY ores. The program objectives were to determine the probable metallurgical response of each of the five major ore types assuming treatment in the Cyprus Anvil Concentrator circuits.

The crushed core samples were composited by ore type having two grade groups for each lobe. Preliminary flotation tests were performed on these composites. Based on the results of these tests, it was concluded

that a very fine grind would be required to ensure good lead - zinc selectivity. Further the data indicated that there was little metallurgical difference between material from either lobe.

Having established that the various ore facies in each lobe responded in a similar fashion, new composites comprising all the available Zone III and IV material, were made up by grade (greater or less than 11% combined lead and zinc) and ore type. Very fine grind tests were then performed on these new composites to demonstrate an improved metallurgy would be obtained at a finer grind level and to estimate the base conditions for cycle test work.

The final stage in the test program involved the planning and execution of the cycle tests. Cycle testing was based on samples of average grade for each ore type.

Details concerning the samples used in this test program and their composites are provided in Appendix I.

ANALYSIS AND DISCUSSION OF RESULTS

In the program discussed below, a total of twenty eight tests were performed. These tests may be divided into three groups: Ten preliminary open circuit cleaner tests were performed to estimate approximate metallurgical response and to detect differences in response between material from the two mineralized lobes. Then ten more cleaner tests were carried out at very fine grind in preparation for the cycle tests. Finally the cycle tests were carried out at one or, in some cases, at two levels of primary grind.

A discussion of the response of the five ore types is shown below with references in the text to data contained in the appendices to this report. The appendices of interest are as follows:

Appendix II - Technical Details of Tests with Metallurgical Balances

Appendix III- Bond Work Index Data

Appendix IV - Cyclosizer Results

Appendix V - Special Assays on Cycle Test Products

It is important to note that the results shown below represent predicted behaviour under presently attainable conditions in the Cyprus Anvil Concentrator. No attempt has been made to optimize the grind level or the reagent balance for the DY ores.

Type G Ore - Baritic-Pyritic Sulphide

This ore type represents approximately 45 percent of the total DY ore reserve tonnage, and is in general of higher than average grade when compared to other ore facies. Type G ore, which is often closely associated with type K (carbonate type) forms, on a unit model basis, the high grade core of the deposit.

Typically type G ore is composed of masses of medium fine crystals of metal sulphides, predominantly pyrites, embedded in a barite matrix. The ore is soft and friable exhibiting a work index of 6 KwH/tonne.

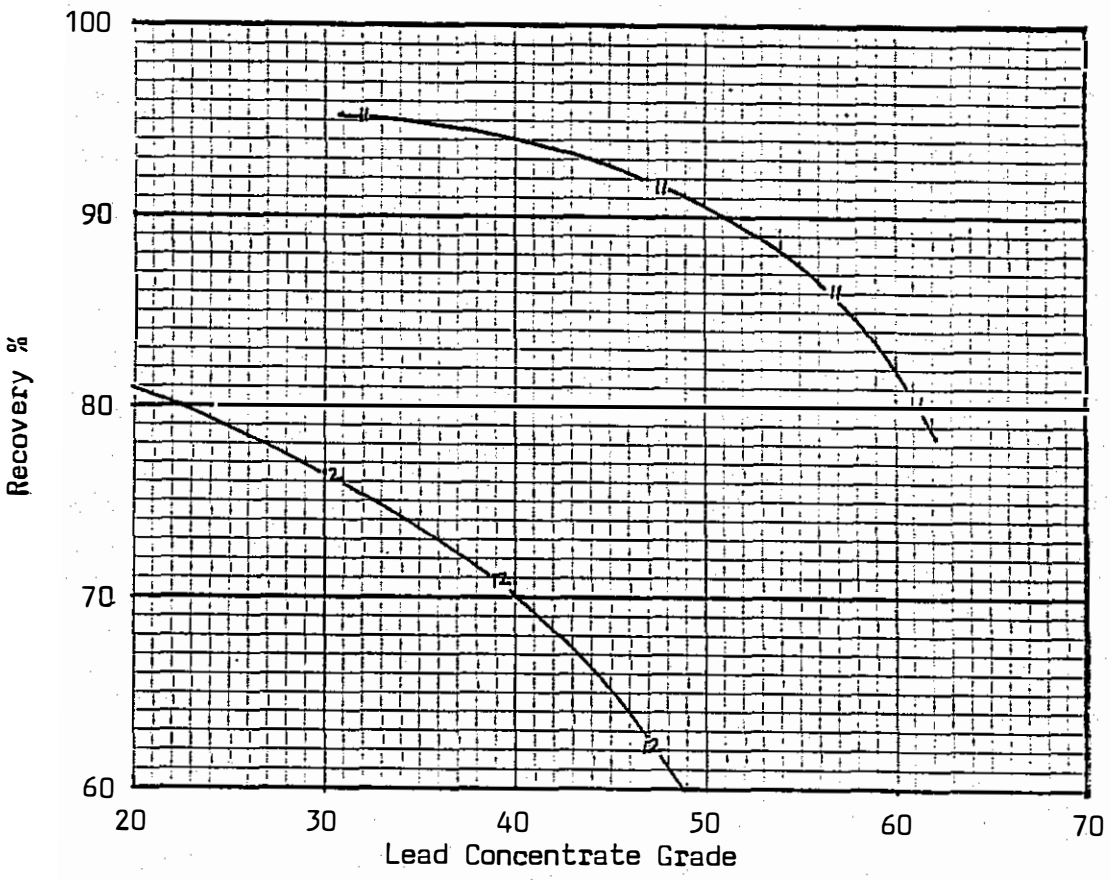
Preliminary Tests

Two open circuit cleaner tests were performed on the type G samples. The tests were carried out under near identical conditions at a very fine primary grind, approximating 40 μm K_{80}.

The results are shown below in Graph No. 1. As expected, the high grade sample yielded superior results which were manifested as improvements in recovery. Metal recoveries were good, but the displacement of zinc into the lead cleaner products, presumably as locked particles, significantly reduced lead concentrate grades. Despite multistage cleaning and fine regrinding, lead grades did not exceed 60% lead.

GRAPH NO. 1

Effect of Feed Grade Changes on Lead Metallurgy



Test	Sample Used	Assays %		Grind	
		Pb	Zn	Time (min)	K_{80} µm
11	4G > 11%	4.1	4.5	30	35
12	4G < 11%	8.1	9.1	30	35

Cycle Tests

Two cycle tests were carried out using a type G sample of average feed grade. The tests were performed at two grind levels approximating a flotation feed K_{80} of 40 and 30 μm respectively. Both tests reached equilibrium, although it should be noted that in test No. 17 there was some sample loss in cycle 2 due to the failure of a rod mill seal.

TABLE 1

Metallurgical Results - Test 17

Type G Ore - Average of Cycles 4 & 5

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	5.41	6.68	100.0	100.0
Lead	8.90	53.2	9.25	87.5	12.3
Zinc	9.25	0.92	58.1	1.6	80.4
Tails	81.85	0.72	0.60	10.9	7.3

TABLE 2

Metallurgical Results - Test 26

Type G Ore - Average of Cycles 4 & 5

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	6.11	6.30	100.0	100.0
Lead	8.78	60.5	6.90	86.5	9.6
Zinc	9.03	1.13	57.3	1.7	82.1
Tails	82.19	0.87	0.64	11.8	8.3

Comparison of the results from the two cycle tests indicated that recovery of lead improves only marginally between 40 μm and 30 μm. However, lead grade can be markedly improved by increased regrinding.

A marginal improvement in zinc metallurgy was noted with the finer grind. Possibly this is an indication that any further improvements in zinc recovery can accrue only be recovering some of the zinc misplaced in the lead concentrate. Since the zinc is probably in locked form, still finer lead regrinding (12 μm K_{80}) will be required.

Quality of Concentrates

The concentrates produced by type G ore were of good quality. Based on assays of concentrates from the last two cycles of the locked test, the data shown below was developed.

TABLE 3

Chemical Composition of Type G Concentrates

Product	Assays %									
	Au*	Ag*	Pb	Zn	Fe	Sb	Cd	As	Hg*	Insol
Lead Conc.	5	800	60	9	9	0.15	N.D.	0.1	60	2.1
Zinc Conc.	N.D.	N.D.	1	57	6	0.01	0.08	0.04	500	1.5

N.D. means "Not Determined" * g/tonne

The lead concentrate grade was reduced by zinc and iron mineral contamination. Available evidence suggests that the dilution is the result of extremely fine crystal intergrowths and this can only be reduced by still finer regrinding.

Gold and silver contained in the lead were both high, although gold recovery into the lead concentrate averaged less than 30%. Deleterious elements were not present in significant amounts.

The zinc concentrates were composed of pale brown sphalerite crystals which, it is estimated, contained about 5 percent fixed iron. No free iron minerals were observed. Lead in the zinc concentrates appeared to be the result of free lead minerals escaping into the zinc circuit.

Cadmium in the zinc concentrates was less than the usual payment threshold. Mercury in the concentrates was high at about 500 g/tonne. No other deleterious elements were observed.

Type E Ore - Massive Pyritic Sulphides

This ore type, which comprises about 20 percent of the DY reserve, consists of fine grained massive pyrites with complex intergrowths of lead and zinc sulphides. Type E ore forms a high sulphide envelope around the baritic core of the idealized deposit model and is above average grade.

Despite a finely crystalline character, type E ore is quite easy to grind and exhibits a work index of only 7 KwH/tonne.

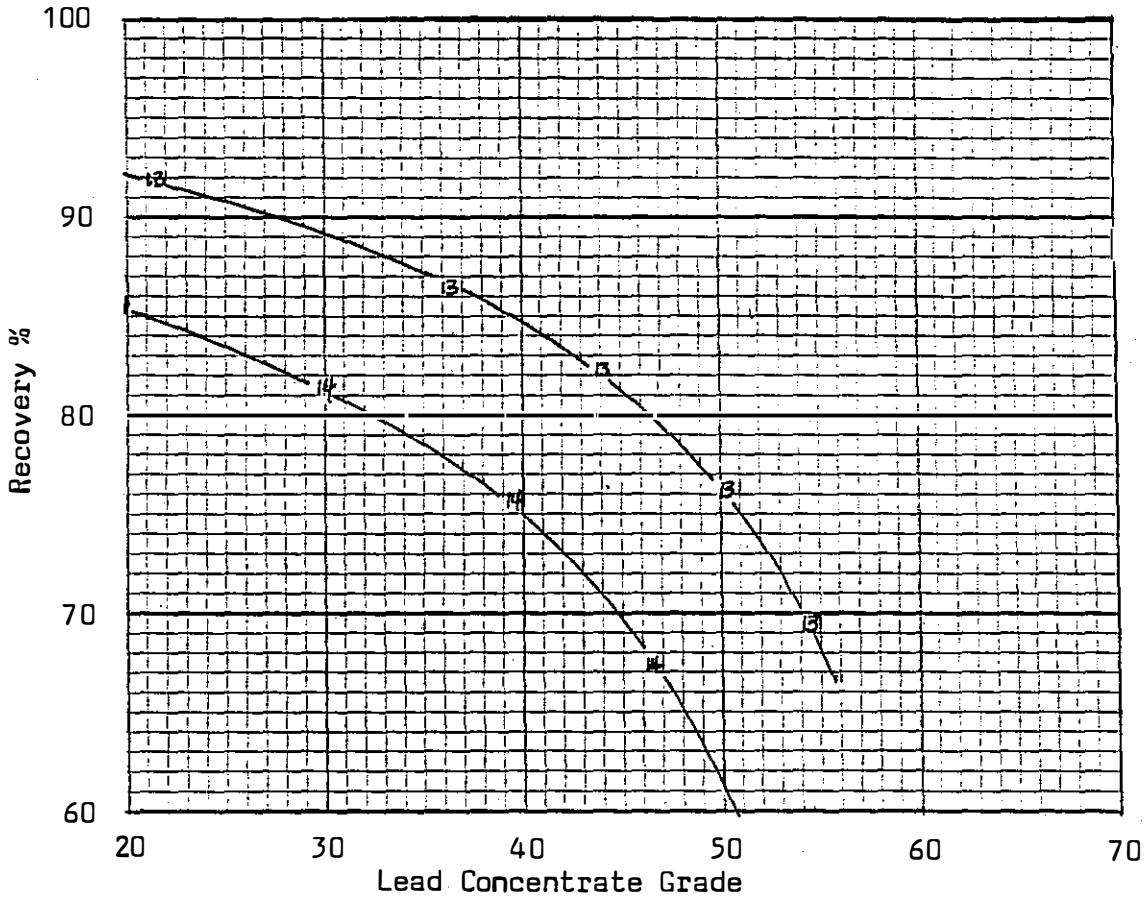
Preliminary Tests

Rather surprisingly, and despite a large difference in sample grades, the results from the two preliminary tests were quite similar. The relatively small differences in grade-recovery suggested that probably one of the test pair was in some way atypical. Assessment of the metallurgical performance of this ore type was hindered by the rather unusual lead-zinc ratio in the samples treated.

Lead recoveries in the roughing stages were close to 90 percent. Attempts to improve recoveries beyond this level resulted in very strong iron flotation. Lead concentrate grades were most difficult to achieve without large recovery sacrifices.

GRAPH NO. 2

Effect of Feed Grade Changes on Lead Metallurgy



Test	Sample Used	Assays %		Grind	
		Pb	Zn	Time (min)	K_{80} µm
13	4E > 11%	8.0	9.5	30	40
14	4E < 11%	4.4	3.7	30	40

Cycle Tests

Two cycle tests were performed on samples of average grade type E material. The tests were conducted at two grind levels but with constant regrinding conditions. Both tests stabilized quite slowly, due to the very high circulating loads encountered. Test No. 18 was continued to six cycles to ensure equilibrium.

TABLE 4

Metallurgical Results - Test 18

Type E Ore - Average of Cycles 5 & 6

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	6.06	6.45	100.0	100.0
Lead	10.43	49.7	9.90	85.4	15.9
Zinc	8.81	3.34	56.8	4.9	77.5
Tails	80.76	0.73	0.53	9.7	6.6

TABLE 5

Metallurgical Results - Test 27

Type E Ore - Average of Cycles 4 & 5

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	5.66	5.93	100.0	100.0
Lead	9.97	51.9	6.70	91.4	7.9
Zinc	9.32	0.97	55.7	1.6	87.4
Tails	80.72	0.51	0.35	7.0	4.7

A comparison of data from the two tests indicated that much improved selectivity was the result in increasing the fineness of primary grind from 40 μm K_{80} to 35 μm K_{80}. Despite the improved results at the finer grind, probably even better results could be expected by regrinding the lead rougher concentrates still further.

The zinc circuit, which was influenced by the large circulating loads of sulphides, might also benefit from finer regrinding of rougher concentrates.

Quality of Concentrates

Predictably, the concentrates from the massive sulphide ore suffered from iron mineral contamination, especially in the lead concentrates. Microscopic studies suggest that some of the iron minerals in the lead are present as free pyrite crystals.

TABLE 6

Chemical Composition of Type E Concentrates

Product	Assays %									
	Au*	Ag*	Pb	Zn	Fe	Sb	Cd	As	Hg*	Insol
Lead Conc.	7.0	725	50	5	12	0.23	N.D.	0.19	90	1.1
Zinc Conc.	N.D.	N.D.	1	56	7	0.02	0.08	0.08	500	0.4

N.D. means "Not Determined" * g/tonne

Gold and silver concentrations in the lead were high with gold recovery in excess of 40% and silver recovery in the 80% range. Lead concentrates appeared to contain more deleterious elements than is usual, with mercury, arsenic and antimony all showing relatively high values.

Zinc concentrates contained some free pyrite granules and lead crystals but, overall, concentrate grade was good averaging 56% zinc. Mercury in the zinc concentrates was high at 500 g/tonne.

Type DC Ore - Pyritic Quartzite

The pyritic quartzites are finely crystalline in texture with variable quantities of muscovite and highly variable lead-zinc mineral contents. The principal sulphide is pyrite which occurs with the other sulphides. The pyrite quartzites form a mineralized layer encompassing the type G and type E core and compose about 15 percent of the total ore reserve. Despite their quartzitic nature, they exhibit a work index of only 9 KwH/tonne.

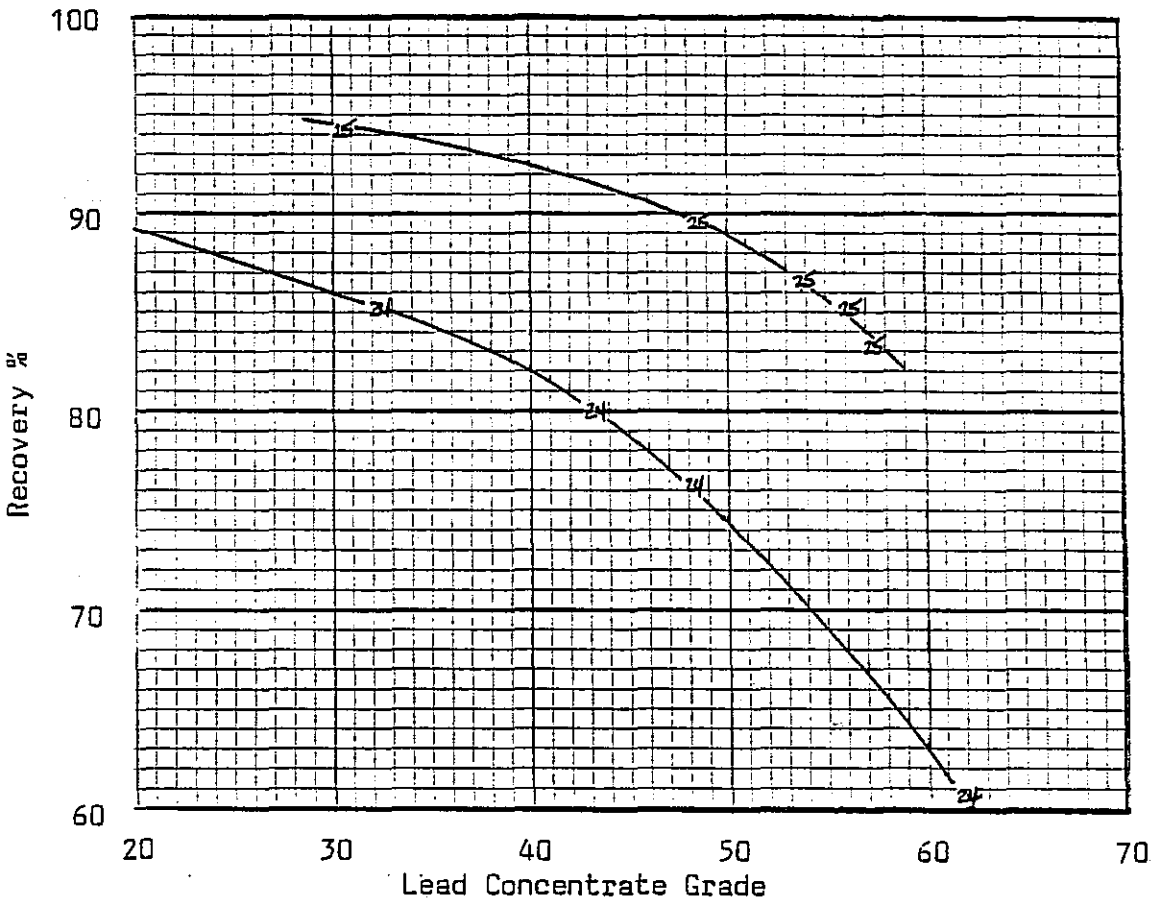
Preliminary Tests

Lead recoveries were high for both samples, but predictably, lead concentrate grades did not exceed the 60% grade barrier. Strong flotation of iron and zinc with the lead minerals was further complicated by the flotation of non-sulphide middlings.

The lack of mineral selectivity was again attributed to complex mineral intergrowths.

