G-7

MATTAGAMI LAKE MINES LIMITED
Matagami, Que.

OCT 04 1976

019633

INTER-OFFICE MEMORANDUM

FROM K.V. Konigsmann

TO R.L. Coleman

DATE September 30, 1976

COPY TO B.P. Wallace

SUBJECT Flotation Process for Ores from the Grum Deposit.

COPY TO E. Kirkpatrick

Flotation Process for Ores from the Grum Deposit.

Reference is made to B-type ores as represented by a sample received on March 19, 1976.

The last summary on flotation results with Grum ores had been submitted on July 30, 1976. Since then some progress has been made in the development of a stable zinc circuit. However, major obstacles remain to be overcome in the lead rougher flotation. Too much zinc is still floating with the lead. In the lead cleaner flotation, zinc depression remains inefficient.

From test results produced to date, projected plant results are as tabulated below. The forecast is without safety margin, on the contrary, all laboratory results are interpreted in the most favourable light.

	Analyses oz/t or %			Recoveries %		
	Ag	Pb	Zn	Ag	Pb	Zn
Mill Feed	3.8	8.7	16			
Lead Concentrate	20	45-55	12-15	65	75	
Zinc Concentrate	3	3	53+			70

LCr

Lead Flotation

The main difficulty in circuit development remains in lead flotation. The quantities of zinc and pyrite floating into the lead rougher concentrate are yet too high. Currently rougher concentrates contain

Assay %		Metal Distribution (%MF)	
Pb	Zn	Pb	Zn
24	20	92	42

In lead cleaner flotation the depression of the contaminants is not adequate. Lead circuit flotation (Flowsheet on figure 3, page 11) is still unstable; a slight error in reagent or product manipulation throws a long test out of balance. Conditions of greater stability will have to be developed in the laboratory to be acceptable for plant operation.

Oxidation of the ore along apparent leach planes is seen as the cause of preactivation of zinc. The extremely fine grained mineralization adds to the difficulty of separation.

Zinc Flotation

By comparison with the lead circuit, the zinc circuit presents few problems. 85 to 90 per cent of the zinc in the circuit feed is recovered into a product of good grade. For example test #97:

	Assay Zn	Zn Recovery % Circuit Feed	Zn Recovery % Mill Feed
Zinc circuit feed	14.9	100	75.6
Zinc concentrate	54.0	87.2	65.9
Zinc cleaner tailings*	14.0	4.1	3.1
Zinc rougher tailings	1.8	8.7	6.6
Calculated final tail	2.5	12.8	9.7

* Zinc cleaner tailings are discarded.

The zinc circuits are stable.

Contaminants

The ores contain some arsenic, 0.2 to 0.4% As; mercury has been analysed at about 50 ppm. A zinc concentrate of high grade contained 650 ppm Hg. The distribution of impurities in all products will be investigated in detail only after flowsheet design has advanced further.

K. Klingmann

MATTAGAMI LAKE MINES LIMITED

CONCENTRATOR LABORATORY

VANGORDA-GRUM

SAMPLE B_3

PROGRESS REPORT #3

WORK PERFORMED FROM JULY 28 to SEPTEMBER 30, 1976.

TESTS #VAN 88-VAN 103

K. Stowe
K. STOWE
METALLURGIST

SEPTEMBER 30, 1976.

Vangorda-Grum Testwork

Tests VAN #88-103

The ore used in this series of tests consisted of a sample of B material received in March 1976 and assaying 8% Pb and 16% Zn. The sample was highly oxidized and easily fractured.

The majority of the tests were locked cycle tests of 6 or 7 cycles. Circuit stability was obtained in almost all tests. However little or no improvement was shown over the results reported earlier for VAN 86.

VAN 88

Six rougher flotations were performed with fineness of grind varied from 25-95% -325 mesh. Results are listed in TABLE 1.

Increasing grind time improved selectivity in the Pb rougher only marginally. Pb and Zn recoveries in their respective rougher concentrates were relatively constant for grinds of 10 minutes (70% -325 mesh) to 18 minutes (95% -325 mesh). The most marked improvement was in the rougher concentrate grades.

Samples of rougher tailings were infrasized. From FIGURES 1 and 2 a grind of between 50-70% -325 mesh was sufficient to minimize Pb and Zn losses to the tailings.

LOCKED CYCLE TESTS VAN# 91, 93-98, 100, 103.

The main problem with the ore has been the poor selectivity in the Pb circuit. Changes in grind, collector, pH and depressants have had little effect. This remained true for this series of tests. Consequences are:-

1. Pb concentrates are extremely low grade at acceptable levels of recovery.
2. Although high grade Zn concentrates are possible Zn recovery is necessarily low.

The standard flowsheet for the cycle tests, as developed from previous work, is shown in FIGURE 3. Deviations from this standard and descriptions of the individual tests are listed in TABLE 2. Important features are:-

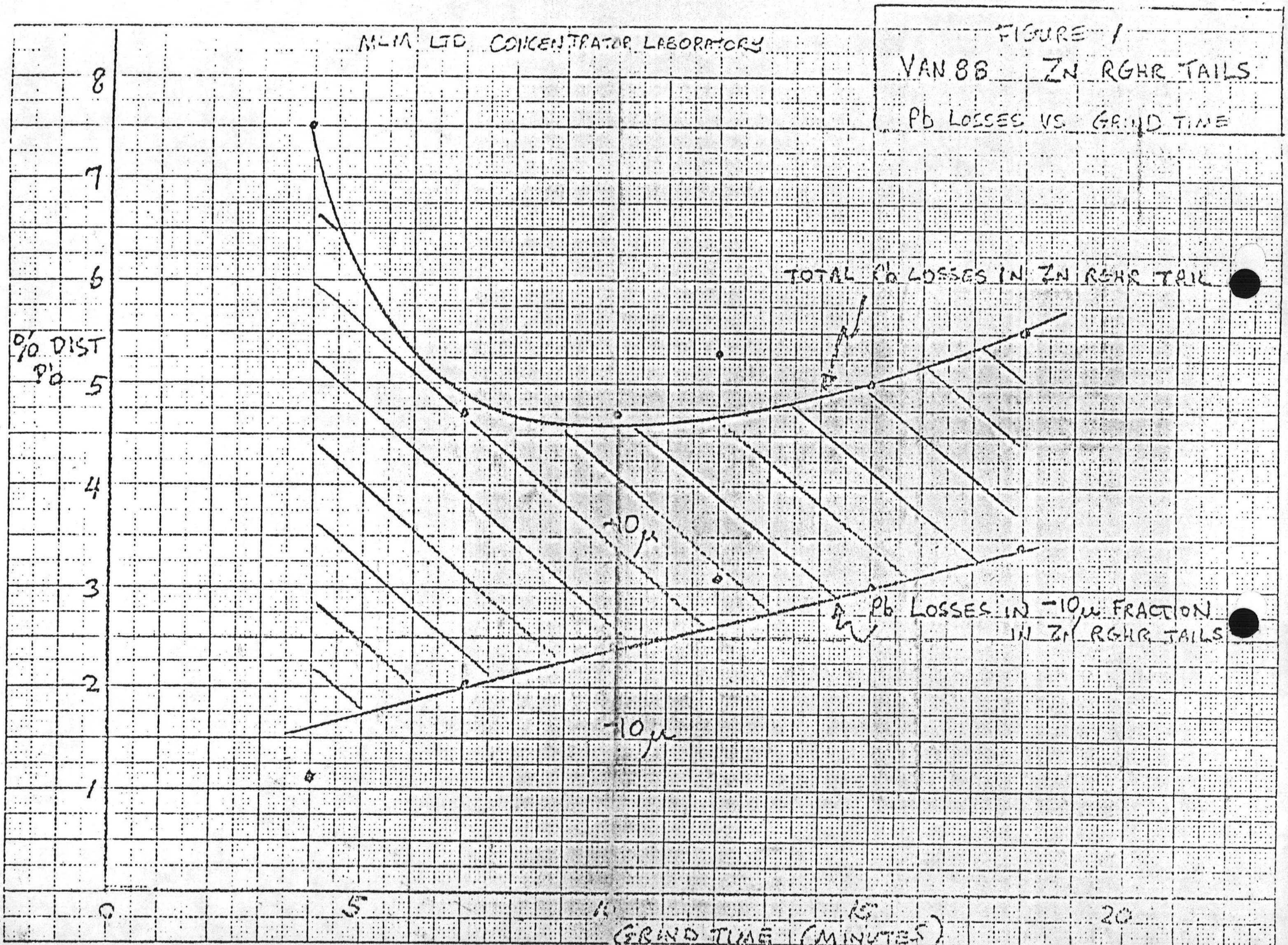
1. a grind of 70% -325 mesh was usually used
2. NaCN was not used in most of the tests
3. only 1 or 2 Zn cleaners were employed
4. up to 4 regrinds were used:- Pb rougher conc, Pb scavenger conc, Zn rougher Conc, and Zn scavenger conc.
5. 1st Pb Clnr Tails were recirculated to either the Pb or Zn circuits.