GRAPH NO. 3

Effect of Feed Grade Changes on Lead Metallurgy



Test	Sample Used	Assays %		Grind	
		Pb	Zn	Time (min)	K_{80} µm
24	4DC <11%	4.0	5.0	30	40
25	4DC >11%	6.7	10.1	30	40

Cycle Test

Only one cycle test was performed on this ore type. The results indicated rapid stabilization and that good metallurgy could be obtained, despite the complex nature of the ore type.

TABLE 7

Metallurgical Results - Test 19

Type DC Ore - Average of Cycles 4 & 5

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	4.86	7.86	100.0	100.0
Lead	8.02	55.4	9.90	91.3	10.1
Zinc	12.49	1.07	55.9	2.7	87.1
Tails	79.69	0.37	0.25	6.0	2.5

The test, once stabilized, showed relatively small circulating loads in the lead and zinc circuits. Flotation was rapid and good end points were observed on all stages of flotation. Consensus was that finer lead regrinding would greatly assist the attainment of higher concentrate grades and improved zinc recovery.

Quality of Concentrates

The lead concentrates produced by type DC were heavily contaminated by iron and zinc minerals. A significant proportion of these contaminants appeared to be as locked particles with other sulphides, or with silica grains.

The gold and silver concentrations in the lead were relatively good with recoveries of about 70% and 30% respectively. Arsenic, antimony and mercury levels were close to those recorded for the pyritic ore concentrates.

TABLE 8

Chemical Composition of Type DC Concentrates

Product	Assays %									
	Au*	Ag*	Pb	Zn	Fe	Sb	Cd	As	Hg*	Insol
Lead Conc.	3.9	740	55	10	9	0.16	N.D.	0.31	80	2.3
Zinc Conc.	N.D.	N.D.	1	56	7	0.01	0.07	0.06	500	1.5

N.D. means "Not Determined" * g/tonne

The zinc concentrates were of good grade with some minor pyrite and galena contamination. Mercury was present at the 500 g/tonne level but other deleterious element concentrations were inconsequential.

Type A Ore - Graphitic Quartzites

This ore type which tends to be peripheral to the major ore zones and may be considered as mineralized contact material is composed of thinly banded quartzites interladen with sulphides which bear the lead-zinc minerals. Graphite, which occurs with the silica bands is usually visible as a grey-black layer. Principally because of the silica content, this ore is resistant to grinding, exhibiting a work index of 12 KwH/tonne.

Type A ore is usually somewhat lower in grade than the average for the deposit and comprises about 7 percent of the total reserve.

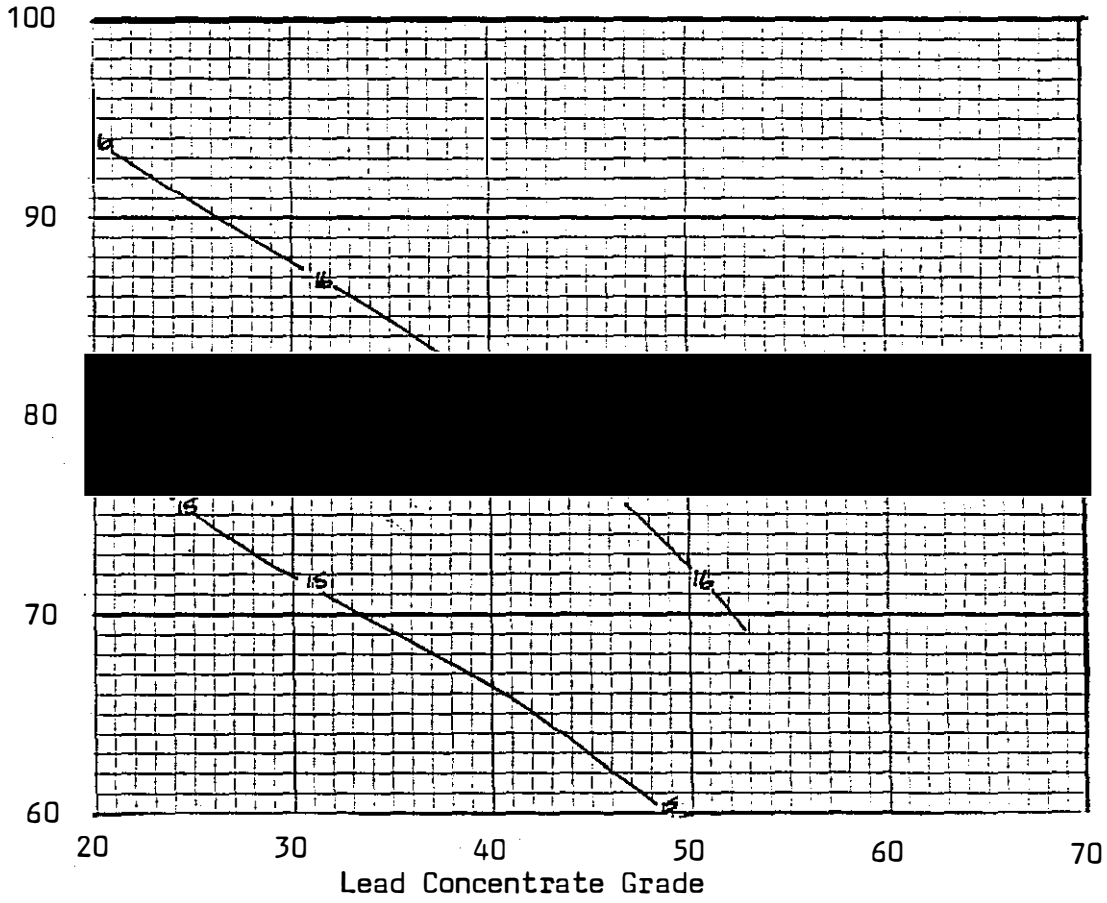
Preliminary Tests

The two preliminary tests showed that good lead concentrate grade would be difficult to achieve despite large recovery sacrifices. The difference in response between the high and the lower grade samples was somewhat less than expected.

The flotation was dominated by the graphite present where large quantities of reagents were adsorbed and froth control was difficult throughout lead flotation. Very few problems were encountered in zinc flotation since most of the graphite had been removed in the lead flotation stage.

GRAPH NO. 4

Effect of Feed Grade Changes on Lead Metallurgy



Test	Sample Used	Assays %		Grind	
		Pb	Zn	Time (min)	K_{80} µm
15	4A < 11%	2.9	5.0	30	40
16	4A > 11%	6.0	12.0	30	40

Cycle Tests

Two cycle tests were performed on this ore type at two grind levels. The results of the last two cycles of each test are shown below.

TABLE 9

Metallurgical Results - Test 20

Type A Ore - Average of Cycles 4 & 5

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	4.24	8.45	100.0	100.0
Lead	7.09	52.4	10.4	87.5	8.7
Zinc	13.15	0.77	56.0	2.4	87.1
Tails	79.76	0.53	0.44	10.1	4.2

TABLE 10

Metallurgical Results - Test 28

Type A Ore - Average of Cycles 4 & 5

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	4.08	8.52	100.0	100.0
Lead	6.69	55.6	9.6	90.9	7.5
Zinc	13.94	0.67	55.0	2.3	90.0
Tails	79.37	0.35	0.27	6.8	2.5

Both tests stabilized quite rapidly, although the graphite flotation caused significant problems in the manipulation of the lead cleaner stages. The finer grinding did result in some metallurgical improvements over the range 45 μm K_{80} to 35 μm K_{80}. However, probably the same order of improvement could be expected by increased regrinding of the lead-rougher concentrates.

Quality of Concentrates

The lead concentrates were contaminated with zinc, and to a lesser extent iron minerals which appeared to be associated with the graphite-quartzite. The non-sulphide component of the concentrate was significant at about 8%.

Since the insoluble component is the principal problem in graphitic quartzite flotation a sample of lead concentrate was cyclosized and the fractions assayed.

TABLE 11

Distribution of Metals in Lead Concentrate

Size Range	Weight	Assays %			
μm	%	Pb	Zn	Fe	Insol
+31.2	1.9	45.8	12.9	10.6	1.6
-31.2 +21.9	5.5	42.9	15.8	10.5	2.5
-21.9 +15.2	14.0	44.8	15.4	8.6	3.7
-15.2 +10.6	18.3	47.0	14.4	7.3	5.6
-10.6 +8.3	13.0	50.2	11.8	5.9	7.6
-8.3	47.3	55.6	6.0	3.5	13.9

NOTES: Data from cyclosized fractions, including under size, from lead concentrate, cycles 4 and 5, Test 20.

It is apparent that, after allowing for the very obvious differences in mineral densities, the non-sulphide is concentrated in the ultra-fine ranges. Also, the relatively constant lead-zinc-iron ratios tend to indicate middling particles in the coarser sizes.

TABLE 12

Chemical Composition of Type A Concentrates

Product	Assays %									
	Au*	Ag*	Pb	Zn	Fe	Sb	Cd	As	Hg*	Insol
Lead Conc.	2.5	775	54	10	6	0.25	N.D.	0.17	75	7.9
Zinc Conc.	N.D.	N.D.	1	55	7	0.01	0.06	0.08	500	2.4

N.D. means "Not Determined

* g/tonne

slightly elevated levels. Gold and silver contents were similar to these exhibited by type DC ores. In general precious metal recoveries were fractionally lower when compared to typical pyritic quartzite response.

The zinc concentrates produced contain fractionally more non-sulphides. Mercury remains constant at the 500 g/tonne level.

Type K Ore - Carbonate Bearing Massive Pyritic Sulphides

Type K is a general classification covering mineralized carbonates in which, typically, the lead content is greater than the zinc content. Pyrite is the predominant mineral specie although some lead and zinc minerals are visible. The carbonates appear as a grey-brown non-sulphide. This relatively rare ore type which constitutes only 5 percent of the present DY reserve is usually found in association with the baritic type G.

Despite the significant carbonate mineral content, the work index is only about 7.5 KwH/tonne - about average for the DY deposit.

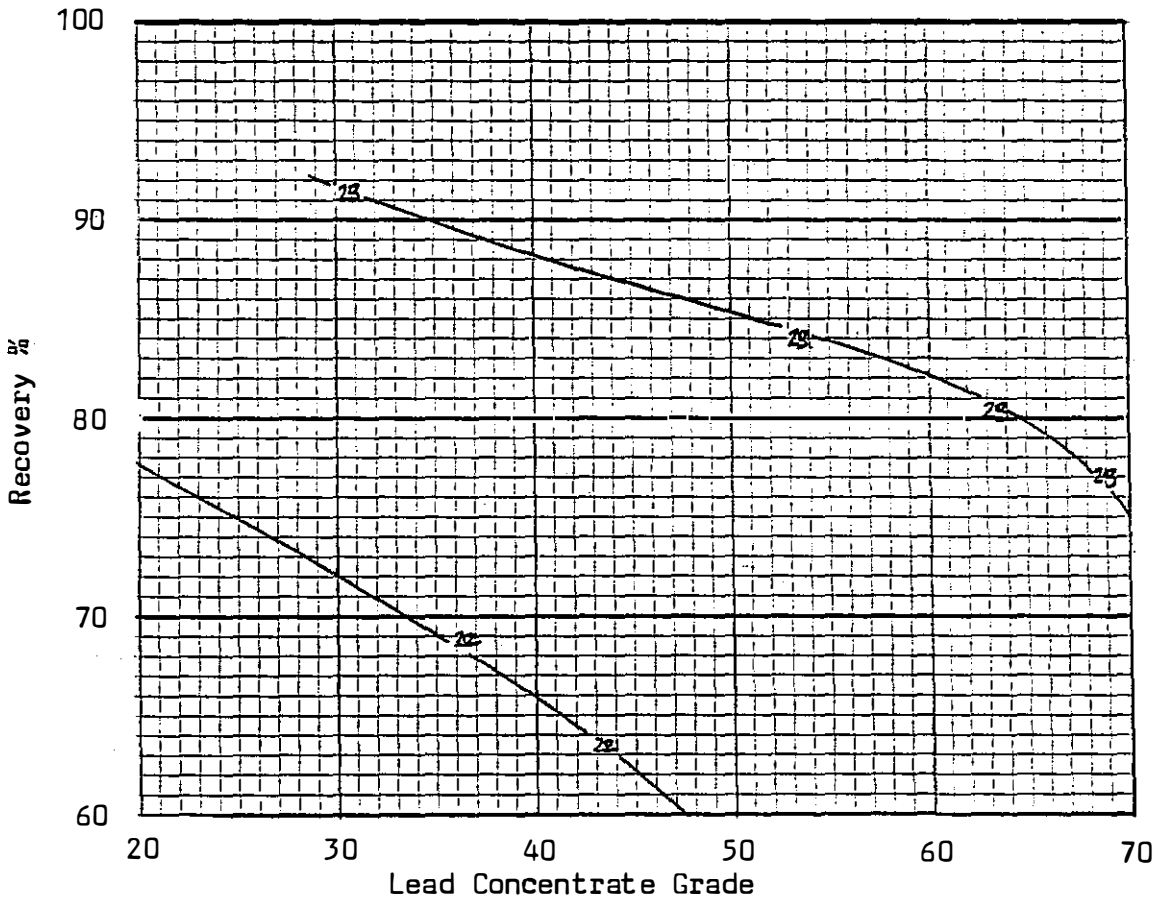
Preliminary Tests

The unusual lead-zinc ratio in these samples helped to ensure well above average lead concentrate grades and recoveries. Naturally with this type of lead-zinc ratio, zinc metallurgy tends to suffer.

From a flotation view point, the iron in the samples was most active and considerable care was required to avoid massive pyrite flotation.

GRAPH NO. 5

Effect of Feed Grade Changes on Lead Metallurgy



Test	Sample Used	Assays %		Grind	
		Pb	Zn	Time (min)	K_{80} µm
22	4K < 11%	4.4	3.3	30	35
23	4K > 11%	9.0	6.0	30	35

Cycle Tests

Because of the minor occurence of the ore type only one cycle test was performed. The results were predictable: Good lead concentrate grades and recoveries and relatively poor zinc recoveries reflecting the unusual lead-zinc ratio in the feed.

TABLE 12

Metallurgical Results - Test 21

Type K Ore - Average of Cycles 4 & 5

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	6.42	4.22	100.0	100.0
Lead	9.89	56.1	5.53	86.4	13.0
Zinc	6.16	1.13	54.2	1.1	79.0
Tails	83.96	0.96	0.41	12.5	8.0

Test equilibrium was reached after three cycles, however, lead recovery and grade were lower then expected. Again, lead regrinding would probably greatly improve overall metallurgy.

Quality of Concentrates

The lead concentrates contained appreciable free pyrite and some sphalerite. Possibly this reflects entrainment due to the volume of mineral rapidly floating in the lead circuit.

Gold and silver contents in the concentrates were good, although the silver concentration was the lowest recorded for any DY ore type. Gold recovery was 40% while silver recovery was only 75%. Probably the low silver recovery indicates the presence of a second major silver bearing phase in type K ores.

TABLE 13

Chemical Composition of Type K Concentrates

Product	Assays %									
	Au*	Ag*	Pb	Zn	Fe	Sb	Cd	As	Hg*	Insol
Lead Conc.	4.9	600	56	6	10	0.30	N.D.	0.13	40	0.9
Zinc Conc.	N.D.	N.D.	1	54	9	0.01	0.08	0.06	300	0.8

N.D. means "Not Determined" * g/tonne

The zinc concentrates contained abundant free pyrite which could be the result of less than ideal test conditions. Mercury in the zinc concentrates was low at 300 g/tonne raising speculation that the mercury and silver in the zinc lattice may be related.

APPENDIX I

DETAILS OF SAMPLES USED IN TEST PROGRAMS

To provide an accurate record of the samples used in this program, the following descriptions of ore type and drill intercept tag numbers were provided by Dr. D. S. Jennings of Cyprus Anvil Mines. They are shown below in Table I - 1 and Table I - 2.

TABLE I - 1

Geological Descriptions of Ore Types

Ore Type	Description
4A	Dark grey to black, laminarly to thinly banded, sulfide bearing graphitic quartzites characterised by alternating siliceous graphitic pelite (shale) and variably pyritic quartz-sulfide (ZnS, PbS) layers.
4CD	Light grey, finely crystalline, variably muscovitic pyritic quartzites with highly variable PbS - ZnS content.
4E	Massive, finely to medium crystalline, commonly banded, variably porous (carbonate-bearing) pyritic sulfides.
4G	Light grey, fine to medium crystalline, variably pyritic baritic sulfides usually with high (10%) ZnS and PbS content.
4K	Massive pyritic sulfides with coarsely crystalline patches of cream to tan ferroan carbonate (ankerite to siderite) of either primary or secondary origin.

TABLE I - 2

Sample Numbers, Ore Zones and Ore Types

Combined Lead - Zinc Values

Zone III

Facies	5 - 7	7 - 9	9 - 11	11 - 13	13 - 15	15 - 17	17 - 19	19+
4A	2635	2631 2581	2634 0723	2735 2501		2637		2646
4CD	2639 2717	2847 0726	2812 0725	2848 2814	2652 2710	2744	2653 2746	2750
4E	2815	2706				2655 2845	2742	2740
4G	2644	2810	2648 2811		2650 2808 2846	2643	2737	2642

Zone IV

Facies	5 - 7	7 - 9	9 - 11	11 - 13	13 - 15	15 - 17	17 - 19	19+
4A	0340 1761	3397 1905	2001 2685	1749	1251			
4CD	1266 1972	0323 1883	0387	3391		1798* 2006*		
4E	0335 1786	1262 1789	0331 1879	1253* 2007*	3386			1995
4G	1682 2028	0452 1752	0339 1895	1143 5149	0326 1787	0347 1771	1653	0329 1778
4K	1260 3135	0309	1142 3133	1841	3100	1259 1843	1842	

* Small Sample

Because of problems with sample size only two sample ranges were considered for each ore zone: Less than 11 percent combined lead-zinc and more than 11 percent combined lead-zinc. These composites were made up for both Zone III and Zone IV and assayed, the results are shown below in Table I - 3 and Table I - 4. Finally after preliminary testing had showed that for the same ore species, response from Zone III and Zone IV was similar, new composites of material from both zones were made up and assayed, the results are shown in Table I - 5. Additional samples for cycle tests were formed by mixing equal amounts of both grade groups for each ore specie (Table I - 6).

TABLE I - 3

Composition of Samples by Type and Ore Zone

Zone III

Ore Type	Assays %					
	Pb	Zn	Fe	Cu	Ag*	Po
4G Less than 11	2.4	5.7	16.3	0.01	33	1.3
4G Greater than 11	5.0	11.5	15.2	0.03	85	3.5
4E Greater than 11	8.3	9.9	23.1	0.08	122	4.0
4A Less than 11	3.4	5.7	6.6	0.04	52	1.2
4A Greater than 11	6.0	12.0	9.1	0.07	95	2.3
4DC Less than 11	4.0	5.4	16.0	0.08	62	2.6
4DC Greater than 11	6.5	10.7	10.6	0.06	89	1.5

* grams/tonne

TABLE I - 4

Composition of Samples by Type and Ore Zone

Zone IV

Ore Type	Assays %					
	Pb	Zn	Fe	Cu	Ag*	Po
4G Less than 11	4.0	4.4	27.2	0.19	54	5.0
4G Greater than 11	9.5	8.0	19.0	0.09	119	5.3
4E Less than 11	4.4	3.9	36.5	0.23	61	4.2
4E Greater than 11	5.6	7.5	30.7	0.13	77	2.1
4A Less than 11	2.5	4.8	8.9	0.05	36	2.1
4DC Less than 11	3.5	3.8	27.3	0.18	45	7.6
4DC Greater than 11	6.9	8.0	17.1	0.06	90	5.5
4K Less than 11	4.4	3.3	35.3	0.22	55	10.4
4K Greater than 11	9.0	6.0	25.5	0.10	95	10.0

* grams/tonne

TABLE I - 5

Composition of Samples Used in

Tests 10 - 16 and 22 - 25 Inclusive

Ore Type	Assays %		
	Pb	Zn	Fe
4G Less than 11	4.1	4.5	25.5
4G Greater than 11	8.1	9.1	18.4
4E Less than 11	4.4	3.7	36.5
4E Greater than 11	8.0	9.5	24.0
4A Less than 11	2.9	5.0	8.2
4A Greater than 11	6.0	12.0	9.1
4DC Less than 11	4.0	5.0	17.2
4DC Greater than 11	6.7	10.1	12.4
4K Less than 11	4.4	3.3	35.3
4K Greater than 11	9.0	6.0	25.5

NOTE: These samples are a composite of Zone III and IV where applicable.