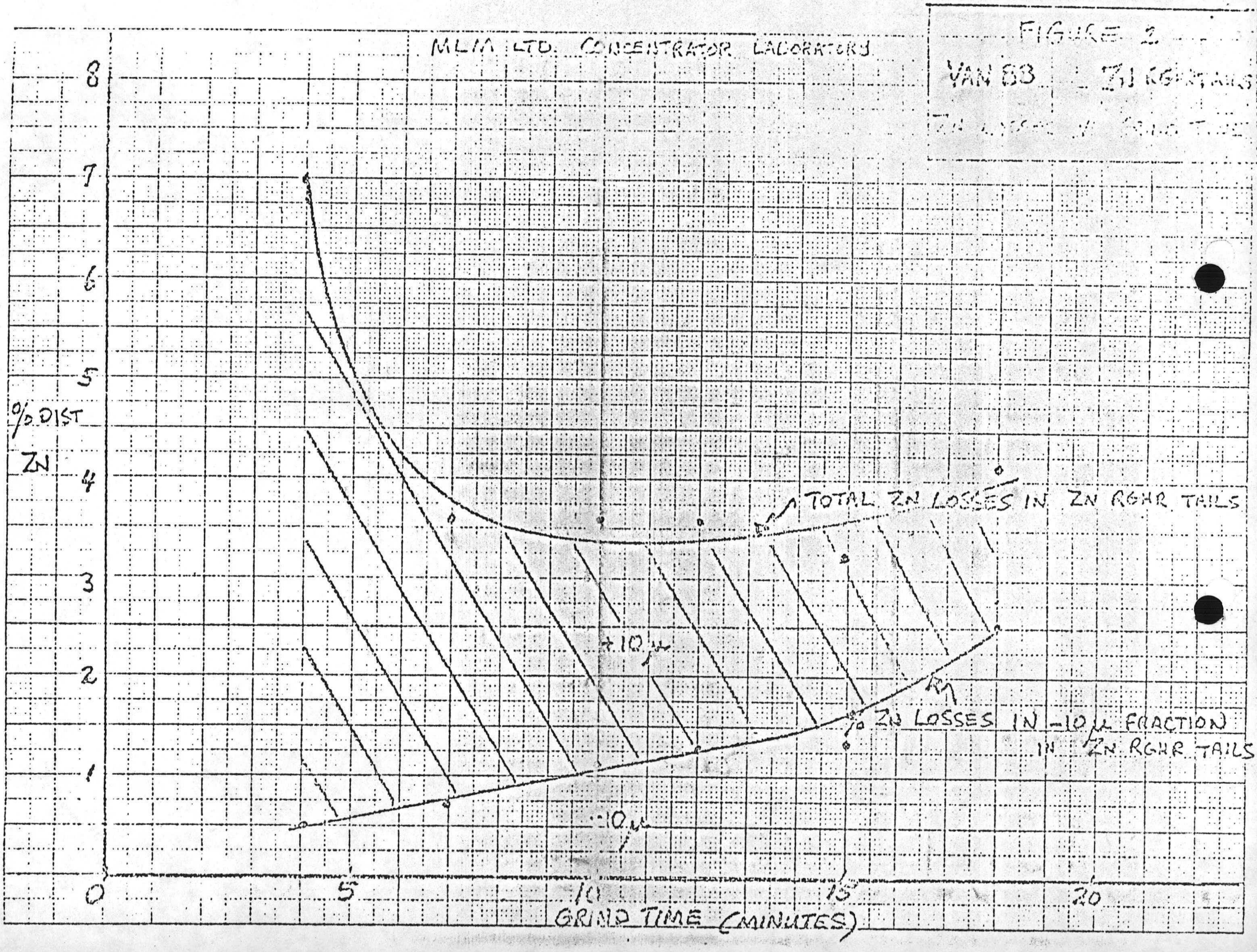
Results of the 2 best tests are listed in TABLES 3-6. Low grade Pb concentrates and excellent Zn concentrates were obtained. Pb recovery versus Pb grade for all the tests is plotted in FIGURE 4. From this curve a Pb recovery of 70% would be expected at 50% grade using the standard flowsheet. During the testwork 2 variables stood out as determining the Pb grade and recovery for the various tests:-

1. the speed of Pb rougher flotation
2. the amount of regrind of the Pb rougher concentrate.

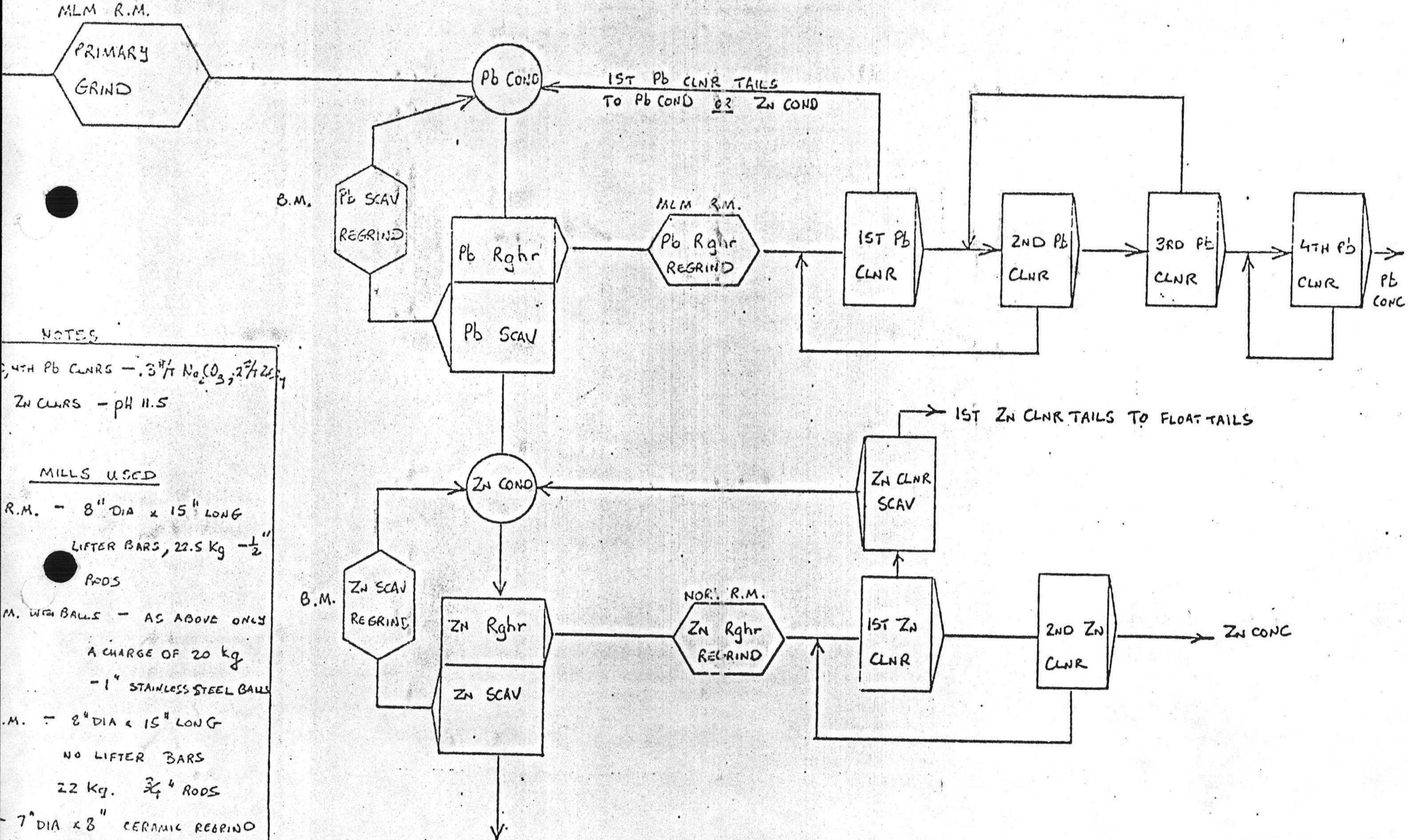
VAN #101-102

Dezincing of the Pb concentrate by a procedure used at the Sullivan Concentrator was investigated. The flowsheet and results of VAN 101 are shown in FIGURE 5. % Zn in the Pb concentrate was reduced to 5% however a considerable amount of Pb also floated. More testwork is needed to properly evaluate this procedure.


MLM LTD CONCENTRATOR LABORATORY
FIGURE 1
VAN 88 Zn RGHR TAILS
Pb LOSSES VS GRIND TIME
% DIST Pb
TOTAL Pb LOSSES IN Zn RGHR TAIL
+10μ
Pb LOSSES IN -10μ FRACTION IN Zn RGHR TAILS
-10μ
GRIND TIME (MINUTES)
0
5
10
15
20
1
2
3
4
5
6
7
8


MLM LTD. CONCENTRATOR LABORATORY
FIGURE 2
VAN 83
ZN RGHR TAILS
TOTAL ZN LOSSES IN ZN RGHR TAILS
+10μ
ZN LOSSES IN -10μ FRACTION IN ZN RGHR TAILS
-10μ
% DIST ZN
0
1
2
3
4
5
6
7
8
5
10
15
20
GRIND TIME (MINUTES)