TABLE I - 6

Approximate Composition of Samples Used in Cycle Tests

Ore Type	Assays %		
	Pb	Zn	Fe
4G	6.1	6.8	22.0
4E	6.2	6.6	30.3
4A	4.5	8.5	8.7
4DC	5.4	7.6	14.8
4K	6.7	4.7	30.4

NOTE: These samples were made up by mixing equal amounts of the two grade groups for each ore species. Samples were not assayed - data shown above derived by averaging.

APPENDIX II

TECHNICAL DETAILS OF TESTS 1 - 28 INCLUSIVE

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

Note that, in the FEED description "+ve or -ve 11%" represents greater or less than 11% combined lead and zinc.

KM076

TEST NO. 1

PURPOSE: Preliminary Evaluation

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: 1 kg. Type 4DC "+ve 11%" Zone IV

GRIND: 10 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				10				9.6
Lead Conditioning			30				5		9.6	9.6
Lead Ro/Sc			70					10	9.6	9.3
Lead Regrind	1000	200				15				10.3
Lead 1st Cleaner			60				2	8	10.3	10.0
Lead 2nd Cleaner			30				2	5	9.6	9.2
Lead 3rd Cleaner			10				2	4	10.1	9.9
Lead 4th Cleaner			-				2	3	10.0	9.9
Zinc Conditioning				500			10		11.0	11.0
Zinc Ro/Sc			50					8	11.0	11.0
Zinc Regrind				200	1000	10				11.7
Zinc 1st Cleaner			40				2	6	11.7	11.4
Zinc 2nd Cleaner			20				2	4	11.8	11.5
Zinc 3rd Cleaner			10				2	3	12.3	12.1
Zinc 4th Cleaner			-				2	2	12.3	12.1

Test No. 1

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	11.65	47.60	14.20			83.77	20.61		
Pb Cleaner Tails 4	0.85	15.00	19.80			1.92	2.09		
Pb Cleaner Tails 3	1.45	10.00	19.30			2.19	3.49		
Pb Cleaner Tails 2	1.85	5.06	18.20			1.41	4.20		
Pb Cleaner Tails 1	13.66	1.62	16.50			3.34	28.09		
Zn Cleaner Conc. 4	5.74	2.00	47.30			1.73	33.82		
Zn Cleaner Tails 4	0.78	2.13	18.90			0.25	1.83		
Zn Cleaner Tails 3	1.30	1.70	9.41			0.33	1.53		
Zn Cleaner Tails 2	2.91	1.26	2.82			0.55	1.02		
Zn Cleaner Tails 1	10.09	0.83	1.06			1.26	1.33		
Tails	49.73	0.43	0.32			3.23	1.98		
Calculated Head	100.00	6.62	8.02			100.00	100.00		

KM076

TEST NO. 2

PURPOSE: Preliminary Evaluation

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: 1 kg. Type 4DC "-ve 11%" Zone IV

GRIND: 10 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				10				8.6
Lead Conditioning	x		30				5		9.6	9.6
Lead Ro/Sc			20					8	9.6	9.1
Lead Regrind	1000	200				10				10.5
Lead 1st Cleaner			20				2	7	10.5	9.9
Lead 2nd Cleaner			10				2	5	10.4	9.9
Lead 3rd Cleaner			-				2	4	10.4	10.0
Lead 4th Cleaner			-				2	3	10.4	10.2
Zinc Conditioning				500			10		11.0	11.0
Zinc Ro/Sc			30					4	11.0	11.0
Zinc Regrind				200	1000	10				
Zinc 1st Cleaner			40				2	2	11.6	11.5
Zinc 2nd Cleaner			20				2	2	12.0	11.9
Zinc 3rd Cleaner			10				2	2	11.9	11.8
Zinc 4th Cleaner			-				2	2	12.1	12.0

Test No. 2

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	4.34	44.50	7.10			59.75	8.53		
Pb Cleaner Tails 4	2.60	12.40	7.60			9.95	5.46		
Pb Cleaner Tails 3	1.09	10.80	6.10			3.63	1.83		
Pb Cleaner Tails 2	2.72	5.16	5.69			4.34	4.29		
Pb Cleaner Tails 1	13.79	1.35	3.60			5.76	13.73		
Zn Cleaner Conc. 4	3.00	1.20	48.90			1.11	40.53		
Zn Cleaner Tails 4	0.63	1.92	23.80			0.38	4.17		
Zn Cleaner Tails 3	0.92	2.08	15.30			0.59	3.87		
Zn Cleaner Tails 2	2.11	1.85	8.60			1.21	5.02		
Zn Cleaner Tails 1	4.47	1.26	2.68			1.74	3.32		
Tails	64.34	0.58	0.52			11.54	9.26		
Calculated Head	100.00	3.23	3.61			100.00	100.00		

KM076

TEST NO. 3

PURPOSE: Preliminary Evaluation

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: 1 kg. Type 4E "-ve 11%" Zone IV

GRIND: 10 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				10				8.5
Lead Conditioning	1000		30				5		9.4	9.4
Lead Ro/Sc			40					6	9.4	9.4
Lead Regrind	1000	200				10				10.4
Lead 1st Cleaner			30				2	6	10.4	10.0
Lead 2nd Cleaner			20				2	4	10.4	10.2
Lead 3rd Cleaner			10				2	3	10.4	10.0
Lead 4th Cleaner			-				2	2	10.4	10.2
Zinc Conditioning				500			10		11.5	11.0
Zinc Ro/Sc			30					6	11.0	11.0
Zinc Regrind				200	1000	10				11.6
Zinc 1st Cleaner			40				2	5	11.6	11.3
Zinc 2nd Cleaner			20				2	4	11.8	11.7
Zinc 3rd Cleaner			10				2	3	12.0	11.9
Zinc 4th Cleaner			-				2	3	12.2	12.1

Test No. 3

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	3.97	52.70	5.18			49.34	5.41		
Pb Cleaner Tails 4	1.77	20.00	6.60			8.35	3.07		
Pb Cleaner Tails 3	4.90	14.80	5.65			17.12	7.29		
Pb Cleaner Tails 2	3.59	4.78	4.30			4.05	4.06		
Pb Cleaner Tails 1	11.27	1.32	3.38			3.51	10.04		
Zn Cleaner Conc. 4	4.32	2.60	47.90			2.65	54.46		
Zn Cleaner Tails 4	0.65	4.52	14.30			0.69	2.45		
Zn Cleaner Tails 3	0.62	5.27	10.80			0.77	1.76		
Zn Cleaner Tails 2	1.73	3.62	4.50			1.48	2.06		
Zn Cleaner Tails 1	11.83	1.50	1.33			4.19	4.15		
Tails	55.36	0.60	0.36			7.84	5.25		
Calculated Head	100.00	4.24	3.80			100.00	100.00		

KM1076

TEST NO. 4

PURPOSE: Preliminary Evaluation

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: 1 kg. Type 4A "-ve 11%" Zone IV

GRIND: 10 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				10				9.7
Lead Conditioning			30				5		9.7	9.7
Lead Ro/Sc			50					10	9.7	9.5
Lead Regrind	1000	200				10				10.4
Lead 1st Cleaner			30				2	5	10.4	10.3
Lead 2nd Cleaner			20				2	4	10.4	10.4
Lead 3rd Cleaner			10				2	3	10.4	10.4
Lead 4th Cleaner			-							
Zinc Conditioning				500			10		11.3	11.0
Zinc Ro/Sc			50				2	7	11.0	11.0
Zinc Regrind						10				11.7
Zinc 1st Cleaner			40				2	5	11.7	11.7
Zinc 2nd Cleaner			20				2	4	11.9	11.8
Zinc 3rd Cleaner			10				2	3	12.0	12.0
Zinc 4th Cleaner			-				2	2	12.2	12.2

Test No. 4

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	4.14	34.80	7.50			58.46	6.34		
Pb Cleaner Tails 4	0.90	9.10	8.35			3.33	1.54		
Pb Cleaner Tails 3	0.98	4.95	6.35			1.96	1.26		
Pb Cleaner Tails 2	11.25	3.08	6.80			14.05	15.61		
Pb Cleaner Tails 1	8.43	1.37	6.40			4.68	11.00		
Zn Cleaner Conc. 4	5.82	1.62	45.70			3.82	54.24		
Zn Cleaner Tails 4	0.98	2.01	12.80			0.80	2.57		
Zn Cleaner Tails 3	1.44	1.80	6.78			1.05	1.99		
Zn Cleaner Tails 2	2.95	0.77	1.33			0.92	0.80		
Zn Cleaner Tails 1	17.05	0.42	0.50			2.90	1.74		
Tails	46.05	0.43	0.31			8.03	2.91		
Calculated Head	100.00	2.47	4.90			100.00	100.00		

KM076

TEST NO. 5

PURPOSE: Preliminary Evaluation

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: 1 kg. Type 4G "-ve 11%" Zone IV

GRIND: 15 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				15				9.6
Lead Conditioning			30				5		9.6	9.6
Lead Ro/Sc			70					10	9.6	9.2
Lead Regrind	1000	200				15				10.3
Lead 1st Cleaner			30				2	7	10.3	10.0
Lead 2nd Cleaner			20				2	4	10.3	10.1
Lead 3rd Cleaner			10				2	3	10.3	10.1
Lead 4th Cleaner			-				2	2	10.3	10.2
Zinc Conditioning				500			10		11.0	11.3
Zinc Ro/Sc			70				2	8	11.3	11.0
Zinc Regrind				200	1000	15				11.8
Zinc 1st Cleaner			40				2	5	11.8	11.7
Zinc 2nd Cleaner			20				2	4	11.9	11.8
Zinc 3rd Cleaner			10				2	3	12.0	11.9
Zinc 4th Cleaner			-				2	3	12.2	12.1

Test No. 5

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	7.88	39.60	7.24			80.82	15.67		
Pb Cleaner Tails 4	1.61	5.95	6.76			2.49	3.00		
Pb Cleaner Tails 3	0.90	5.53	8.20			1.29	2.03		
Pb Cleaner Tails 2	3.91	2.74	8.62			2.77	9.26		
Pb Cleaner Tails 1	9.55	1.30	7.95			3.22	20.86		
Zn Cleaner Conc. 4	2.75	1.36	49.90			0.97	37.69		
Zn Cleaner Tails 4	0.59	1.98	12.90			0.30	2.11		
Zn Cleaner Tails 3	0.60	1.96	8.70			0.31	1.44		
Zn Cleaner Tails 2	1.61	1.28	2.70			0.54	1.20		
Zn Cleaner Tails 1	21.14	0.49	0.53			2.68	3.08		
Tails	49.46	0.36	0.27			4.61	3.67		
Calculated Head	100.00	3.86	3.64			100.00	100.00		

KM1076

TEST NO. 6

PURPOSE: Preliminary Evaluation

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: 1 kg. Type 4G "+ve 11%" Zone IV

GRIND: 15 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				15				9.5
Lead Conditioning			30				5		9.5	9.5
Lead Ro/Sc			40					10	9.5	9.3
Lead Regrind	1000	200				15				10.3
Lead 1st Cleaner			30				2	6	10.3	10.1
Lead 2nd Cleaner			20				2	4	10.3	10.2
Lead 3rd Cleaner			10				2	3	10.4	10.2
Lead 4th Cleaner			-				2	2	10.4	10.3
Zinc Conditioning				500			10		11.0	11.4
Zinc Ro/Sc			70				2	8	11.4	11.0
Zinc Regrind				200	1000	15				11.6
Zinc 1st Cleaner			50				2	5	11.5	11.3
Zinc 2nd Cleaner			20				2	4	11.7	11.6
Zinc 3rd Cleaner			10				2	3	11.9	11.9
Zinc 4th Cleaner			-				2	3	12.1	12.1

Test No. 6

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	12.70	58.20	9.30			80.88	14.81		
Pb Cleaner Tails 4	2.10	19.80	15.90			4.55	4.19		
Pb Cleaner Tails 3	2.19	11.00	15.80			2.64	4.35		
Pb Cleaner Tails 2	3.63	6.60	13.40			2.62	6.10		
Pb Cleaner Tails 1	9.67	3.17	12.00			3.35	14.55		
Zn Cleaner Conc. 4	7.43	1.78	53.10			1.45	49.45		
Zn Cleaner Tails 4	0.34	3.58	18.90			0.13	0.81		
Zn Cleaner Tails 3	0.46	3.51	11.90			0.18	0.69		
Zn Cleaner Tails 2	1.66	2.18	4.45			0.40	0.92		
Zn Cleaner Tails 1	17.10	0.88	1.18			1.65	2.53		
Tails	42.72	0.46	0.30			2.15	1.61		
Calculated Head	100.00	9.14	7.98			100.00	100.00		

KM076

TEST NO. 7

PURPOSE: Preliminary Test on New Sample Type

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: 1 kg. Type 4K "-ve 11%" Zone IV

GRIND: 10 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				10				9.3
Lead Conditioning			30				5		9.6	9.6
Lead Ro/Sc			70					7	9.6	9.2
Lead Regrind	1000	200				15				11.0
Lead 1st Cleaner			30				2	7	11.0	11.0
Lead 2nd Cleaner			20				2	5	10.4	10.2
Lead 3rd Cleaner			10				2	4	10.4	10.2
Lead 4th Cleaner			10				2	3	10.4	10.3
Zinc Conditioning				500			10		11.4	11.3
Zinc Ro/Sc			60				2	7	11.2	11.0
Zinc Regrind						15				11.7
Zinc 1st Cleaner			40				2	5	11.7	11.3
Zinc 2nd Cleaner			20				2	4	12.0	11.9
Zinc 3rd Cleaner			10				2	3	12.2	12.2

Test No. 7

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	7.22	44.00	5.58			75.36	16.69		
Pb Cleaner Tails 4	1.20	14.20	3.59			4.05	1.79		
Pb Cleaner Tails 3	1.78	7.65	4.63			3.23	3.41		
Pb Cleaner Tails 2	3.62	3.71	3.82			3.19	5.73		
Pb Cleaner Tails 1	14.25	1.18	3.00			3.99	17.71		
Zn Cleaner Conc. 3	1.47	1.64	46.70			0.57	28.38		
Zn Cleaner Tails 3	3.22	2.00	5.50			1.53	7.34		
Zn Cleaner Tails 2	6.06	0.83	1.36			1.19	3.41		
Zn Cleaner Tails 1	34.92	0.47	0.84			3.89	12.15		
Tails	26.26	0.48	0.31			2.99	3.37		
Calculated Head	100.00	4.21	2.41			100.00	100.00		

KM076

TEST NO. 8

PURPOSE: Repeat Test No. 5

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: 1 kg. Type 4G "-ve 11%" Zone III

GRIND: 15 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				15				9.7
Lead Conditioning			30				5		9.7	9.7
Lead Ro/Sc			70					10	9.7	9.2
Lead Regrind	1000	200				15			10.5	10.5
Lead 1st Cleaner			30				2	7	10.5	10.2
Lead 2nd Cleaner			20				2	4	10.5	10.1
Lead 3rd Cleaner			10				2	3	10.5	10.1
Zinc Conditioning				500			10		11.0	11.3
Zinc Ro/Sc			70				2	8	11.3	11.3
Zinc Regrind				200	1000	15				11.8
Zinc 1st Cleaner			40				2	5	11.8	11.8
Zinc 2nd Cleaner			20				2	4	11.8	11.8
Zinc 3rd Cleaner			10				2	3	12.0	12.0

Test No. 8

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 3	4.79	35.70	15.00			75.49	13.01		
Pb Cleaner Tails 3	1.11	8.50	17.00			4.17	3.42		
Pb Cleaner Tails 2	4.63	3.00	15.90			6.14	13.35		
Pb Cleaner Tails 1	14.43	0.93	12.30			5.93	32.18		
Zn Cleaner Conc. 3	2.87	0.90	57.10			1.14	29.70		
Zn Cleaner Tails 3	0.53	1.85	22.10			0.44	2.14		
Zn Cleaner Tails 2	1.73	0.93	6.70			0.71	2.11		
Zn Cleaner Tails 1	7.79	0.54	1.70			1.86	2.40		
Tails	62.11	0.15	0.15			4.12	1.69		
Calculated Head	100.00	2.26	5.52			100.00	100.00		

KM076

TEST NO. 9

PURPOSE: Repeat Test No. 3

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: 1 kg. Type 4E "+ve 11%" Zone III

GRIND: 10 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				10				9.7
Lead Conditioning			30				2		9.7	9.7
Lead Ro/Sc			40					6	9.7	9.5
Lead Regrind	1000	200				10				10.6
Lead 1st Cleaner			30				2	6	10.6	10.4
Lead 2nd Cleaner			20				2	4	10.4	10.2
Lead 3rd Cleaner			10				2	3	10.4	10.4
Zinc Conditioning				500			10		11.5	11.4
Zinc Ro/Sc			30					6	11.0	11.0
Zinc Regrind				200	1000	10				11.8
Zinc 1st Cleaner			40				2	5	11.8	11.5
Zinc 2nd Cleaner			20				2	4	12.0	12.0
Zinc 3rd Cleaner			10				2	3	12.2	12.0

Test No. 9

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 3	14.79	41.80	16.00			80.44	25.17		
Pb Cleaner Tails 3	3.28	11.30	17.90			4.82	6.24		
Pb Cleaner Tails 2	5.29	7.00	14.40			4.82	8.10		
Pb Cleaner Tails 1	15.05	2.33	12.40			4.56	19.85		
Zn Cleaner Conc. 3	5.09	1.18	56.00			0.78	30.35		
Zn Cleaner Tails 3	0.82	2.55	23.60			0.27	2.07		
Zn Cleaner Tails 2	1.60	1.40	5.63			0.29	0.96		
Zn Cleaner Tails 1	10.82	0.97	4.35			1.37	5.01		
Tails	43.26	0.47	0.49			2.65	2.26		
Calculated Head	100.00	7.68	9.40			100.00	100.00		

KM1076

TEST NO. 10

PURPOSE: Repeat Test 3

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: 1 kg. Type E "+ve 11%" Zone IV

GRIND: 10 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				10				9.1
Lead Conditioning			30				2		9.4	9.4
Lead Ro/Sc			40					6	9.4	9.0
Lead Regrind	1000	200				10				10.4
Lead 1st Cleaner			30				2	6	10.4	10.0
Lead 2nd Cleaner			20				2	4	10.4	10.2
Lead 3rd Cleaner			10				2	3	10.4	10.3
Zinc Conditioning				500			10		11.0	11.3
Zinc Ro/Sc			30					6	11.3	11.2
Zinc Regrind						10				11.3
Zinc 1st Cleaner			40				2	5	11.3	11.2
Zinc 2nd Cleaner			20				2	4	11.8	11.7
Zinc 3rd Cleaner			10				2	3	12.0	11.9