VANGORDA - GRUM TESTWORK
"STANDARD" FLOWSHEET
LOCKED CYCLE TESTS



NOTES

, 4TH Pb CLNRS — .3 #/T Na_2CO_3; .2 #/T $ZnSO_4$

Zn CLNRS - pH 11.5

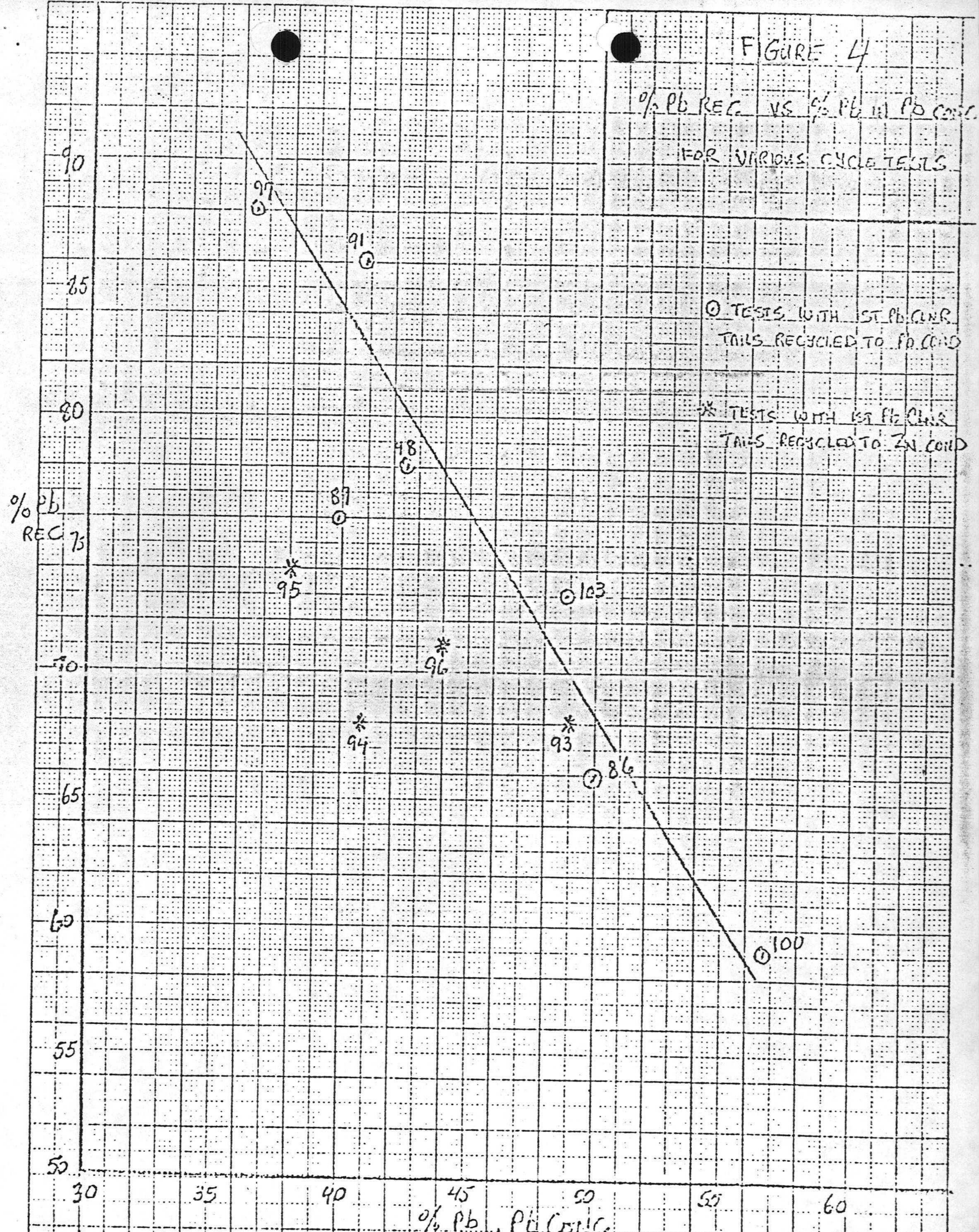
MILLS USED

R.M. - 8" DIA x 15" LONG
LIFTER BARS, 22.5 Kg - ½" RODS

M. WITH BALLS - AS ABOVE ONLY
A CHARGE OF 20 kg
- 1" STAINLESS STEEL BALLS

.M. - 8" DIA x 15" LONG
NO LIFTER BARS
22 Kg. ¾" RODS

- 7" DIA x 8" CERAMIC REGRIND
MILL WITH 6 lbs - ½ CERAMIC BALL



461510

K+E 10 X 10 TO THE CENTIMETER 18 X 25 CM. KEUFFEL & ESSER CO. MADE IN U.S.A.

K.S.