Test No. 10

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 3	9.03	37.95	8.50			64.09	10.21		
Pb Cleaner Tails 3	1.42	18.00	10.60			4.77	2.00		
Pb Cleaner Tails 2	3.40	9.40	10.20			5.98	4.61		
Pb Cleaner Tails 1	10.04	3.70	8.40			6.95	11.22		
Zn Cleaner Conc. 3	8.69	1.76	47.80			2.86	55.28		
Zn Cleaner Tails 3	1.80	2.93	15.40			0.99	3.69		
Zn Cleaner Tails 2	2.18	3.62	8.60			1.48	2.50		
Zn Cleaner Tails 1	11.98	2.01	3.24			4.51	5.16		
Tails	51.46	0.87	0.78			8.38	5.34		
Calculated Head	100.00	5.35	7.52			100.00	100.00		

KM076

TEST NO. 11

PURPOSE: Preliminary Evaluation - Fine Grind

PROCEDURE: Standard open circuit cleaner test

FEED: 1 kg. Type 4G "+ve 11%"

GRIND: 30 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				30				9.8
Lead Conditioning			50				2		9.8	9.8
Lead Ro/Sc			50					10	9.8	9.3
Lead Regrind	1000	200				15				10.5
Lead 1st Cleaner			50				2	5	10.5	10.3
Lead 2nd Cleaner			20				2	4	10.5	10.3
Lead 3rd Cleaner			10				2	3	10.5	10.3
Lead 4th Cleaner			-				2	2	10.5	10.3
Zinc Conditioning				1000			10		11.0	10.6
Zinc Ro/Sc			70				2	10	11.0	10.8
Zinc Regrind				200	1000	15				11.9
Zinc 1st Cleaner			50				2	5	11.9	11.7
Zinc 2nd Cleaner			20				2	4	11.9	11.7
Zinc 3rd Cleaner			-				2	3	12.0	12.1

Test No. 11

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	10.50	61.80	8.70			80.19	10.28		
Pb Cleaner Tails 4	1.62	29.80	16.20			5.96	2.95		
Pb Cleaner Tails 3	3.32	13.90	17.20			5.70	6.42		
Pb Cleaner Tails 2	3.76	5.96	15.70			2.77	6.66		
Pb Cleaner Tails 1	4.40	1.65	14.10			0.90	6.99		
Zn Cleaner Conc. 3	8.87	0.64	58.90			0.70	58.84		
Zn Cleaner Tails 3	0.83	1.79	20.50			0.18	1.91		
Zn Cleaner Tails 2	1.89	1.48	8.90			0.35	1.89		
Zn Cleaner Tails 1	6.54	0.99	2.65			0.80	1.95		
Tails	58.28	0.34	0.32			2.45	2.10		
Calculated Head	100.00	8.09	8.88			100.00	100.00		

KM1076

TEST NO. 12

PURPOSE: Preliminary Evaluation - Fine Grind

PROCEDURE: Standard open circuit cleaner test

FEED: 1 kg. Type G "-ve 11%"

GRIND: 30 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				30				9.1
Lead Conditioning			50				2		9.5	9.5
Lead Ro/Sc								5	9.5	9.5
Lead Regrind	1000	200				15				10.5
Lead 1st Cleaner			40				2	4	10.5	10.3
Lead 2nd Cleaner			10				2	3	10.5	10.4
Lead 3rd Cleaner			10				2	2	10.5	10.4
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				500			10		11.0	11.0
Zinc Ro/Sc			70				2	5	11.0	10.8
Zinc Regrind				200	1000	15				11.5
Zinc 1st Cleaner			40				2	5	11.5	11.4
Zinc 2nd Cleaner			20				2	3	12.0	11.9
Zinc 3rd Cleaner			-				2	2	12.0	11.8

Test No. 12

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	3.45	53.60	5.56			53.09	4.54		
Pb Cleaner Tails 4	1.12	28.50	8.75			9.19	2.32		
Pb Cleaner Tails 3	1.65	18.40	8.63			8.74	3.37		
Pb Cleaner Tails 2	2.43	7.56	7.65			5.28	4.40		
Pb Cleaner Tails 1	8.74	2.29	6.20			5.75	12.82		
Zn Cleaner Conc. 3	2.93	1.82	58.70			1.53	40.70		
Zn Cleaner Tails 3	1.10	3.49	44.50			1.10	11.59		
Zn Cleaner Tails 2	1.44	4.43	20.00			1.83	6.81		
Zn Cleaner Tails 1	5.61	2.50	6.05			4.03	8.03		
Tails	71.52	0.46	0.32			9.45	5.41		
Calculated Head	100.00	3.48	4.23			100.00	100.00		

KM1076

TEST NO. 13

PURPOSE: Preliminary Evaluation

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: 1 kg. Type E "+ve 11%"

GRIND: 30 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				30				9.7
Lead Conditioning			50				2		9.7	9.7
Lead Ro/Sc			50					10	9.7	9.4
Lead Regrind	1000	200				15				10.4
Lead 1st Cleaner			30				2	5	10.4	10.2
Lead 2nd Cleaner			20				2	4	10.5	10.3
Lead 3rd Cleaner			10				2	3	10.5	10.4
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.0	11.1
Zinc Ro/Sc			70				2	6	11.2	11.2
Zinc Regrind				200	1000	15				11.4
Zinc 1st Cleaner			40				2	5	11.4	11.4
Zinc 2nd Cleaner			30				2	4	11.8	11.7
Zinc 3rd Cleaner			20				2	3	12.1	12.2

Test No. 13

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	9.86	54.60	12.10			69.62	12.66		
Pb Cleaner Tails 4	1.80	27.90	16.60			6.50	3.17		
Pb Cleaner Tails 3	2.70	17.50	17.00			6.12	4.88		
Pb Cleaner Tails 2	4.07	7.98	14.60			4.20	6.31		
Pb Cleaner Tails 1	14.98	2.84	11.90			5.50	18.92		
Zn Cleaner Conc. 3	7.16	1.02	58.50			0.94	44.46		
Zn Cleaner Tails 3	0.71	2.34	30.50			0.21	2.29		
Zn Cleaner Tails 2	1.30	2.20	15.80			0.37	2.18		
Zn Cleaner Tails 1	5.81	1.40	3.43			1.05	2.11		
Tails	51.62	0.82	0.55			5.48	3.01		
Calculated Head	100.00	7.73	9.42			100.00	100.00		

KM076

TEST NO. 14

PURPOSE: Preliminary Evaluation

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: 1 kg. Type E "-ve 11%"

GRIND: 30 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				30				8.8
Lead Conditioning			30				4		9.5	9.5
Lead Ro/Sc			40					8	9.5	9.3
Lead Regrind	1000	200				15				10.5
Lead 1st Cleaner			50				2	5	10.5	10.3
Lead 2nd Cleaner			20				2	4	10.5	10.3
Lead 3rd Cleaner			10				2	3	10.5	10.3
Lead 4th Cleaner			-				2	2	10.5	10.3
Zinc Conditioning				500			10		11.2	11.3
Zinc Ro/Sc			70					7	11.1	11.1

Test No. 14

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	4.98	53.50	4.40			54.61	6.19		
Pb Cleaner Tails 4	2.09	30.20	6.30			12.90	3.71		
Pb Cleaner Tails 3	2.29	17.80	6.18			8.35	3.99		
Pb Cleaner Tails 2	3.90	7.25	5.64			5.80	6.21		
Pb Cleaner Tails 1	8.04	2.45	4.83			4.03	10.96		
Zn Ro/Sc Conc.	10.97	2.73	20.10			6.13	62.24		
Tails	67.74	0.59	0.35			8.19	6.69		
Calculated Head	100.00	4.88	3.54			100.00	100.00		

KM1076

TEST NO. 15

PURPOSE: Preliminary Evaluation - Fine Grind

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: 1 kg. Type A "-ve 11%"

GRIND: 30 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				30				9.4
Lead Conditioning			30						9.5	9.5
Lead Ro/Sc			40				2	8	9.5	9.5
Lead Regrind	1000	200				15				10.8
Lead 1st Cleaner			50				2	5	10.8	10.3
Lead 2nd Cleaner			20				2	4	10.5	10.3
Lead 3rd Cleaner			10				2	3	10.5	10.5
Lead 4th Cleaner			-				2	2	10.5	10.5
Zinc Conditioning				500			10		11.3	11.4
Zinc Ro/Sc									11.0	11.0
Zinc Regrind				200	1000	15				11.6
Zinc 1st Cleaner			40				2	5	11.6	11.7
Zinc 2nd Cleaner			20				2	4	12.0	12.0
Zinc 3rd Cleaner			-				2	3	12.2	12.2

Test No. 15

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	3.16	49.40	5.80			59.78	3.76		
Pb Cleaner Tails 4	2.85	11.00	7.75			12.01	4.53		
Pb Cleaner Tails 3	1.91	4.72	6.70			3.46	2.63		
Pb Cleaner Tails 2	3.30	3.84	6.40			4.85	4.32		
Pb Cleaner Tails 1	6.75	3.10	6.50			8.01	8.99		
Zn Cleaner Conc. 3	5.78	0.74	54.70			1.64	64.78		
Zn Cleaner Tails 3	0.92	1.82	17.10			0.64	3.22		
Zn Cleaner Tails 2	1.99	1.04	4.63			0.79	1.89		
Zn Cleaner Tails 1	14.37	0.45	0.85			2.48	2.50		
Tails	58.98	0.28	0.28			6.33	3.39		
Calculated Head	100.00	2.61	4.88			100.00	100.00		

KM076

TEST NO. 16

PURPOSE: Preliminary Evaluation - Fine Grind

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: 1 kg. Type A "+ve 11%"

GRIND: 30 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				30				9.5
Lead Conditioning			30				2		9.5	9.5
Lead Ro/Sc			50					8	9.5	9.3
Lead Regrind	1000	200								10.5
Lead 1st Cleaner			60				2	8	10.5	10.2
Lead 2nd Cleaner			30				2	4	10.5	10.4
Lead 3rd Cleaner			10				2	3	10.5	10.4
Lead 4th Cleaner			-				2	3	10.5	10.4
Zinc Conditioning				500			10		11.4	11.3
Zinc Ro/Sc			70				2	7	11.2	11.0
Zinc Regrind				200	1000	15				11.6
Zinc 1st Cleaner			40				2	5	11.8	11.9
Zinc 2nd Cleaner			20				2	4	11.9	11.8
Zinc 3rd Cleaner			-				2	3	12.2	12.1

Test No. 16

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	8.16	50.80	12.90			71.82	8.64		
Pb Cleaner Tails 4	1.28	21.20	16.90			4.70	1.77		
Pb Cleaner Tails 3	2.57	12.40	16.60			5.51	3.50		
Pb Cleaner Tails 2	3.68	7.62	15.60			4.86	4.71		
Pb Cleaner Tails 1	11.33	3.54	14.90			6.95	13.85		
Zn Cleaner Conc. 3	11.81	0.57	58.00			1.17	56.21		
Zn Cleaner Tails 3	1.54	1.66	38.60			0.44	4.86		
Zn Cleaner Tails 2	2.50	1.41	13.80			0.61	2.83		
Zn Cleaner Tails 1	10.45	0.71	2.44			1.28	2.09		
Tails	46.70	0.33	0.40			2.67	1.53		
Calculated Head	100.00	5.77	12.19			100.00	100.00		

KM076

TEST NO. 17 - Cycle I

PURPOSE: Cycle Test at Medium Fine Grind

PROCEDURE: Standard Cycle Procedure with Pb 1st Cleaner Tails and Zinc 1st Cleaner Tails recycled to the head of the appropriate circuit

FEED: 1 kg. Type G Composite

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

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				20				9.4
Lead Ro/Sc			40/40				2	2/5	9.4	9.2
Lead Regrind	1000	200				20				
Lead 1st Cleaner			40				2	5	10.5	10.4
Lead 2nd Cleaner			30				2	4	10.5	10.2
Lead 3rd Cleaner			20				2	3	10.5	10.2
Lead 4th Cleaner			-				2	2	10.5	10.3
Zinc Conditioning				1000			10		11.2	11.2
Zinc Ro/Sc			30/40				2	2/5	11.1	11.1
Zinc Regrind				200	1000	20				11.8
Zinc 1st Cleaner			50				2	5	11.8	11.7
Zinc 2nd Cleaner			20				2	4	12.0	11.9
Zinc 3rd Cleaner			10				2	2	12.2	12.2

TEST NO. 17 - II

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				20				9.3
Lead Ro/Sc			40/40				2	3/4	9.4	9.2
Lead Regrind	1000	200				20				10.6
Lead 1st Cleaner			40				2	5	10.6	10.4
Lead 2nd Cleaner			30				2	4	10.5	10.4
Lead 3rd Cleaner			20				2	3	10.4	10.4
Lead 4th Cleaner			-				2	2	10.4	10.2
Zinc Conditioning				1000			10		11.5	11.5
Zinc Ro/Sc			30/40				2	3/4	11.2	11.2
Zinc Regrind				200	1000	20				11.5
Zinc 1st Cleaner			50				2	5	11.5	11.3
Zinc 2nd Cleaner			20				2	4	11.8	11.8
Zinc 3rd Cleaner			10				2	3	12.0	12.0

TEST NO. 17 - III

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				20				9.1
Lead Ro/Sc			40/40				2	3/4	9.5	9.4
Lead Regrind	1000	200				20				
Lead 1st Cleaner			40				2	5	10.5	10.4
Lead 2nd Cleaner			30				2	4	10.4	10.4
Lead 3rd Cleaner			20				2	3	10.4	10.3
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.4	11.2
Zinc Ro/Sc			30/40				2	3/4	11.1	11.0
Zinc Regrind				200	1000	20				
Zinc 1st Cleaner			50				2	5	11.5	11.5
Zinc 2nd Cleaner			20				2	4	11.5	11.5
Zinc 3rd Cleaner			10				2	3	11.5	11.5

TEST NO. 17 - IV

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				20				9.2
Lead Ro/Sc			40/40				2	3/4	9.4	9.4
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			40				2	5	10.5	10.4
Lead 2nd Cleaner			30				2	4	10.5	10.4
Lead 3rd Cleaner			20				2	3	10.4	10.2
Lead 4th Cleaner			-				2	2	10.4	10.3
Zinc Conditioning				1000			10		11.3	11.2
Zinc Ro/Sc			30/40					3/4	11.2	11.0
Zinc Regrind				200	1000	20				11.5
Zinc 1st Cleaner			50				2	5	11.5	11.5
Zinc 2nd Cleaner			20				2	4	12.0	12.0
Zinc 3rd Cleaner			10				2	3	12.2	12.2

TEST NO. 17 - V

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				20				9.3
Lead Ro/Sc			40/40				2	3/4	9.4	9.4
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			40				2	5	10.5	10.4
Lead 2nd Cleaner			30				2	4	10.4	10.2
Lead 3rd Cleaner			20				2	3	10.5	10.2
Lead 4th Cleaner			-				2	2	10.5	10.2
Zinc Conditioning				1000			10		11.5	11.5
Zinc Ro/Sc			30/40				2	3/4	11.3	11.2
Zinc Regrind				200	1000	20				11.5
Zinc 1st Cleaner			50				2	5	11.5	11.5
Zinc 2nd Cleaner			20				2	4	12.0	12.0
Zinc 3rd Cleaner			10				2	3	12.2	12.2

Test No. 17

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Lead Concentrate I	.68	61.8	7.56	7.76	.77
Lead Concentrate II	1.09	58.7	8.62	11.82	1.41
Lead Concentrate III	1.58	55.2	8.98	16.11	2.12
Lead Concentrate IV	1.96	53.5	9.00	19.37	2.64
Lead Concentrate V	1.91	52.9	9.50	18.67	2.72
Lead Scavenger Conc.	3.38	4.74	12.8	2.96	6.48
Lead Cleaner Tails 4	.61	25.6	15.3	2.88	1.40
Lead Cleaner Tails 3	.69	18.4	14.5	2.35	1.50
Lead Cleaner Tails 2	.94	13.0	14.0	2.26	1.97
Lead Cleaner Tails 1	2.27	5.17	12.6	2.17	4.28
Zinc Concentrate I	.48	.98	57.1	.09	4.10
Zinc Concentrate II	1.25	.96	58.2	.22	10.89
Zinc Concentrate III	.85	1.08	57.5	.17	7.32
Zinc Concentrate IV	1.64	.86	58.8	.26	14.44
Zinc Concentrate V	1.71	.98	57.3	.31	14.67
Zinc Scavenger Conc.	2.09	2.38	7.05	.92	2.21
Zinc Cleaner Tails 3	.50	2.72	39.9	.25	2.99
Zinc Cleaner Tails 2	1.21	2.92	29.4	.65	5.33
Zinc Cleaner Tails 1	2.58	2.70	17.8	1.29	6.87
Tails I	9.45	.58	.41	1.01	.58
Tails II	13.95	.53	.39	1.37	.81
Tails III	15.15	.93	.65	2.60	1.47
Tails IV	17.50	.77	.60	2.49	1.57
Tails V	16.54	.67	.59	2.05	1.46
Calculated Head	100.00	5.41	6.68	100.00	100.00

Grade Recovery Data for Last Two Cycles

Test No. 17

Cycle 4

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	5.41	6.68	100.00	100.00
Lead	8.78	53.5	9.00	86.83	11.83
Zinc	9.18	.86	58.8	1.46	80.81
Tails	82.04	.77	.60	11.68	7.37

Cycle 5

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	5.41	6.68	100.00	100.00
Lead	9.02	52.9	9.50	88.20	12.83
Zinc	9.32	.98	57.3	1.69	79.95
Tails	81.66	.67	.59	10.11	7.21

NOTE: The recoveries based on 3 product formula calculations.