FIGURE 5

VAN 101 21/91

B2

EXPERIMENTAL Pb DEZINC FLOTATION

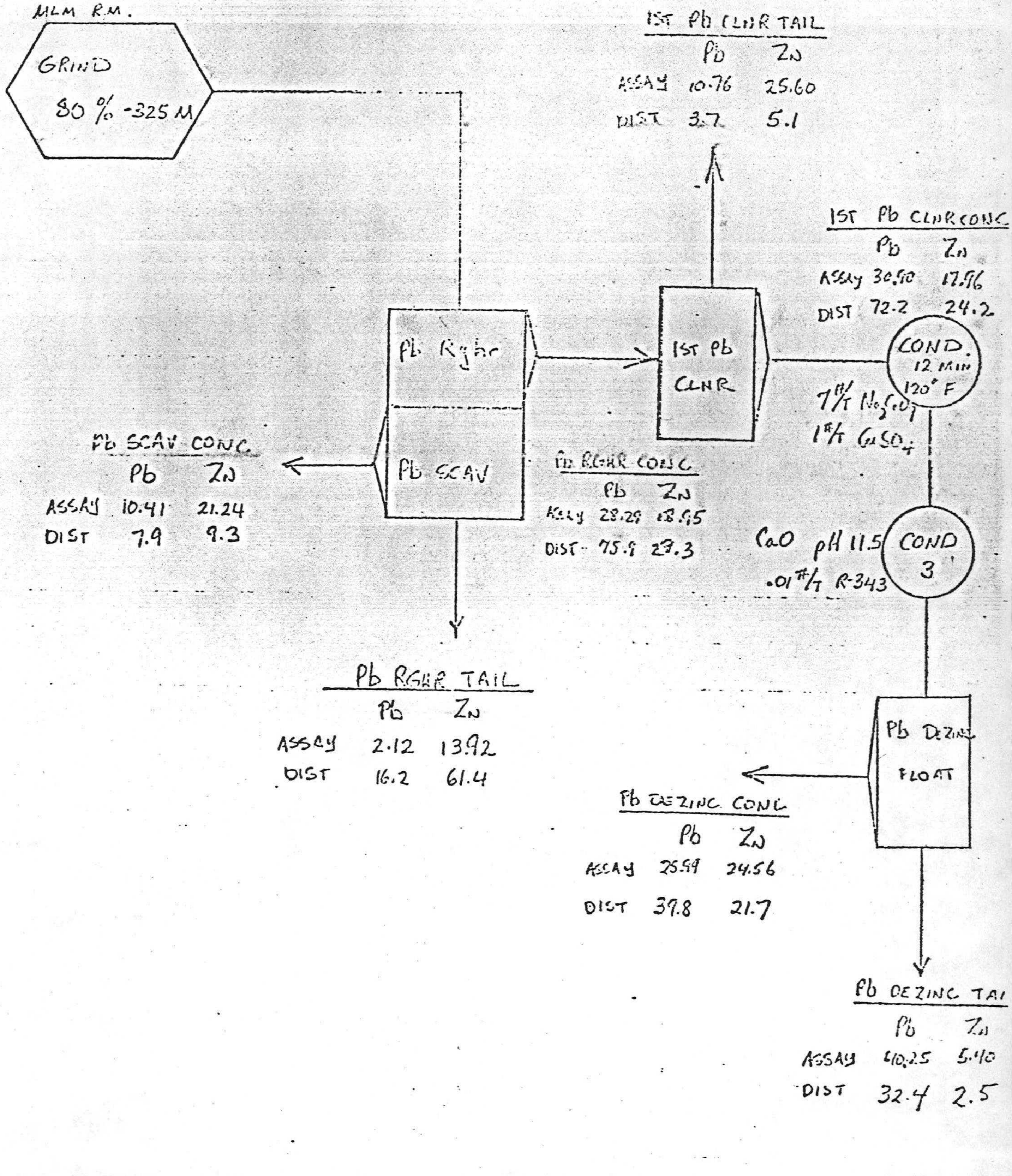


TABLE 1

VAN #88

B3

	GRIND		Pb RGHR CONCENTRATE				Zn RGHR CONCENTRATE			
	MIN	% -325 MESH	% Pb	% Zn	% DIST Pb	% DIST Zn	% Pb	% Zn	% DIST Pb	% DIST
VAN 88	4	25	18.79	20.36	76.1	43.5	3.47	19.97	16.4	49.5
	7	50	20.17	21.17	86.1	46.8	2.30	23.97	9.2	49.6
	10	70	23.12	20.93	89.0	42.6	2.04	32.77	6.3	54.8
	12	80	23.67	20.74	89.7	42.2	1.87	37.76	5.0	54.2
	15	90	25.81	21.15	90.2	40.1	1.88	40.20	5.8	56.8
	18	95	28.24	21.11	89.7	36.1	2.10	42.74	4.8	58.6