KM076

TEST NO. 18 - I

PURPOSE: Cycle Test at Medium Fine Grind

PROCEDURE: Standard Size Cycle Procedure

FEED: 1 kg. Type E Composite

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

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	2000	300				20				8.9
Lead Ro/Sc			50/50				2	3/7	9.6	9.5
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.3
Lead 2nd Cleaner			20				2	4	10.5	10.3
Lead 3rd Cleaner			10				2	3	10.5	10.3
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.0	11.1
Zinc Ro/Sc			50/50				2	3/4	11.0	11.6
Zinc Regrind				200	1000	20				11.5
Zinc 1st Cleaner			40				2	5	11.5	11.5
Zinc 2nd Cleaner			30				2	4	11.8	11.6
Zinc 3rd Cleaner			20				2	3	12.0	12.1

TEST NO. 18 - II

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	3000	300				20				9.7
Lead Ro/Sc			50/50				2	3/7	9.7	9.5
Lead Regrind	1000	200				20				11.5
Lead 1st Cleaner			50				2	5	10.5	10.4
Lead 2nd Cleaner			20				2	4	10.5	10.4
Lead 3rd Cleaner			10				2	3	10.5	10.3
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.2	11.3
Zinc Ro/Sc			50/30				2	3/5	11.3	11.2
Zinc Regrind				200	1000	20				11.7
Zinc 1st Cleaner			40				2	5	11.7	11.5
Zinc 2nd Cleaner			30				2	4	11.8	11.4
Zinc 3rd Cleaner			20				2	3	12.0	12.1

TEST NO. 18 - III

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	3000	300				20				9.5
Lead Ro/Sc			50/50				2	3/7	9.5	9.3
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.3
Lead 2nd Cleaner			20				2	4	10.5	10.4
Lead 3rd Cleaner			10				2	3	10.5	10.4
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.2	11.2
Zinc Ro/Sc			50/40				2	3/6	11.2	11.2
Zinc Regrind				200	1000	20				11.4
Zinc 1st Cleaner			40				2	5	11.4	11.3
Zinc 2nd Cleaner			30				2	4	11.8	11.7
Zinc 3rd Cleaner			20				3	3	12.0	12.2

TEST NO. 18 - IV

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	3000	300				20				9.5
Lead Ro/Sc			50/50				2	3/7	9.5	9.3
Lead Regrind						20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.3
Lead 2nd Cleaner			20				2	4	10.5	10.4
Lead 3rd Cleaner			10				2	3	10.5	10.3
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.2	11.2
Zinc Ro/Sc			50/50				2	3/5	11.3	11.2
Zinc Regrind				200	1000	20				11.5
Zinc 1st Cleaner			40				2	5	11.5	11.6
Zinc 2nd Cleaner			30				2	4	11.8	11.9
Zinc 3rd Cleaner			20				2	3	12.1	12.0

TEST NO. 18 - V

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	3000	300				20				9.5
Lead Ro/Sc			50/50				2	3/7	9.5	9.3
Lead Regrind						20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.3
Lead 2nd Cleaner			30				2	4	10.5	10.4
Lead 3rd Cleaner			10				2	3	10.5	10.3
Lead 4th Cleaner			-				2	2	10.5	10.3
Zinc Conditioning				1000			10		11.2	11.2
Zinc Ro/Sc			50/50					3/5	11.3	11.2
Zinc Regrind				200	1000	20				11.5
Zinc 1st Cleaner			40				3	5	11.5	11.5
Zinc 2nd Cleaner			30				2	4	11.8	11.7
Zinc 3rd Cleaner			20				2	3	12.0	12.1

TEST NO. 18 - VI

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	3000	300				20				9.6
Lead Ro/Sc			50/50				2	3/7	9.6	9.5
Lead Regrind	2000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.3
Lead 2nd Cleaner			20				2	4	10.5	10.4
Lead 3rd Cleaner			10				2	3	10.5	10.4
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.2	11.2
Zinc Ro/Sc			50/50				2	3/5	11.3	11.3
Zinc Regrind				200	1000	20				11.5
Zinc 1st Cleaner			50				2	5	11.5	11.3
Zinc 2nd Cleaner			40				2	4	11.8	11.9
Zinc 3rd Cleaner			20				2	3	12.0	12.1

Test No. 18

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Lead Concentrate I	1.14	57.6	7.94	10.83	1.41
Lead Concentrate II	1.41	54.8	9.26	12.75	2.03
Lead Concentrate III	.98	51.3	8.96	8.30	1.36
Lead Concentrate IV	1.62	53.9	9.30	14.41	2.34
Lead Concentrate V	1.33	49.8	9.40	10.93	1.94
Lead Concentrate VI	1.79	49.5	10.3	14.62	2.86
Lead Scavenger Conc.	5.27	5.04	9.40	4.38	7.70
Lead Cleaner Tails 4	.75	26.6	14.6	3.29	1.70
Lead Cleaner Tails 3	1.06	18.4	14.6	3.22	2.40
Lead Cleaner Tails 2	1.30	11.4	13.0	2.45	2.63
Lead Cleaner Tails 1	2.39	5.21	11.1	2.06	4.12
Zinc Concentrate I	.73	2.40	58.1	.29	6.59
Zinc Concentrate II	1.04	1.78	57.9	.31	9.35
Zinc Concentrate III	.57	2.83	57.8	.27	5.12
Zinc Concentrate IV	1.27	3.45	56.4	.72	11.13
Zinc Concentrate V	1.18	3.34	56.9	.65	10.43
Zinc Concentrate VI	1.45	3.34	56.6	.80	12.75
Zinc Scavenger Conc.	1.77	2.78	10.0	.81	2.75
Zinc Cleaner Tails 3	.15	4.17	37.2	.10	.87
Zinc Cleaner Tails 2	.48	4.04	32.9	.32	2.45
Zinc Cleaner Tails 1	.94	3.46	17.5	.54	2.56
Tails I	4.92	.82	.90	.67	.69
Tails II	15.69	.47	.34	1.22	.83
Tails III	12.94	.76	.45	1.62	.90
Tails IV	11.36	.67	.51	1.26	.90
Tails V	13.90	.69	.53	1.58	1.14
Tails VI	12.55	.77	.53	1.59	1.03
Calculated Head	100.00	6.06	6.44	100.00	100.00

Grade Recovery Data for Last Two Cycles

Test No. 18

Cycle 5

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	6.06	6.45	100.00	100.00
Lead	10.46	49.8	9.40	85.96	15.24
Zinc	8.86	3.34	56.9	4.88	78.16
Tails	80.68	.69	.53	9.19	6.63

Cycle 6

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	6.06	6.45	100.00	100.00
Lead	10.39	49.5	10.3	84.87	16.59
Zinc	8.75	3.34	56.6	4.82	76.78
Tails	80.86	.77	.53	10.27	6.64

NOTE: The recoveries based on 3 product formula calculations.

KM1076

TEST NO. 19 - I

PURPOSE:

PROCEDURE:

FEED: 1 kg. Type BCD Composite

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

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				20				9.4
Lead Ro/Sc			50/50				2	3/5	9.4	9.2
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			40				2	5	10.5	10.4
Lead 2nd Cleaner			30				2	4	10.5	10.2
Lead 3rd Cleaner			20				2	3	10.5	10.4
Lead 4th Cleaner			-				2	2	10.5	10.2
Zinc Conditioning				1000			10		11.0	11.0
Zinc Ro/Sc			50/50				2	3/5	11.0	11.0
Zinc Regrind				200	1000	20				11.8
Zinc 1st Cleaner			50				2	5	11.8	11.7
Zinc 2nd Cleaner			20				2	4	12.0	12.0
Zinc 3rd Cleaner			10				2	3	12.2	12.2

TEST NO. 19 - II

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				20				9.4
Lead Ro/Sc			50/40				2	3/5	9.3	9.2
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			40				2	5	10.5	10.2
Lead 2nd Cleaner			30				2	4	10.4	10.4
Lead 3rd Cleaner			20				2	3	10.5	10.4
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.0	11.0
Zinc Ro/Sc			50/40				2	3/5	11.0	11.0
Zinc Regrind				200	1000	20				11.6
Zinc 1st Cleaner			70				2	5	11.6	11.5
Zinc 2nd Cleaner			20				2	4	12.0	12.0
Zinc 3rd Cleaner			10				2	3	12.2	12.2

TEST NO. 19 - III

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				20				9.3
Lead Ro/Sc			50/40				2	3/5	9.3	9.2
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			40				2	5	10.5	10.4
Lead 2nd Cleaner			30				2	4	10.5	10.4
Lead 3rd Cleaner			20				2	3	10.5	10.4
Lead 4th Cleaner			-				2	2	10.5	10.5
Zinc Conditioning				1000			10		11.5	11.3
Zinc Ro/Sc			50/40				2	3/5	11.3	11.3
Zinc Regrind				200	1000	20				11.6
Zinc 1st Cleaner			70				2	5	11.6	11.4
Zinc 2nd Cleaner			20				2	4	12.0	11.9
Zinc 3rd Cleaner			10				2	3	12.2	12.2

TEST NO. 19 - IV

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				20				9.3
Lead Ro/Sc			50/40				2	3/5	9.3	9.2
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			40				2	5	10.5	10.4
Lead 2nd Cleaner			30				2	4	10.5	10.5
Lead 3rd Cleaner			20				2	3	10.5	10.4
Lead 4th Cleaner			-				2	2	10.5	10.5
Zinc Conditioning				1000			10		11.5	11.3
Zinc Ro/Sc			50/40				2	3/5	11.3	11.2
Zinc Regrind				200	1000	20				11.5
Zinc 1st Cleaner			70				2	5	11.5	11.5
Zinc 2nd Cleaner			20				2	4	12.0	12.0
Zinc 3rd Cleaner			10				2	3	12.2	12.2

TEST NO. 19 - V

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				20				9.3
Lead Ro/Sc			50/40				2	3/5	9.3	9.3
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			40				2	5	10.6	10.6
Lead 2nd Cleaner			30				2	4	10.5	10.4
Lead 3rd Cleaner			20				2	3	10.5	10.2
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.5	11.5
Zinc Ro/Sc			50/40					3/5	11.4	11.5
Zinc Regrind				200	1000	20				9.6
Zinc 1st Cleaner			70				2	5	11.5	11.5
Zinc 2nd Cleaner							2	4	12.0	12.0
Zinc 3rd Cleaner							2	3	12.2	12.1

Test No. 19

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Lead Concentrate I	1.08	60.7	8.94	13.48	1.26
Lead Concentrate II	1.49	51.8	11.0	15.87	2.13
Lead Concentrate III	1.46	55.6	9.70	16.69	1.84
Lead Concentrate IV	1.21	57.0	9.60	14.18	1.51
Lead Concentrate V	1.59	53.7	10.2	17.56	2.11
Lead Scavenger Conc.	3.09	3.79	16.5	2.41	6.64
Lead Cleaner Tails 4	.66	26.0	16.7	3.53	1.43
Lead Cleaner Tails 3	.60	22.0	16.7	2.71	1.30
Lead Cleaner Tails 2	.90	13.4	16.2	2.48	1.90
Lead Cleaner Tails 1	1.71	6.33	13.7	2.23	3.05
Zinc Concentrate I	1.46	.80	58.5	.24	11.12
Zinc Concentrate II	1.74	.90	56.2	.32	12.73
Zinc Concentrate III	1.74	.86	55.9	.31	12.66
Zinc Concentrate IV	2.00	.98	55.9	.40	14.55
Zinc Concentrate V	1.93	1.16	55.9	.46	14.04
Zinc Scavenger Conc.	4.94	.86	1.50	.87	.96
Zinc Cleaner Tails 3	.58	2.45	34.6	.29	2.61
Zinc Cleaner Tails 2	1.11	2.27	19.3	.52	2.79
Zinc Cleaner Tails 1	2.88	1.46	8.92	.86	3.34
Tails I	8.15	.22	.15	.37	.16
Tails II	12.55	.32	.22	.83	.36
Tails III	14.11	.33	.23	.96	.42
Tails IV	18.62	.37	.28	1.42	.68
Tails V	14.41	.37	.21	1.10	.39
Calculated Head	100.00	4.86	7.68	100.00	100.00

Grade Recovery Data for Last Two Cycles

Test No. 19

Cycle 4

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	4.86	7.68	100.00	100.00
Lead	7.80	57.0	9.60	91.48	9.75
Zinc	12.00	.98	55.9	2.42	87.34
Tails	80.20	.37	.28	6.11	2.92

Cycle 5

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	4.86	7.68	100.00	100.00
Lead	8.24	53.7	10.2	91.05	10.94
Zinc	11.93	1.16	55.9	2.85	86.83
Tails	79.83	.37	.21	6.08	2.18

NOTE: The recoveries based on 3 product formula calculations.

KM1076

TEST NO. 20 - I

PURPOSE: Cycle Test Procedure and Medium Fine Grind

PROCEDURE: Standard Fine Cycle

FEED: 1 kg. Type A Composite

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

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				20				9.7
Lead Ro/Sc			50/50				2	3/7	9.7	9.3
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.3
Lead 2nd Cleaner			20				2	4	10.5	10.4
Lead 3rd Cleaner			20				2	3	10.5	10.4
Lead 4th Cleaner			-				2	2	10.5	10.3
Zinc Conditioning				1000			10		11.4	11.3
Zinc Ro/Sc			50/50					3/4	11.3	11.2
Zinc Regrind				200	1000	20				11.7
Zinc 1st Cleaner			40				2	5	11.7	11.6
Zinc 2nd Cleaner			30				2	4	11.9	11.8
Zinc 3rd Cleaner			20				2	3	12.0	12.0

TEST NO. 20 - II

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				20				9.7
Lead Ro/Sc			50/50				2	3/7	9.7	9.3
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.3
Lead 2nd Cleaner			40				2	4	10.5	10.4
Lead 3rd Cleaner			20				2	3	10.5	10.5
Lead 4th Cleaner			-				2	2	10.5	10.5
Zinc Conditioning				1000			10		11.5	11.4
Zinc Ro/Sc			20/50					3/4	11.4	11.2
Zinc Regrind				200	1000	20				11.6
Zinc 1st Cleaner			40				2	5	11.6	11.7
Zinc 2nd Cleaner			30				2	4	11.8	11.9
Zinc 3rd Cleaner			20				2	3	12.2	12.1

TEST NO. 20 - III

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				20				9.7
Lead Ro/Sc			50/50				2	3/7	9.7	9.5
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.3
Lead 2nd Cleaner			40				2	4	10.5	10.4
Lead 3rd Cleaner			20				2	3	10.5	10.4
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.1	11.2
Zinc Ro/Sc			20/50					3/5	11.1	11.0
Zinc Regrind				200	1000	20				11.5
Zinc 1st Cleaner			40				2	5	11.5	11.6
Zinc 2nd Cleaner			30				2	4	11.9	12.0
Zinc 3rd Cleaner			20				2	3	12.2	12.1

TEST NO. 20 - IV

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				20				9.7
Lead Ro/Sc			50/50				2	3/7	9.7	9.4
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.4
Lead 2nd Cleaner			40				2	4	10.5	10.3
Lead 3rd Cleaner			20				2	3	10.5	10.4
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.4	11.2
Zinc Ro/Sc			20/50					3/4	11.2	11.2
Zinc Regrind				200	1000	20				11.4
Zinc 1st Cleaner			40				2	5	11.5	11.6
Zinc 2nd Cleaner			30				2	4	11.8	11.7
Zinc 3rd Cleaner			20				2	3	11.9	12.1

TEST NO. 20 - V

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				20				9.7
Lead Ro/Sc			50/50				2	3/7	9.7	9.3
Lead Regrind	1000	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.4
Lead 2nd Cleaner			40				2	4	10.5	10.4
Lead 3rd Cleaner			20				2	3	10.5	10.4
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.2	11.1
Zinc Ro/Sc			20/50					3/4	11.2	11.1
Zinc Regrind				200	1000	20				11.5
Zinc 1st Cleaner			40				2	5	11.5	11.6
Zinc 2nd Cleaner			30				2	4	11.8	11.8
Zinc 3rd Cleaner			20				2	3	12.2	12.3

Test No. 20

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Lead Concentrate I	.77	43.1	9.3	7.82	.85
Lead Concentrate II	1.36	50.6	10.0	16.22	1.61
Lead Concentrate III	1.10	58.7	8.8	15.22	1.15
Lead Concentrate IV	1.45	52.4	10.5	17.91	1.80
Lead Concentrate V	1.41	52.4	10.3	17.41	1.72
Lead Scavenger Conc.	3.87	2.59	12.8	2.36	5.86
Lead Cleaner Tails 4	.77	19.4	16.5	3.52	1.50
Lead Cleaner Tails 3	1.10	12.2	15.8	3.16	2.06
Lead Cleaner Tails 2	1.24	9.0	15.0	2.63	2.20
Lead Cleaner Tails 1	1.61	6.88	15.5	2.61	2.95
Zinc Concentrate I	.96	.48	60.3	.11	6.85
Zinc Concentrate II	1.89	.50	56.8	.22	12.71
Zinc Concentrate III	2.23	.60	56.8	.32	15.00
Zinc Concentrate IV	2.85	.78	55.7	.52	18.79
Zinc Concentrate V	2.37	.76	56.3	.42	15.80
Zinc Scavenger Conc.	2.73	1.51	9.35	.97	3.02
Zinc Cleaner Tails 3	.19	2.35	37.3	.11	.84
Zinc Cleaner Tails 2	.38	2.36	23.0	.21	1.03
Zinc Cleaner Tails 1	1.08	1.92	11.3	.49	1.44
Tails I	10.66	.35	.27	.88	.34
Tails II	13.22	.39	.20	1.22	.31
Tails III	14.43	.45	.22	1.53	.38
Tails IV	15.40	.53	.40	1.92	.73
Tails V	16.90	.54	.48	2.15	.96
Calculated Head	100.00	4.24	8.45	100.00	100.00

Grade Recovery Data for Last Two Cycles

Test No. 20

Cycle 4

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	4.24	8.45	100.00	100.00
Lead	7.09	52.4	10.5	87.62	8.81
Zinc	13.26	.78	55.7	2.44	87.41
Tails	79.65	.53	.40	9.96	3.77

Cycle 5

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	4.24	8.45	100.00	100.00
Lead	7.08	52.4	10.3	87.50	8.63
Zinc	13.03	.76	56.3	2.34	86.82
Tails	79.89	.54	.48	10.17	4.54

NOTE: The recoveries based on 3 product formula calculations.

KM076

TEST NO. 21 - I

PURPOSE: Cycle Test

PROCEDURE: Standard 5 cycle

FEED: DY Zone III and IV Composite of K Type

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

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1250	300				20				9.2
Lead Ro/Sc			30/70				2	3/5	9.5	9.3
Lead Regrind	500	200				20				10.2
Lead 1st Cleaner			50				2	5	10.5	10.2
Lead 2nd Cleaner			30				2	4	10.5	10.4
Lead 3rd Cleaner			20				2	3	10.5	10.4
Lead 4th Cleaner			10				2	2	10.5	10.5
Zinc Conditioning				1000			10		11.3	11.3
Zinc Ro/Sc			50/50				2	3/4	11.0	11.2
Zinc Regrind				200	1000	20				11.7
Zinc 1st Cleaner			50				2	5	11.7	11.5
Zinc 2nd Cleaner			20				2	4	12.0	11.9
Zinc 3rd Cleaner			-				2	3	12.2	12.1

TEST NO. 21 - II

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1250	300				20				9.4
Lead Ro/Sc			40/60				2	3/5	9.4	9.4
Lead Regrind	500	200				20				10.4
Lead 1st Cleaner			50				2	5	10.5	10.3
Lead 2nd Cleaner			30				2	4	10.5	10.4
Lead 3rd Cleaner			20				2	3	10.5	10.5
Lead 4th Cleaner			10				2	2	10.5	10.6
Zinc Conditioning				1000			10		11.5	11.2
Zinc Ro/Sc			50/50				2	3/4	11.2	11.5
Zinc Regrind				200	1000	20				11.7
Zinc 1st Cleaner			50				2	5	11.7	11.6
Zinc 2nd Cleaner			20				2	4	11.8	11.9
Zinc 3rd Cleaner			-				2	3	12.1	12.0

TEST NO. 21 - III

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1250	300				20				9.5
Lead Ro/Sc			40/60				2	3/5	9.4	9.2
Lead Regrind	500	200				20				10.4
Lead 1st Cleaner			50				2	5	10.5	10.6
Lead 2nd Cleaner			40				2	4	10.5	10.4
Lead 3rd Cleaner			30				2	3	10.5	10.5
Lead 4th Cleaner			20				2	2	10.5	10.5
Zinc Conditioning				1000			10		11.5	11.3
Zinc Ro/Sc			50/50				2	3/4	11.3	11.2
Zinc Regrind				200	1000	20				11.5
Zinc 1st Cleaner			50				2	5	11.4	11.5
Zinc 2nd Cleaner			20				2	4	11.8	11.7
Zinc 3rd Cleaner			-				2	3	12.1	12.1

TEST NO. 21 - IV

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1250	300				20				9.6
Lead Ro/Sc			40/60				2	3/5	9.4	9.4
Lead Regrind	500	200				20				10.5
Lead 1st Cleaner			50				2	5	10.5	10.5
Lead 2nd Cleaner			40				2	4	10.5	10.4
Lead 3rd Cleaner			30				2	3	10.5	10.3
Lead 4th Cleaner			20				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.4	11.3
Zinc Ro/Sc			50/50					3/5	11.0	11.1
Zinc Regrind				200	1000	20				11.7
Zinc 1st Cleaner			50				2	5	11.7	11.5
Zinc 2nd Cleaner			20				2	4	12.0	12.0
Zinc 3rd Cleaner			-				2	3	12.2	12.2

TEST NO. 21 - V

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1250	300				20				9.1
Lead Ro/Sc			40/50				2	3/5	9.5	9.4
Lead Regrind	500	200				20				10.6
Lead 1st Cleaner			50				2	5	10.6	10.5
Lead 2nd Cleaner			40				2	4	10.5	10.4
Lead 3rd Cleaner			30				2	3	10.5	10.5
Lead 4th Cleaner			20				2	2	10.6	10.4
Zinc Conditioning				1000			10		11.5	11.5
Zinc Ro/Sc			50/50				2	3/4	11.5	11.5
Zinc Regrind				200	1000	20				11.7
Zinc 1st Cleaner			50				2	5	11.7	11.5
Zinc 2nd Cleaner			20				2	4	12.0	12.0
Zinc 3rd Cleaner			-				2	3	12.2	12.2

Test No. 21

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Lead Concentrate I	1.00	65.7	4.24	10.23	1.01
Lead Concentrate II	1.66	63.4	4.68	16.39	1.81
Lead Concentrate III	1.78	59.7	5.62	16.55	2.37
Lead Concentrate IV	1.89	55.8	5.28	16.42	2.37
Lead Concentrate V	2.01	56.4	5.78	17.66	2.75
Lead Scavenger Conc.	5.18	3.27	4.05	2.64	4.97
Lead Cleaner Tails 4	.37	25.3	9.00	1.46	.79
Lead Cleaner Tails 3	.63	18.9	8.70	1.85	1.30
Lead Cleaner Tails 2	.96	13.0	7.93	1.94	1.81
Lead Cleaner Tails 1	2.78	5.00	6.45	2.16	4.25
Zinc Concentrate I	.69	.96	54.3	.10	8.88
Zinc Concentrate II	1.06	1.22	53.1	.20	13.35
Zinc Concentrate III	.85	1.00	54.3	.13	10.94
Zinc Concentrate IV	.96	1.16	53.4	.17	12.16
Zinc Concentrate V	1.06	1.10	54.9	.18	13.80
Zinc Scavenger Conc.	2.61	3.01	3.74	1.22	2.31
Zinc Cleaner Tails 3	.12	2.93	37.5	.05	1.07
Zinc Cleaner Tails 2	.57	4.10	20.0	.36	2.70
Zinc Cleaner Tails 1	1.63	3.77	13.8	.96	5.33
Tails I	8.89	.86	.35	1.19	.74
Tails II	16.48	.66	.28	1.69	1.09
Tails III	14.81	.76	.31	1.75	1.09
Tails IV	17.07	.97	.46	2.58	1.86
Tails V	14.94	.95	.35	2.21	1.24
Calculated Head	100.00	6.42	4.22	100.00	100.00

Grade Recovery Data for Last Two Cycles

Test No. 21

Cycle 4

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	6.42	4.22	100.00	100.00
Lead	9.92	55.8	5.28	86.2	12.4
Zinc	6.20	1.16	53.4	1.12	78.5
Tails	83.88	.97	.46	12.7	9.14

Cycle 5

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	6.42	4.22	100.00	100.00
Lead	9.85	56.4	5.78	86.5	13.5
Zinc	6.11	1.10	54.9	1.05	79.5
Tails	84.04	.95	.35	12.4	6.97

NOTE: The recoveries based on 3 product formula calculations.