MATTAGAMI LAKE MINES LTD. CONCENTRATOR LABORATORY

TABLE 2

SUMMARY OF RESULTS AND PROCEDURES OF CYCLE TESTS # 91, 93

TEST #	REMARKS	PRIMARY GRIND	Pb RGHR CONC REGRIND	Pb SCAV CONC REGRIND	Zn RGHR CONC REGRIND	Zn SCAV CONC REGRIND	Pb CONCENTRATE Pb	Pb CONCENTRATE Zn	Pb CONCENTRATE % DIST Pb	Pb CONCENTRATE % DIST Zn	Zn CONC Pb	Zn CONC Zn
VAN 91 (B4)	No NaCN, 2 Zn CLNRS	12 MIN, 10 #/T Na_2CO_3; 1 #/T $ZnSO_4$; .03 #/T 242	18 MIN (MLM R.M.); 15 #/T Na_2CO_3, 1 #/T $ZnSO_4$; .03 #/T 242	10 MIN (BALL MILL); 1 #/T Na_2CO_3, 1 #/T $ZnSO_4$; .01 #/T 242	10 MIN (NORANDA R.M.); .5 #/T $CuSO_4$; 1 #/T CaO, .02 #/T Z200	NO	408	19.2	86	21	12	5
VAN 93 (B4)	No NaCN; 2 Zn CLNRS; REDUCED Na_2CO_3, COLLECTOR TO PRIM. GRIND; 1st Pb CLNR TAIL TO Zn COND.	.5 #/T Na_2CO_3; .03 #/T 242; .03 #/T 404	.02 #/T 242; .02 #/T 404	AS FOR VAN-91	AS FOR VAN-91	NO	49	16	63	11	41	5
VAN [illegible] (B4)	No NaCN; 2 Zn CLNRS; 1ST Pb CLNR TAILS TO Zn COND; REDUCED Pb TO Zn RGHR CONC REGRIND; INCREASE COLLECTOR Pb RGHR REGRIND	AS FOR VAN-93	13 MIN	15 MIN	1.5 #/T CaO; .04 #/T Z200	5 MIN (BM); .2 #/T $CuSO_4$; .01 #/T Z200	40.9	20.6	68	12	4.6	4
VAN 95 (B4)	No NaCN; 2 Zn CLNRS, 1ST Pb CLNR. TAILS TO Zn CIRCUIT; COARSER PRIM. GRIND; 7 CYCLES	10 MIN, 4 #/T Na_2CO_3; .03 #/T 242, .03 #/T 404	14 MIN; .01 #/T 242; .01 #/T 404	AS FOR VAN 94	AS FOR VAN 94	AS FOR VAN-94	38	21	74	21	4.1	
VAN 96 (B4)	AS FOR VAN-95 EXCEPT 15 MIN REGRIND OF Pb RGHR CONC; Zn CIRCUIT NOT STABLE	AS FOR VAN-95	15 MIN	10 MIN (NOR. R.M.); .05 #/T 242; .01 #/T 404	AS FOR VAN-94	10 MIN (BM); .02 #/T Z200; .2 #/T $CuSO_4$	44	19	71	17	4.5	
VAN 97 (B4)	No NaCN; 1 Zn CLNR; 1ST Pb CLNR TAIL TO Pb CIRCUIT; FINER PRIM. GRIND; 7 CYCLES	18 MIN, 10 #/T Na_2CO_3; .03 #/T 242	12 MIN (MLM R.M. WITH BALLS); .03 #/T 242	AS FOR VAN-91	AS FOR VAN 94	AS FOR VAN 94	36.5	20.0	88	24	1.4	
VAN 98 (B3)	No NaCN; 1 Zn CLNR ONLY; REDUCED COLLECTOR TO PRIM. GRIND	18 MIN, 10 #/T Na_2CO_3; .05 #/T 242	18 MIN; .015 #/T 242	AS FOR VAN 91	AS FOR VAN 94	NO	42.5	13.5	78	17	3.5	4
VAN 100 (B3)	.2 #/T NaCN IN PRIM. GRIND,	AS FOR VAN-91 EXCEPT .2 #/T NaCN	AS FOR VAN-91	AS FOR VAN-91	AS FOR VAN-94	NO	56.7	14.3	59	6	5.0	
VAN 103 (B2)	.3 #/T NaCN IN PRIMARY GRIND; 5 Pb CLNRS, 3 Zn CLNRS; REGRIND 1ST CLNR CONC (Pb AND Zn); ADD NaCN ... TO Pb CLNRS	AS FOR VAN-91 EXCEPT .3 #/T NaCN	REGRIND 1ST CLNR CONC 5 MIN; 1.5 #/T Na_2CO_3; 1 #/T $ZnSO_4$, .03 #/T 242	AS FOR VAN 91	AS FOR VAN 94 EXCEPT GRIND 1ST CLNR CONC - 15 MIN	NO	43.0	17.3	72	14	5.0	