KM076

TEST NO. 22

PURPOSE: Preliminary Evaluation - Fine Grind

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: Type 4K "-ve 11%"

GRIND: 30 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				30				9.2
Lead Ro/Sc			70				2	5	9.2	9.3
Lead Regrind	1000	200				15				10.5
Lead 1st Cleaner			40				2	5	10.5	10.4
Lead 2nd Cleaner			30				2	4	10.5	10.5
Lead 3rd Cleaner			20				2	3	10.5	10.2
Lead 4th Cleaner			-				2	2	10.5	10.2
Zinc Conditioning				500			10		11.1	11.1
Zinc Ro/Sc			70				2	5	11.2	11.2
Zinc Regrind				200	1000	15				11.6
Zinc 1st Cleaner			60				2	5	11.6	11.6
Zinc 2nd Cleaner			20				2	3	12.0	12.0
Zinc 3rd Cleaner			-				2	2	12.0	12.0

Test No. 22

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	4.08	55.40	4.64			51.84	4.71		
Pb Cleaner Tails 4	1.21	26.20	5.81			7.26	1.75		
Pb Cleaner Tails 3	1.09	18.00	4.65			4.51	1.26		
Pb Cleaner Tails 2	1.88	12.30	3.92			5.32	1.84		
Pb Cleaner Tails 1	12.66	3.69	2.82			10.71	8.69		
Zn Cleaner Conc. 3	4.16	2.00	50.40			1.91	52.16		
Zn Cleaner Tails 3	0.62	4.45	27.30			0.63	4.22		
Zn Cleaner Tails 2	1.49	3.68	12.70			1.25	4.70		
Zn Cleaner Tails 1	16.70	1.30	2.40			4.98	9.99		
Tails	56.12	0.90	0.75			11.59	10.48		
Calculated Head	100.00	4.36	4.01			100.00	100.00		

KM076

TEST NO. 23

PURPOSE: Preliminary Evaluation - Fine Grind

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: Type 4K "+ve 11%"

GRIND: 30 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				30				8.9
Lead Conditioning			50				2		9.6	9.5
Lead Ro/Sc			50					6	9.5	9.1
Lead Regrind	1000	200				15				10.6
Lead 1st Cleaner			40				2	5	10.6	10.4
Lead 2nd Cleaner			30				2	4	10.5	10.3
Lead 3rd Cleaner			20				2	3	10.5	10.4
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.1	11.0
Zinc Ro/Sc			70				2	6	11.0	10.9
Zinc Regrind				200	1000	15				11.6
Zinc 1st Cleaner			50				2	5	11.6	11.5
Zinc 2nd Cleaner			20				2	3	11.8	11.7
Zinc 3rd Cleaner			-				2	2	12.1	12.0

Test No. 23

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	8.70	71.60	3.90			73.74	5.89		
Pb Cleaner Tails 4	0.74	39.50	10.00			3.47	1.29		
Pb Cleaner Tails 3	1.25	22.80	13.40			3.38	2.91		
Pb Cleaner Tails 2	2.49	11.30	12.80			3.34	5.55		
Pb Cleaner Tails 1	11.76	5.40	11.80			7.52	24.09		
Zn Cleaner Conc. 3	5.21	1.40	54.60			0.86	49.36		
Zn Cleaner Tails 3	0.60	5.55	16.60			0.40	1.74		
Zn Cleaner Tails 2	1.41	3.40	7.79			0.57	1.91		
Zn Cleaner Tails 1	8.84	1.82	2.53			1.91	3.88		
Tails	59.00	0.69	0.33			4.82	3.38		
Calculated Head	100.00	8.44	5.76			100.00	100.00		

KM076

TEST NO. 24

PURPOSE: Preliminary Evaluation - Fine Grind

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: Type DC "-ve 11%"

GRIND: 30 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				30				9.4
Lead Conditioning			50				2		9.4	9.5
Lead Ro/Sc			50					6	9.4	9.2
Lead Regrind	1000	200				15				10.6
Lead 1st Cleaner			40				2	5	10.6	10.4
Lead 2nd Cleaner			30				2	4	10.5	10.4
Lead 3rd Cleaner			20				2	3	10.5	10.2
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				500			10		11.0	11.1
Zinc Ro/Sc			70				2	7	11.0	11.0
Zinc Regrind						15				11.8
Zinc 1st Cleaner			50				2	5	11.8	11.7
Zinc 2nd Cleaner			20				2	3	12.0	12.0
Zinc 3rd Cleaner			-				2	2	12.1	12.1

Test No. 24

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	3.64	62.00	6.15			60.98	4.54		
Pb Cleaner Tails 4	2.20	25.60	12.80			15.22	5.72		
Pb Cleaner Tails 3	0.95	14.80	11.10			3.81	2.14		
Pb Cleaner Tails 2	2.88	6.90	8.23			5.38	4.82		
Pb Cleaner Tails 1	16.97	1.41	4.07			6.47	14.02		
Zn Cleaner Conc. 3	4.20	0.90	57.70			1.02	49.18		
Zn Cleaner Tails 3	0.53	1.83	40.70			0.26	4.41		
Zn Cleaner Tails 2	1.30	1.40	15.60			0.49	4.13		
Zn Cleaner Tails 1	11.09	0.50	2.16			1.50	4.86		
Tails	56.23	0.32	0.54			4.87	6.17		
Calculated Head	100.00	3.70	4.92			100.00	100.00		

KM076

TEST NO. 25

PURPOSE: Preliminary Evaluation - Fine Grind

PROCEDURE: Standard Open Circuit Cleaner Test

FEED: Type DC "+ve 11%"

GRIND: 30 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				30				9.4
Lead Conditioning			50				2		9.4	9.3
Lead Ro/Sc			50					10	9.3	9.1
Lead Regrind	1000	200				15				10.6
Lead 1st Cleaner			40				2	5	10.6	10.5
Lead 2nd Cleaner			30				2	4	10.5	10.4
Lead 3rd Cleaner			20				2	3	10.5	10.4
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.0	11.0
Zinc Ro/Sc			70				2	10	11.0	10.9
Zinc Regrind				200	1000	15				11.8
Zinc 1st Cleaner			50				2	5	11.8	11.6
Zinc 2nd Cleaner			20				2	3	11.9	11.7
Zinc 3rd Cleaner			-				2	2	12.0	11.9

Test No. 25

Product	Weight	Assays %				Distribution			
	%	Pb	Zn			Pb	Zn		
Pb Cleaner Conc. 4	9.04	57.90	11.30			83.45	9.87		
Pb Cleaner Tails 4	0.44	23.60	19.20			1.67	0.82		
Pb Cleaner Tails 3	0.58	18.20	18.00			1.69	1.01		
Pb Cleaner Tails 2	1.50	12.30	17.60			2.95	2.55		
Pb Cleaner Tails 1	7.89	3.50	15.60			4.41	11.90		
Zn Cleaner Conc. 3	12.50	0.76	57.60			1.52	69.57		
Zn Cleaner Tails 3	0.29	2.43	16.00			0.11	0.44		
Zn Cleaner Tails 2	1.30	1.46	5.64			0.30	0.71		
Zn Cleaner Tails 1	13.37	0.56	1.15			1.19	1.49		
Tails	53.08	0.32	0.32			2.71	1.64		
Calculated Head	100.00	6.27	10.35			100.00	100.00		

KM076

TEST NO. 26 - I

PURPOSE: Lock cycle - Fine grind

PROCEDURE: Standard lock cycle using ultra fine primary and regrind

FEED: Type 4G

GRIND: 30 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				30				9.7
Lead Ro/Sc			50/50					3/5	9.7	9.7
Lead Regrind	1000	200				30				10.8
Lead 1st Cleaner			70				2	7	10.8	10.3
Lead 2nd Cleaner			30				2	5	10.5	10.3
Lead 3rd Cleaner			10				2	4	10.5	10.3
Lead 4th Cleaner			-				2	3	10.5	10.5
Zinc Conditioning				1000			10		11.2	11.2
Zinc Ro/Sc			40/50					3/4	11.3	11.2
Zinc Regrind				200	1000	30				11.6
Zinc 1st Cleaner			40				2	5	11.6	11.5
Zinc 2nd Cleaner			30				2	4	11.8	11.8
Zinc 3rd Cleaner			20				2	3	12.2	12.3

TEST NO. 26 - II

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				30				9.6
Lead Ro/Sc			50/50				2	3/5	9.6	9.6
Lead Regrind	1000	200				30				10.8
Lead 1st Cleaner			70				2	7	10.8	10.3
Lead 2nd Cleaner			30				2	5	10.6	10.5
Lead 3rd Cleaner			10				2	4	10.6	10.5
Lead 4th Cleaner			-				2	3	10.6	10.5
Zinc Conditioning				1000			10		11.2	11.2
Zinc Ro/Sc			40/50					3/4	11.2	11.1
Zinc Regrind				200	1000	30				11.5
Zinc 1st Cleaner			50				2	5	11.5	11.5
Zinc 2nd Cleaner			40				2	4	11.8	11.9
Zinc 3rd Cleaner			30				2	3	12.2	12.1

TEST NO. 26 - III

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				30				9.6
Lead Ro/Sc			50/50				2	3/5	9.6	9.6
Lead Regrind	1000	200				30				10.8
Lead 1st Cleaner			70				2	7	10.8	10.5
Lead 2nd Cleaner			30				2	5	10.5	10.5
Lead 3rd Cleaner			-				2	4	10.5	10.5
Lead 4th Cleaner			-				2	3	10.5	10.5
Zinc Conditioning				1000			10		11.2	11.2
Zinc Ro/Sc			40/50					3/4	11.2	11.0
Zinc Regrind				200	1000	30				11.5
Zinc 1st Cleaner			50				2	5	11.5	11.4
Zinc 2nd Cleaner			40				2	4	11.8	11.7
Zinc 3rd Cleaner			30				2	3	12.1	12.2

TEST NO. 26 - IV

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				30				9.3
Lead Ro/Sc			50/50				2	3/5	9.4	9.3
Lead Regrind	1000	200				30				10.9
Lead 1st Cleaner			70				2	7	10.9	10.5
Lead 2nd Cleaner			30				2	5	10.5	10.5
Lead 3rd Cleaner			10				2	4	10.5	10.5
Lead 4th Cleaner			-				2	3	10.5	10.5
Zinc Conditioning				1000			10		11.1	11.2
Zinc Ro/Sc			50/50					3/4	11.1	11.2
Zinc Regrind				200	1000	30				11.6
Zinc 1st Cleaner			50				2	5	11.6	11.6
Zinc 2nd Cleaner			40				2	4	11.8	11.5
Zinc 3rd Cleaner			30				2	3	12.1	12.0

TEST NO. 26 - V

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				30				9.3
Lead Ro/Sc			50/50				2	3/5	9.5	9.5
Lead Regrind	1000	100				30				10.8
Lead 1st Cleaner			70				2	7	10.8	10.5
Lead 2nd Cleaner			30				2	5	10.5	10.3
Lead 3rd Cleaner			10				2	4	10.5	10.3
Lead 4th Cleaner			-				2	3	10.5	
Zinc Conditioning				1000			10		11.5	11.4
Zinc Ro/Sc			50/50					3/4	11.0	11.0
Zinc Regrind				200	1000	30				11.6
Zinc 1st Cleaner			50				2	5	11.6	11.4
Zinc 2nd Cleaner			40				2	4	11.8	11.7
Zinc 3rd Cleaner			30				2	3	12.1	12.2

Test No. 26

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Lead Concentrate I	1.08	65.2	5.80	11.52	.99
Lead Concentrate II	1.28	65.2	5.30	13.66	1.08
Lead Concentrate III	1.69	60.0	6.60	16.59	1.77
Lead Concentrate IV	1.61	61.8	6.60	16.28	1.69
Lead Concentrate V	1.75	58.7	7.20	16.81	2.00
Lead Scavenger Conc.	3.59	5.58	10.4	3.28	5.93
Lead Cleaner Tails 4	.51	30.0	12.3	2.50	1.00
Lead Cleaner Tails 3	.55	19.6	12.8	1.76	1.12
Lead Cleaner Tails 2	1.34	11.2	12.7	2.46	2.70
Lead Cleaner Tails 1	1.86	7.18	11.8	2.19	3.49
Zinc Concentrate I	.43	.78	59.1	.05	4.04
Zinc Concentrate II	1.15	.78	58.7	.15	10.72
Zinc Concentrate III	1.48	1.02	58.3	.25	13.70
Zinc Concentrate IV	1.69	1.10	57.7	.30	15.49
Zinc Concentrate V	1.70	1.16	56.9	.32	15.36
Zinc Scavenger Conc.	1.68	3.32	10.0	.91	2.67
Zinc Cleaner Tails 3	.38	3.63	40.5	.23	2.44
Zinc Cleaner Tails 2	.66	4.00	27.1	.43	2.84
Zinc Cleaner Tails 1	1.58	3.77	18.0	.97	4.52
Tails I	12.36	.50	.37	1.01	.73
Tails II	15.73	.74	.51	1.90	1.27
Tails III	12.74	.76	.55	1.58	1.11
Tails IV	17.18	.85	.62	2.39	1.69
Tails V	15.98	.90	.65	2.35	1.65
Calculated Head	100.00	6.11	6.30	100.00	100.00

Grade Recovery Data for Last Two Cycles

Test No. 26

Cycle 4

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	6.11	6.30	100.00	100.00
Lead	8.59	61.8	6.6	86.88	9.00
Zinc	9.05	1.10	57.7	1.63	82.89
Tails	82.36	.85	.62	11.46	8.11

Cycle 5

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	6.11	6.30	100.00	100.00
Lead	8.97	58.7	7.2	86.18	10.25
Zinc	9.00	1.16	56.9	1.71	81.29
Tails	82.03	.90	.65	12.08	8.46

NOTE: The recoveries based on 3 product formula calculations.

KM076

TEST NO. 27 - I

PURPOSE: Lock Cycle Test - Fine Grind

PROCEDURE: Vary Primary Grind

FEED: 1 kg. Type 4E Composite

GRIND: 30 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	3000	300				30				9.8
Lead Ro/Sc			50/50				2	3/7	9.8	9.5
Lead Regrind	1000	200				20				10.6
Lead 1st Cleaner			50				2	5	10.6	10.2
Lead 2nd Cleaner			20				2	4	10.5	10.3
Lead 3rd Cleaner			10				2	3	10.5	10.5
Lead 4th Cleaner			-				2	3	10.5	10.5
Zinc Conditioning				1000			10		11.0	11.0
Zinc Ro/Sc			50/50				2	3/7	11.1	11.1
Zinc Regrind				200	1000	20				11.6
Zinc 1st Cleaner			50				2	5	11.6	11.6
Zinc 2nd Cleaner			30				2	3	11.8	11.8
Zinc 3rd Cleaner			20				2	3	12.0	12.0

TEST NO. 27 - II

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	3000	300				30				9.5
Lead Ro/Sc			50/50				2	3/7	9.5	9.5
Lead Regrind	1000	200				20				10.6
Lead 1st Cleaner			50				2	5	10.6	10.3
Lead 2nd Cleaner			20				2	4	10.5	10.4
Lead 3rd Cleaner			10				2	3	10.5	10.5
Lead 4th Cleaner			-				2	3	10.5	10.5
Zinc Conditioning				1000			10		11.0	11.0
Zinc Ro/Sc			50/50				2	3/7	11.0	11.0
Zinc Regrind				200	1000	20				11.6
Zinc 1st Cleaner			50				2	5	11.6	11.5
Zinc 2nd Cleaner			30				2	4	11.8	11.7
Zinc 3rd Cleaner			20				2	3	12.2	12.2

TEST NO. 27 - III

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	3000	300				30				9.6
Lead Ro/Sc			50/50				2	3/7	9.6	9.6
Lead Regrind	1000	200				20				10.6
Lead 1st Cleaner			50				2	5	10.6	10.3
Lead 2nd Cleaner			20				2	4	10.5	10.4
Lead 3rd Cleaner			10				2	3	10.5	10.5
Lead 4th Cleaner			-				2	3	10.5	10.5
Zinc Conditioning				1000			10		11.0	11.0
Zinc Ro/Sc			50/50					3/7	11.2	11.1
Zinc Regrind				200	1000	20				11.6
Zinc 1st Cleaner			50				2	5	11.6	11.5
Zinc 2nd Cleaner			30				2	4	11.8	11.7
Zinc 3rd Cleaner			20				2	3	12.1	12.1

TEST NO. 27 - IV

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	3000	300				30				9.8
Lead Ro/Sc			50/50				2	3/7	9.8	9.8
Lead Regrind	1000	200				20				10.6
Lead 1st Cleaner			50				2	5	10.6	10.3
Lead 2nd Cleaner			20				2	4	10.5	10.4
Lead 3rd Cleaner			10				2	3	10.5	10.5
Lead 4th Cleaner			-				2	3	10.5	10.5
Zinc Conditioning				1000			10		11.0	11.0
Zinc Ro/Sc			50/50				2	3/7	11.2	11.1
Zinc Regrind				200	1000	20				11.6
Zinc 1st Cleaner			50				2	5	11.6	11.5
Zinc 2nd Cleaner			30				2	4	11.9	11.8
Zinc 3rd Cleaner			20				2	3	12.1	12.1

TEST NO. 27 - V

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	3000	300				30				9.6
Lead Ro/Sc			50/50				2	3/7	9.6	9.6
Lead Regrind	1000	200				20				10.6
Lead 1st Cleaner			50				2	5	10.6	10.3
Lead 2nd Cleaner			20				2	4	10.5	10.4
Lead 3rd Cleaner			10				2	3	10.5	10.5
Lead 4th Cleaner			-				2	3	10.5	10.5
Zinc Conditioning				1000			10		11.0	11.0
Zinc Ro/Sc			50/50				2	3/7	11.2	11.1
Zinc Regrind				200	1000	20				11.6
Zinc 1st Cleaner			40				2	5	11.6	11.6
Zinc 2nd Cleaner			30				2	4	11.8	11.8
Zinc 3rd Cleaner			20				2	3	12.0	12.0

Test No. 27

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Lead Concentrate I	1.44	57.8	4.13	14.71	1.00
Lead Concentrate II	1.50	53.5	4.49	14.18	1.14
Lead Concentrate III	2.16	46.6	5.42	17.79	1.98
Lead Concentrate IV	1.37	53.9	4.39	13.05	1.02
Lead Concentrate V	1.62	50.0	5.00	14.32	1.37
Lead Scavenger Conc.	4.81	3.92	8.75	3.33	7.10
Lead Cleaner Tails 4	.85	28.0	12.7	4.21	1.82
Lead Cleaner Tails 3	1.23	18.8	13.2	4.09	2.74
Lead Cleaner Tails 2	1.76	12.8	12.3	3.98	3.65
Lead Cleaner Tails 1	3.26	4.45	10.6	2.56	5.83
Zinc Concentrate I	.78	.42	57.7	.06	7.60
Zinc Concentrate II	1.33	1.15	56.2	.27	12.62
Zinc Concentrate III	1.37	1.11	55.8	.27	12.90
Zinc Concentrate IV	1.42	1.00	55.3	.25	13.25
Zinc Concentrate V	1.24	.94	56.0	.21	11.72
Zinc Scavenger Conc.	2.04	2.15	10.0	.78	3.44
Zinc Cleaner Tails 3	.26	2.78	40.0	.13	1.76
Zinc Cleaner Tails 2	.46	2.98	29.8	.24	2.31
Zinc Cleaner Tails 1	1.11	2.50	16.4	.49	3.07
Tails I	10.25	.30	.23	.54	.40
Tails II	14.36	.37	.33	.94	.80
Tails III	15.09	.37	.26	.99	.66
Tails IV	15.46	.45	.30	1.23	.78
Tails V	14.83	.54	.39	1.42	.98
Calculated Head	100.00	5.66	5.93	100.00	100.00

Grade Recovery Data for Last Two Cycles

Test No. 27

Cycle 4

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	5.66	5.93	100.00	100.00
Lead	9.65	53.9	4.39	91.90	7.14
Zinc	9.52	1.00	55.3	1.68	88.78
Tails	80.83	.45	.30	6.43	4.09

Cycle 5

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	5.66	5.93	100.00	100.00
Lead	10.28	50.0	5.00	90.81	8.67
Zinc	9.11	.94	56.0	1.51	86.03
Tails	80.61	.54	.39	7.69	5.30

NOTE: The recoveries based on 3 product formula calculations.

KM1076

TEST NO. 28 - I

PURPOSE: Cycle Test at ultra-fine grind

PROCEDURE: Standard cycle test

FEED: Type 4A Composite

GRIND: 30 minutes in laboratory rod mill at 65% solids

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				30				9.6
Lead Ro/Sc			40/50				2	3/5	9.6	9.3
Lead Regrind	1000	200				20				10.6
Lead 1st Cleaner			50				2	5	10.5	10.2
Lead 2nd Cleaner			30				2	4	10.5	10.3
Lead 3rd Cleaner			20				2	3	10.5	10.4
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.0	11.0
Zinc Ro/Sc			50/50				2	3/7	11.0	11.0
Zinc Regrind				200	1000	20				11.7
Zinc 1st Cleaner			50				2	5	11.7	11.7
Zinc 2nd Cleaner			20				2	4	11.8	11.8
Zinc 3rd Cleaner			-				2	3	12.0	12.0

TEST NO. 28 - II

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				30				9.7
Lead Ro/Sc			40/60				2	3/5	9.6	9.5
Lead Regrind	1000	200				20				10.6
Lead 1st Cleaner			50				2	5	10.6	10.4
Lead 2nd Cleaner			30				2	4	10.6	10.5
Lead 3rd Cleaner			20				2	3	10.5	10.4
Lead 4th Cleaner			-				2	2	10.5	10.4
Zinc Conditioning				1000			10		11.0	11.0
Zinc Ro/Sc			50/50				2	3/7	11.0	11.0
Zinc Regrind				200	1000	20				11.7
Zinc 1st Cleaner			50				2	5	11.7	11.5
Zinc 2nd Cleaner			20				2	4	11.8	11.8
Zinc 3rd Cleaner			-				2	3	12.0	12.1

TEST NO. 28 - III

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				30				9.7
Lead Ro/Sc			40/60				2	3/5	9.6	9.5
Lead Regrind	1000	200				20				10.7
Lead 1st Cleaner			50				2	5	10.6	10.6
Lead 2nd Cleaner			30				2	4	10.5	10.4
Lead 3rd Cleaner			20				2	3	10.5	10.6
Lead 4th Cleaner			-				2	2	10.5	10.3
Zinc Conditioning				1000			10		11.0	11.0
Zinc Ro/Sc			50/50				2	3/7	11.0	11.0
Zinc Regrind				200	1000	20				11.6
Zinc 1st Cleaner			30				2	5	11.7	11.5
Zinc 2nd Cleaner			20				2	4	11.9	11.7
Zinc 3rd Cleaner			-				2	3	12.1	12.2

TEST NO. 26 - IV

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				30				9.5
Lead Ro/Sc			40/60				2	3/5	9.5	9.4
Lead Regrind	1000	200				20				10.6
Lead 1st Cleaner			50				2	5	10.6	10.5
Lead 2nd Cleaner			40				2	4	10.5	10.4
Lead 3rd Cleaner			20				2	3	10.4	10.4
Lead 4th Cleaner			-				2	2	10.5	10.3
Zinc Conditioning				1000			10		11.0	11.0
Zinc Ro/Sc			50/50				2	3/7	11.0	11.0
Zinc Regrind				200	1000	20				11.6
Zinc 1st Cleaner			50				2	5	11.6	11.5
Zinc 2nd Cleaner			20				2	4	11.8	11.8
Zinc 3rd Cleaner			-				2	3	12.0	12.0

TEST NO. 28 - V

Stage	Reagents added g/tonne					Time, Minutes			pH	
	Na_2CO_3	NaCN	Z-11	$CuSO_4$	CaO	Grind	Cond	Froth	Start	Finish
Primary Grind	1000	300				30				9.5
Lead Ro/Sc			40/60				2	3/5	9.4	9.2
Lead Regrind	1000	200				20				10.6
Lead 1st Cleaner			50				2	5	10.6	10.5
Lead 2nd Cleaner			40				2	4	10.5	10.4
Lead 3rd Cleaner			20				2	3	10.7	10.6
Lead 4th Cleaner			-				2	2	10.5	10.2
Zinc Conditioning				1000			10		11.0	11.0
Zinc Ro/Sc			50/50				2	3/7	11.0	11.0
Zinc Regrind				200	1000	20				11.7
Zinc 1st Cleaner			50				2	5	11.7	11.7
Zinc 2nd Cleaner			20				2	4	11.8	11.9
Zinc 3rd Cleaner			-				2	3	12.1	12.0

Test No. 28

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Lead Concentrate I	.68	67.6	6.74	11.27	.54
Lead Concentrate II	.80	65.8	7.40	12.91	.69
Lead Concentrate III	1.17	59.6	6.46	17.10	1.16
Lead Concentrate IV	1.38	58.1	9.20	19.66	1.49
Lead Concentrate V	1.47	53.1	10.0	19.14	1.73
Lead Scavenger Conc.	3.41	2.55	12.7	2.13	5.08
Lead Cleaner Tails 4	.51	18.4	16.7	2.30	1.00
Lead Cleaner Tails 3	.66	12.9	16.0	2.09	1.24
Lead Cleaner Tails 2	.71	8.73	15.4	1.52	1.28
Lead Cleaner Tails 1	1.37	6.00	15.7	2.02	2.52
Zinc Concentrate I	1.66	.54	57.4	.22	11.18
Zinc Concentrate II	2.38	.60	56.2	.35	15.70
Zinc Concentrate III	2.25	.56	55.7	.31	14.71
Zinc Concentrate IV	2.28	.66	55.0	.37	14.72
Zinc Concentrate V	2.84	.68	55.0	.47	18.33
Zinc Scavenger Conc.	6.74	.88	2.00	1.45	1.58
Zinc Cleaner Tails 3	.36	2.56	24.4	.23	1.03
Zinc Cleaner Tails 2	1.05	2.13	17.6	.55	2.17
Zinc Cleaner Tails 1	2.06	1.69	8.30	.85	2.01
Tails I	8.61	.22	.15	.46	.15
Tails II	13.88	.31	.22	1.05	.36
Tails III	10.82	.28	.22	.74	.28
Tails IV	14.77	.32	.27	1.16	.47
Tails V	18.14	.37	.27	1.65	.57
Calculated Head	100.00	4.08	8.52	100.00	100.00

Grade Recovery Data for Last Two Cycles

Test No. 28

Cycle 4

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	4.08	8.52	100.00	100.00
Lead	6.42	58.1	9.2	91.42	6.93
Zinc	14.03	.66	55.0	2.27	90.57
Tails	79.55	.32	.27	6.24	2.52

Cycle 5

Product	Weight	Assays %		Distribution	
	%	Pb	Zn	Pb	Zn
Head	100.00	4.08	8.52	100.00	100.00
Lead	6.95	53.1	10.0	90.45	8.16
Zinc	13.84	.68	55.0	2.31	89.34
Tails	79.21	.37	.27	7.18	2.52

NOTE: The recoveries based on 3 product formula calculations.

APPENDIX III

BOND TEST DATA SUMMARY

The Bond tests were performed on composites of both grade groups for each of the ore types shown. The data then reflects the median grindability of the ore type.

Ore Type	Bond Index (KWH/Ton)
4G	5.5
4E	6.5
4A	11.2
4DC	8.1
4K	6.7

KAMLOOPS RESEARCH & ASSAY

LABORATORY LIMITED

BOND BALL MILL GRINDABILITY TEST

TEST NO.	KM076
ORE SAMPLE	Type 4G
SIEVE SIZE TESTED	150 Mesh
WEIGHT OF 700 ML. SAMPLE	2413
1/3.5 OF WEIGHT	689.4
% MINUS SIEVE SIZE TESTED	32.1

Cycle	New Feed (g)	No. of Rev	Grams of -150 Mesh			
			In Product	In Feed	Net Product	Net Per Rev
1	2413	100	1087	775	312	3.12
2	1087	109	764	349	415	3.81
3	764	117	704	245	459	3.92
4	704	118	689	226	463	3.92
5						
6						
7						
8						
9						
10						

BONDS WORK INDEX FORMULA

$$Wi = 44.5/(Pi^{.23} \times Gbp^{.82} (10/\sqrt{P} - 10/\sqrt{F}))$$

Where:

Wi = Work Index (KWH/Ton)	=	5.5	KWH/Ton
Pi = Screen Size Tested (microns)	=	106	µm
Gbp = Net grams u/s produced per rev of test mill	=	3.92	g
P = 80% passing size of test product (microns)	=	75	µm
F = 80% passing size of test feed (microns)	=	1700	µm

NOTES:
1. Test results based on submitted sample.
2. Bond Formula by Bond, Fred C. "Crushing and Grinding Calculations Part I eq'n 8" in British Chemical Engineering.
3. Through experimentation accuracy of result is believed to be within 10%.

KAMLOOPS RESEARCH & ASSAY

LABORATORY LIMITED

BOND BALL MILL GRINDABILITY TEST

TEST NO.	KM076
ORE SAMPLE	Type 4E
SIEVE SIZE TESTED	150 Mesh
WEIGHT OF 700 ML. SAMPLE	2264
1/3.5 OF WEIGHT	646.9
% MINUS SIEVE SIZE TESTED	26.8

Cycle	New Feed (g)	No. of Rev	Grams of -150 Mesh			
			In Product	In Feed	Net Product	Net Per Rev
1	2264	100	819	606.8	212.2	2.12
2	819	202	777	219.4	557.6	2.76
3	777	159	682.5	208.2	474.3	2.98
4	682.5	156	649.7	182.9	466.8	2.99
5	649.7	158	647.0	174.1	472.9	2.99
6						
7						
8						
9						
10						

BONDS WORK INDEX FORMULA

$$Wi = 44.5/(Pi^{.23} \times Gbp^{.82} (10/\sqrt{P} - 10/\sqrt{F}))$$

Where:

Wi = Work Index (KWH/Ton)	=	6.5	KWH/Ton
Pi = Screen Size Tested (microns)	=	106	µm
Gbp = Net grams u/s produced per rev of test mill	=	2.99	g
P = 80% passing size of test product (microns)	=	71	µm
F = 80% passing size of test feed (microns)	=	1950	µm

NOTES:
1. Test results based on submitted sample.
2. Bond Formula by Bond, Fred C. "Crushing and Grinding Calculations Part I eq'n 8" in British Chemical Engineering.
3. Through experimentation accuracy of result is believed to be within 10%.

KAMLOOPS RESEARCH & ASSAY

LABORATORY LIMITED

BOND BALL MILL GRINDABILITY TEST

TEST NO.	KM076
ORE SAMPLE	Type 4DC
SIEVE SIZE TESTED	150 Mesh
WEIGHT OF 700 ML. SAMPLE	2013
1/3.5 OF WEIGHT	575.1
% MINUS SIEVE SIZE TESTED	23.3

Cycle	New Feed (g)	No. of Rev	Grams of -150 Mesh			
			In Product	In Feed	Net Product	Net Per Rev
1	2013	100	650	469.0	181	1.81
2	650	234	659	151.5	507.5	2.17
3	659	194	604	153.5	450.5	2.32
4	604	187	587.7	140.7	447	2.39
5	587.7	183	572	136.9	435.1	2.38
6						
7						
8						
9						
10						

BONDS WORK INDEX FORMULA

$$Wi = 44.5/(Pi^{.23} \times Gbp^{.82} (10/\sqrt{P} - 10/\sqrt{F}))$$

Where:

Wi = Work Index (KWH/Ton)	=	8.1	KWH/Ton
Pi = Screen Size Tested (microns)	=	106	µm
Gbp = Net grams u/s produced per rev of test mill	=	2.38	g
P = 80% passing size of test product (microns)	=	77	µm
F = 80% passing size of test feed (microns)	=	2100	µm

NOTES:
1. Test results based on submitted sample.
2. Bond Formula by Bond, Fred C. "Crushing and Grinding Calculations Part I eq'n 8" in British Chemical Engineering.
3. Through experimentation accuracy of result is believed to be within 10%.

KAMLOOPS RESEARCH & ASSAY

LABORATORY LIMITED

BOND BALL MILL GRINDABILITY TEST

TEST NO.	KM076
ORE SAMPLE	Type 4A
SIEVE SIZE TESTED	150 Mesh
WEIGHT OF 700 ML. SAMPLE	1646
1/3.5 OF WEIGHT	470.3
% MINUS SIEVE SIZE TESTED	21.0

Cycle	New Feed (g)	No. of Rev	Grams of -150 Mesh			
			In Product	In Feed	Net Product	Net Per Rev
1	1646	100	469	345.6	123.4	1.23
2	462	303	535	97.0	438	1.45
3	535	247	502	112.4	389.6	1.58
4	502	231	477	105.4	371.6	1.61
5	477	230	483	100.2	382.8	1.66
6	483	222	471	101.4	369.6	1.66
7						
8						
9						
10						

BONDS WORK INDEX FORMULA

$$Wi = 44.5/(Pi^{.23} \times Gbp^{.82} (10/\sqrt{P} - 10/\sqrt{F}))$$

Where:

Wi = Work Index (KWH/Ton)	=	11.2	KWH/Ton
Pi = Screen Size Tested (microns)	=	106	µm
Gbp = Net grams u/s produced per rev of test mill	=	1.66	g
P = 80% passing size of test product (microns)	=	79	µm
F = 80% passing size of test feed (microns)	=	2000	µm

NOTES:
1. Test results based on submitted sample.
2. Bond Formula by Bond, Fred C. "Crushing and Grinding Calculations Part I eq'n 8" in British Chemical Engineering.
3. Through experimentation accuracy of result is believed to be within 10%.

KAMLOOPS RESEARCH & ASSAY

LABORATORY LIMITED

BOND BALL MILL GRINDABILITY TEST

TEST NO.	KM076
ORE SAMPLE	Type 4K
SIEVE SIZE TESTED	150 Mesh
WEIGHT OF 700 ML. SAMPLE	2295
1/3.5 OF WEIGHT	655.7
% MINUS SIEVE SIZE TESTED	26.7

Cycle	New Feed (g)	No. of Rev	Grams of -150 Mesh			
			In Product	In Feed	Net Product	Net Per Rev
1	2295	100	848	612.8	235.2	2.35
2	848	183	755	226.4	528.6	2.93
3	755	155	672	201.6	470.4	3.03
4	672	157	668	179.4	488.6	3.11
5	668	154	658	178.3	479.7	3.11
6						
7						
8						
9						
10						

BONDS WORK INDEX FORMULA

$$Wi = 44.5/(Pi^{.23} \times Gbp^{.82} (10/\sqrt{P} - 10/\sqrt{F}))$$

Where:

Wi = Work Index (KWH/Ton)	=	6.7	KWH/Ton
Pi = Screen Size Tested (microns)	=	106	µm
Gbp = Net grams u/s produced per rev of test mill	=	3.11	g
P = 80% passing size of test product (microns)	=	80	µm
F = 80% passing size of test feed (microns)	=	1850	µm

NOTES:
1. Test results based on submitted sample.
2. Bond Formula by Bond, Fred C. "Crushing and Grinding Calculations Part I eq'n 8" in British Chemical Engineering.
3. Through experimentation accuracy of result is believed to be within 10%.

APPENDIX IV

WARMAN CYCLOSIZER DATA

The cyclosizing was performed on a weighted composite of the last 2 cycles from the lock cycle tests. The data is summarized in the table below.

Ore Type	Test	Grind Time	K_{80} µm		
			Pb Con	Zn Con	Tails
4G	17	20	17	14	25
4G	26	30	12	14	22
4E	18	20	16	14	30
4E	27	30	15	14	25
4DC	19	20	16	16	31
4A	20	20	16	18	33
4A	28	30	15	16	27
4K	21	20	17	14	27

KAMLOOPS RESEARCH AND ASSAY LABORATORY LTD.

WARMAN CYCLOSIZER RESULTS

CLIENT: Cyprus Anvil - KM1076 DATE: March 18, 1982

SAMPLE NUMBER	076-17 Tails	076-18 Tails	076-19 Tails	076-20 Tails
SAMPLE WEIGHT	50.00	50.00	50.00	50.00
TEMPERATURE °C	7.0	7.0	7.0	7.0
SAMPLE SPECIFIC GRAVITY	4.37	4.33	3.50	3.03
FLOWRATE mm	160	180	180	180
ELUTRIATION TIME min	20	20	20	20
CORRECTION FACTORS (temp.)	1.195	1.195	1.195	1.195
(sp. gr.)	.70	.705	.815	.900
(flow)	1.012	1.012	1.012	1.012
(time)	.955	.955	.955	.955
OVERALL CORRECTION FACTOR	.808	.814	.941	1.039
SAMPLE WT. CYCLONE NO. 1	3.55	5.91	4.22	3.68
NO. 2	6.70	8.27	6.60	6.78
NO. 3	10.45	10.40	10.55	10.60
NO. 4	8.05	7.07	8.03	7.72
NO. 5	4.45	3.87	4.35	4.32
% RETAINED CYCLONE NO. 1	7.1	11.8	8.4	7.4
NO. 2	13.4	16.5	13.2	13.6
NO. 3	20.9	20.8	21.1	21.2
NO. 4	16.1	14.1	16.1	15.4
NO. 5	8.9	7.7	8.7	8.6
% PASSING CYCLONE NO. 1	92.9	88.2	91.6	92.6
NO. 2	79.5	71.7	78.4	79.0
NO. 3	58.6	50.9	57.3	57.8
NO. 4	42.5	36.8	41.2	42.4
NO. 5	33.6	29.1	32.5	33.8
de CYCLONE NO. 1	36.1	36.4	42.1	46.4
NO. 2	25.3	25.5	29.5	32.5
NO. 3	17.5	17.7	20.4	22.5
NO. 4	12.3	12.4	14.3	15.8
NO. 5	9.6	9.7	11.2	12.4

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:

KAMLOOPS RESEARCH AND ASSAY LABORATORY LTD.

WARMAN CYCLOSIZER RESULTS

CLIENT: Cyprus Anvil - KM076 DATE: March 18, 1982

SAMPLE NUMBER	076-21 Tails	076-17 Pb Con	076-18 Pb Con	076-19 Pb Con
SAMPLE WEIGHT	50.00	40.00	40.00	40.00
TEMPERATURE °C	7.0	7.0	7.0	7.0
SAMPLE SPECIFIC GRAVITY	4.16	5.97	5.97	5.99
FLOWRATE mm	180	180	180	180
ELUTRIATION TIME min	20	20	20	20
CORRECTION FACTORS (temp.)	1.195	1.195	1.195	1.195
(sp. gr.)	.725	.580	.580	.580
(flow)	1.012	1.012	1.012	1.012
(time)	.955	.955	.955	.955
OVERALL CORRECTION FACTOR	.837	670	.670	.670
SAMPLE WT. CYCLONE NO. 1	4.12	0.80	0.70	0.87
NO. 2	6.80	2.96	2.50	2.60
NO. 3	10.20	8.02	7.15	7.02
NO. 4	7.65	8.60	8.5	8.25
NO. 5	4.26	5.40	5.95	5.80
% RETAINED CYCLONE NO. 1	8.2	2.0	1.8	2.2
NO. 2	13.6	7.4	6.3	6.5
NO. 3	20.4	20.1	17.9	17.6
NO. 4	15.3	21.5	21.3	20.6
NO. 5	8.5	13.5	14.9	14.5
% PASSING CYCLONE NO. 1	91.8	98.0	98.2	97.8
NO. 2	78.2	90.6	91.9	91.3
NO. 3	57.8	70.5	74.0	73.7
NO. 4	42.5	49.0	52.7	53.1
NO. 5	34.0	35.5	37.8	38.6
de CYCLONE NO. 1	37.4	29.9	29.9	29.9
NO. 2	26.2	21.0	21.0	21.0
NO. 3	18.2	14.5	14.5	14.5
NO. 4	12.7	10.2	10.2	10.2
NO. 5	10.0	8.0	8.0	8.0

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:

KAMLOOPS RESEARCH AND ASSAY LABORATORY LTD.

WARMAN CYCLOSIZER RESULTS

CLIENT: Cyprus Anvil - KM076 DATE: March 18, 1982

SAMPLE NUMBER	076-20 Pb Con	076-21 Pb Con	076-17 Zn Con	076-18 Zn Con
SAMPLE WEIGHT	40.00	40.00	50.00	50.00
TEMPERATURE °C	7.0	7.0	7.0	7.0
SAMPLE SPECIFIC GRAVITY	5.50	6.10	4.12	4.20
FLOWRATE mm	180	180	180	180
ELUTRIATION TIME min	20	20	20	20
CORRECTION FACTORS (temp.)	1.195	1.195	1.195	1.195
(sp. gr.)	.605	.570	.730	.720
(flow)	1.012	1.012	1.012	1.012
(time)	.955	.955	.955	.955
OVERALL CORRECTION FACTOR	.699	.658	.843	.832
SAMPLE WT. CYCLONE NO. 1	0.77	1.25	0.45	0.63
NO. 2	2.20	3.55	0.77	1.22
NO. 3	5.60	8.20	3.60	4.19
NO. 4	7.30	8.15	7.43	6.57
NO. 5	5.20	5.05	7.11	5.85
% RETAINED CYCLONE NO. 1	1.9	3.1	0.9	1.3
NO. 2	5.5	8.9	1.5	2.4
NO. 3	14.0	20.5	7.2	8.4
NO. 4	18.3	20.4	14.9	13.1
NO. 5	13.0	12.6	14.2	11.7
% PASSING CYCLONE NO. 1	98.1	96.9	99.1	98.7
NO. 2	92.6	88.0	97.6	96.3
NO. 3	78.6	67.5	90.4	87.9
NO. 4	60.3	47.1	75.5	74.8
NO. 5	47.3	34.5	61.3	63.1
de CYCLONE NO. 1	31.2	29.4	37.7	37.2
NO. 2	21.9	20.6	26.4	26.0
NO. 3	15.2	14.3	18.3	18.1
NO. 4	10.6	10.0	12.8	12.6
NO. 5	8.3	7.8	10.0	9.9

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

KAMLOOPS RESEARCH AND ASSAY LABORATORY LTD.

WARMAN CYCLOSIZER RESULTS

CLIENT: Cyprus Anvil - KM076 DATE: March 18, 1982

SAMPLE NUMBER	076-19 Zn Con	076-20 Zn Con	076-21 Zn Con	076-26 Pb Con
SAMPLE WEIGHT	50.00	50.00	50.00	40.00
TEMPERATURE °C	7.0	7.0	7.0	7.0
SAMPLE SPECIFIC GRAVITY	4.09	4.08	4.13	5.86
FLOWRATE mm	180	180	180	180
ELUTRIATION TIME min	20	20	20	20
CORRECTION FACTORS (temp.)	1.195	1.195	1.195	1.195
(sp. gr.)	.730	.730	.725	.585
(flow)	1.012	1.012	1.012	1.012
(time)	.955	.955	.955	.955
OVERALL CORRECTION FACTOR	.843	.843	.837	.676
SAMPLE WT. CYCLONE NO. 1	0.85	0.71	0.69	.60
NO. 2	1.56	2.39	0.98	.80
NO. 3	4.63	5.99	4.02	3.93
NO. 4	7.02	7.30	7.19	7.10
NO. 5	5.96	5.46	6.53	6.02
% RETAINED CYCLONE NO. 1	1.7	1.4	1.3	1.20
NO. 2	3.1	4.8	2.0	1.60
NO. 3	9.3	12.0	8.0	7.86
NO. 4	14.0	14.6	14.4	14.2
NO. 5	11.9	10.9	13.1	12.0
% PASSING CYCLONE NO. 1	98.3	98.6	98.7	98.8
NO. 2	95.2	93.8	96.7	97.2
NO. 3	85.9	81.8	88.7	89.3
NO. 4	71.9	67.2	74.3	75.1
NO. 5	60.0	56.3	61.2	63.1
de CYCLONE NO. 1	37.7	37.7	37.4	30.2
NO. 2	26.4	26.4	26.2	21.2
NO. 3	18.3	18.3	18.2	14.7
NO. 4	12.8	12.8	12.7	10.3
NO. 5	10.0	10.0	10.0	8.0

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

KAMLOOPS RESEARCH AND ASSAY LABORATORY LTD.

WARMAN CYCLOSIZER RESULTS

CLIENT: Cyprus Anvil - KM076 DATE: March 31, 1982

SAMPLE NUMBER	076-26 Zn Con	076-26 Tails	076-27 Pb Con	076-27 Zn Con
SAMPLE WEIGHT	50.00	50.00	40.00	50.00
TEMPERATURE °C	7.0	7.0	7.5	7.5
SAMPLE SPECIFIC GRAVITY	3.96	4.27	5.67	4.17
FLOWRATE mm	180	180	180	180
ELUTRIATION TIME min	20	20	20	20
CORRECTION FACTORS (temp.)	1.195	1.195	1.185	1.185
(sp. gr.)	.75	.71	.595	.720
(flow)	1.012	1.012	1.012	1.012
(time)	.955	.955	.955	.955
OVERALL CORRECTION FACTOR	.866	.820	.681	.825
SAMPLE WT. CYCLONE NO. 1	.30	1.75	.55	1.15
NO. 2	.65	4.26	2.50	1.10
NO. 3	3.60	9.58	7.65	3.85
NO. 4	7.35	9.05	8.65	6.65
NO. 5	6.38	5.21	5.55	5.85
% RETAINED CYCLONE NO. 1	.60	3.50	1.4	2.3
NO. 2	1.30	8.52	6.3	2.2
NO. 3	7.20	19.2	19.1	7.7
NO. 4	14.7	18.1	21.6	13.3
NO. 5	12.8	10.4	13.9	11.7
% PASSING CYCLONE NO. 1	99.4	96.5	98.6	97.7
NO. 2	98.1	88.0	92.3	95.5
NO. 3	90.9	66.8	73.2	87.8
NO. 4	76.2	50.7	51.6	74.5
NO. 5	63.4	40.3	37.7	62.8
de CYCLONE NO. 1	36.7	36.7	30.4	36.9
NO. 2	27.1	25.7	21.3	25.8
NO. 3	18.8	17.8	14.8	17.9
NO. 4	13.2	12.5	10.4	12.5
NO. 5	10.3	9.6	8.1	9.8

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

KAMLOOPS RESEARCH AND ASSAY LABORATORY LTD.

WARMAN CYCLOSIZER RESULTS

CLIENT: Cyprus Anvil - KM076 DATE: March 31, 1982

SAMPLE NUMBER	076-27 Tails	076-28 Pb Con	076-28 Zn Con	076-28 Tails
SAMPLE WEIGHT	50.00	40.00	50.00	50.00
TEMPERATURE °C	7.5	7.5	7.5	7.5
SAMPLE SPECIFIC GRAVITY	4.51	5.73	4.13	3.17
FLOWRATE mm	180	180	180	180
ELUTRIATION TIME min	20	20	20	20
CORRECTION FACTORS (temo.)	1.185	1.185	1.185	1.185
(sp. gr.)	.685	.590	.73	.67
(flow)	1.012	1.012	1.012	1.012
(time)	.955	.955	.955	.955
OVERALL CORRECTION FACTOR	.784	.676	.836	.996
SAMPLE WT. CYCLONE NO. 1	3.70	.52	.35	1.80
NO. 2	6.95	1.92	1.67	4.35
NO. 3	10.75	5.56	5.75	9.95
NO. 4	8.30	6.86	7.70	9.55
NO. 5	4.50	4.55	5.75	5.35
% RETAINED CYCLONE NO. 1	7.4	1.30	.70	3.6
NO. 2	13.9	4.60	3.3	6.7
NO. 3	21.5	13.9	11.5	19.9
NO. 4	16.6	17.2	15.4	19.1
NO. 5	9.0	11.4	11.5	10.7
% PASSING CYCLONE NO. 1	92.6	98.7	99.3	96.4
NO. 2	78.7	93.9	96.0	87.7
NO. 3	57.2	80.0	84.5	67.8
NO. 4	40.6	62.8	69.1	48.7
NO. 5	31.6	51.4	57.6	38.0
de CYCLONE NO. 1	35.0	30.2	37.4	44.5
NO. 2	24.5	21.2	26.2	31.2
NO. 3	17.0	14.7	18.1	21.6
NO. 4	11.9	10.3	12.7	15.1
NO. 5	9.3	8.0	9.9	11.9

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:

APPENDIX V

SPECIAL ASSAYS ON TEST PRODUCTS

TABLE V - 1

Special Assays on Lead and Zinc Concentrates

Test	Au*	Ag*	Fe		Cd	As		Sb		Hg*	
No.	Pb Con	Pb Con	Pb Con	Zn Con	Zn Con	Pb Con	Zn Con	Pb Con	Zn Con	Pb Con	Zn Con
11	N.D.	N.D.	6.0	5.4	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
12	N.D.	N.D.	11.7	4.5	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
13	N.D.	N.D.	8.3	6.0	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
14	N.D.	N.D.	13.2	27.3	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
15	N.D.	N.D.	6.0	10.6	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
16	N.D.	N.D.	6.0	8.6	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
17	4.1	737	10.0	5.6	.072	.10	.04	.15	.01	64	490
18	6.8	720	12.1	7.3	.075	.19	.08	.23	.02	90	490
19	3.9	740	9.2	7.5	.066	.17	.08	.25	.01	75	490
20	2.3	740	6.0	7.2	.061	.31	.06	.16	.01	83	490
21	4.9	600	10.4	8.9	.077	.13	.06	.30	.01	38	300
22	N.D.	N.D.	12.1	11.2	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
23	N.D.	N.D.	4.2	8.9	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
24	N.D.	N.D.	7.4	7.1	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
25	N.D.	N.D.	6.6	6.1	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
26	5.2	814	6.6	6.1	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
27	7.5	742	11.3	6.6	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
28	2.7	787	5.4	7.0	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.

N.D. means "Not Determined"

* g/tonne

TABLE V - 2

Insoluble Contents - Cycle Test Concentrates

Test	Insoluble Content % Weight	
	Lead Concentrate	Zinc Concentrate
17	2.05	1.47
18	1.10	0.40
19	2.31	1.52
20	7.91	2.39
21	0.92	0.79

TABLE V - 3

Gold-Silver Content - Head Samples Used for Cyclosizing

Ore Type	Assays g/tonne	
	Au	Ag
4G	1.4	84
4E	1.7	89
4DC	1.0	82
4A	.8	77
4K	1.2	80

NOTE: Used in calculations of gold and silver recoveries.

APPENDIX VI.

DETAILS OF EQUIPMENT USED IN TESTWORK

AND FLOWSHEETS USED IN TESTING

APPENDIX VI - 1

Details of Equipment Used in Testwork

A. Grinding

Rod Mill	- Steel container 21.5 cm ø x 40.5 cm. Charge 25 kg steel rods approx. 2.0 cm. ø.
Ball Mill	- Steel container 21.5 cm ø x 18 cm. Charge 5 kg steel balls - graded charge 0.5 - 3.0 cm ø.
Drive for Mills	- Twin rolls, one drive, one idle. Both 12.5 ø x 122 cm.
	- Motor 0.37 KWH at 1725 RPM full load.
	- Mill speed approximately 80 RPM.
Bond Mill	- Standard Bond mill for determination of mean work index of ore.

B. Flotation

Denver D2 Flotation Machine	- Used for roughing and scavenger at 1200 RPM with a 5.5 L stainless steel tank.
	- For first cleaner work with a 2.5 L stainless steel tank.
Denver D1 Flotation Machine	- Used for all cleaning stages at 1800 RPM with a 2.5 L and 1.0 L stainless steel tanks.
Galigher Agitair LA500	- Used for general purpose work with 5.5 L, 2.5 L and 1.5 L perspex flotation tanks and with 25 L stainless steel tank for large volume work.

C. Instrumentation

Orion Specific Ion Meter 401	- Used for pH control on the rougher and scavenger circuits.
Corning Digital pH Meter	- Used for pH control on the cleaning circuits.
Fisher Digital pH Meter 609	- Used for pH control on the cleaning circuits.
Swift 80 and Kalnew 12701 Microscopes	- Used for microscopic examination of various minerals.

D. Particle Sizing

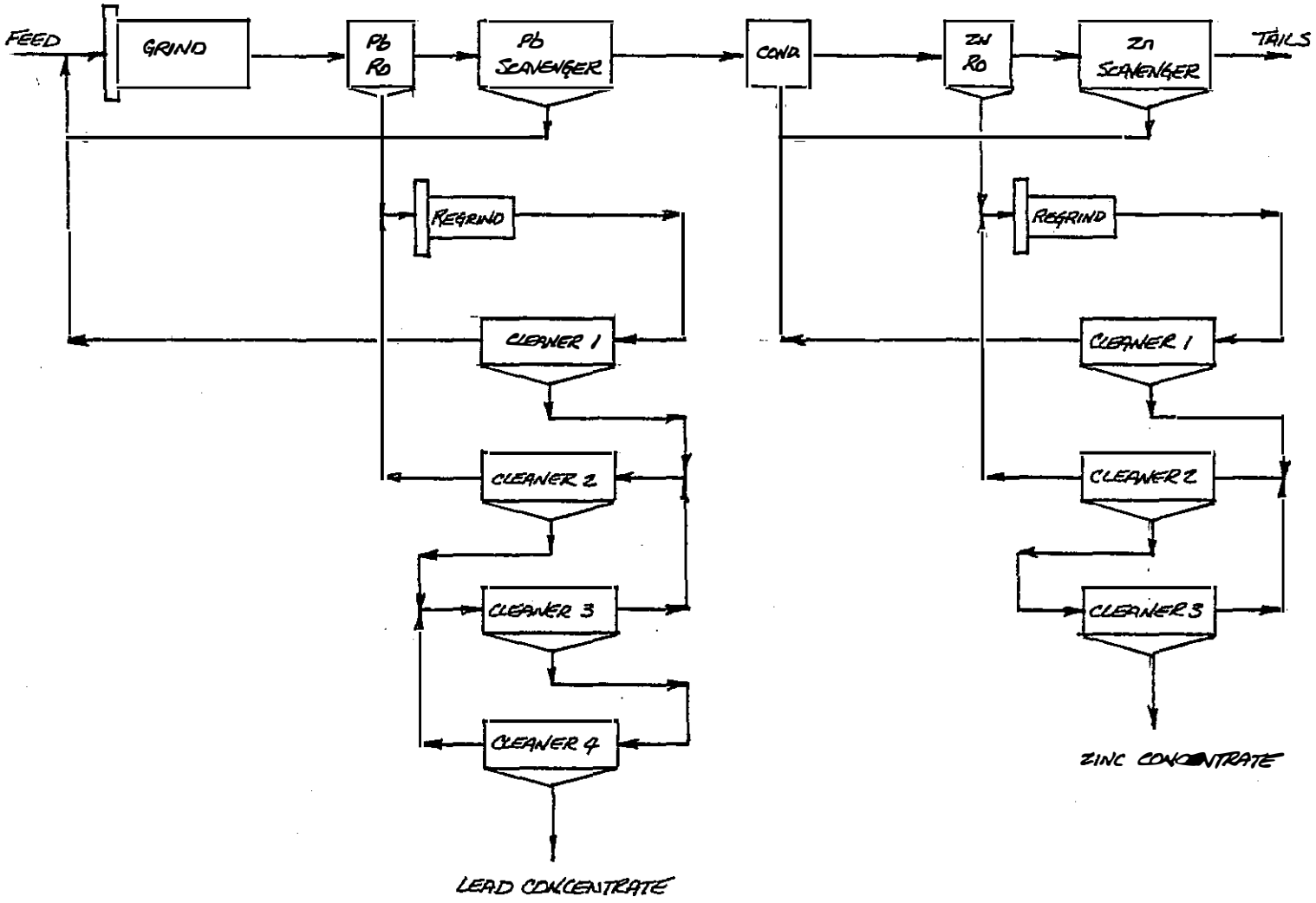
Warman Cyclosizer	- Used for determining the distribution of particle sizes less than 74 um diameter.

APPENDIX VI - 2

FLOWSHEETS USED IN TEST PROGRAM

FIGURE NO. 1

Basic Flowsheet for Lock Cycle Tests



NOTES

Approximate Densities

Pb Ro/Sc	20% solids
Pb Regrind	50% solids
Pb Cleaners	8% solids
Zn Ro/Sc	16% solids
Zn Regrind	50% solids
Zn Cleaners	10% solids

FIGURE NO. 2

Basic Flowsheet for Open Circuit Cleaner Tests