MATTAGAMI LAKE MINES LTD. CONCENTRATOR LABORATORY

SUMMARY OF RESULTS AND PROCEDURES OF CYCLE TESTS # 91, 93-98, 100, 03

Primary Grind	Pb Rghr Conc Regrind	Pb Scav Conc Regrind	Zn Rghr Conc Regrind	Zn Scav Conc Regrind	Pb Concentrate Pb	Pb Concentrate Zn	Pb Conc % Dist Pb	Pb Conc % Dist Zn	Zn Concentrate Pb	Zn Concentrate Zn	Zn Conc % Dist Pb	Zn Conc % Dist Zn	Zn [illegible] Pb	Zn [illegible] Zn	[illegible]	[illegible]
min, 10#/T Na_2CO_3 #/T $ZnSO_4$ .03#/T 242	13 min (MLM R.M.) 1.5#/T Na_2CO_3, 1#/T $ZnSO_4$ .03#/T 242	10 min (Ball mill) 1#/T Na_2CO_3, 1#/T $ZnSO_4$ .01#/T 242	10 min (Noranda R.M.) .5#/T $CuSO_4$ 1#/T CaO, .02#/T Z200	NO	40.8	19.2	86	21	1.2	54.6	4	66	1.1	22	8	8
.5#/T Na_2CO_3 .03#/T 242 .03#/T 404	.02#/T 242 .02#/T 404	AS FOR UAN-91	AS FOR UAN-91	NO	49	16	83	11	4.1	53.5	11	62	2.0	30	15	11
AS FOR UAN-93	13 MIN	15 MIN	1.5#/T CaO .04#/T Z200	5 min (BM) .2#/T $CuSO_4$ .01#/T Z200	40.9	20.6	68	18	4.6	48.1	13	71	23	2.4	16	7
10 min, 4#/T Na_2CO_3 .03#/T 242, .03#/T 404	14 MIN .01#/T 242 .01#/T 404	AS FOR UAN 94	AS FOR UAN-94	AS FOR UAN-94	38	21	74	21	4.1	47	10	60	1.8	3.5	14	14
AS FOR UAN-95	15 MIN	10 min (Nor. R.M.) .05#/T 242 .01#/T 404	AS FOR UAN-94	10 min (BM) .02#/T Z200 .2#/T $CuSO_4$	44	19	71	17	4.5	52	3	51	1.7	4.0	14	7
13 min, 10#/T Na_2CO_3 .02 F/[illegible]2	12 min (MLM R.M. WITH [illegible]) .03#/T 242	AS FOR UAN-91	AS FOR UAN 94	AS FOR UAN 94	36.5	20.0	88	24	1.4	54.0	34	66	1.0	1.2	7	7
13 min, 10#/T Na_2CO_3 .06#/T 242	13 MIN .05#/T 242	AS FOR UAN 91	AS FOR UAN 94	NO	42.5	13.5	78	17	3.5	48.3	10	71	1.5	2.0	10	7
AS FOR UAN-91 EXCEPT .2#/T NaCN	AS FOR UAN-91	AS FOR UAN-91	AS FOR UAN-94	NO	56.7	14.3	59	6	5.0	48.0	17	65	1.8	2.9	16	10
AS FOR UAN-91 EXCEPT .3#/T NaCN	REGRIND [illegible] CLNR CONC 5 min; 1.5#/T Na_2CO_3 1#/T $ZnSO_4$, .03#/T 242	AS FOR UAN 91	AS FOR UAN 94 EXCEPT GRIND [illegible] CLNR CONC - 15 MIN	NO	43.0	17.3	72	14	5.0	45	12	65	1.8	23	9	6

TABLE 3

VAN 91

B4

SAMPLE	WEIGHT GMS	% Pb	% Zn
Pb CONCENTRATE CYCLE 1	106.2	45.59	[illegible]
2	198.4	32.48	14.12
3	163.8	41.66	19.32
4	169.6	41.42	19.14
5	164.5	39.21	19.10
6	178.2	38.07	20.03
Zn CONCENTRATE CYCLE 1	85.4	1.10	53.17
2	119.8	1.67	53.49
3	161.0	1.71	54.37
4	141.1	1.84	55.43
5	172.5	1.68	54.14
6	190.7	1.84	54.35
1ST Zn CLEANER TAILS CYCLE 1	38.3	2.13	11.10
2	38.2	1.67	6.57
3	39.2	2.45	10.24
4	51.2	2.75	33.35
5	43.5	2.00	25.32
6	32.5	2.74	20.12
Zn ROUGHER TAILS CYCLE 1	406.2	.93	1.25
2	463.6	.94	1.40
3	557.7	1.10	1.85
4	599.4	1.16	2.30
5	583.4	1.08	2.08
6	596.7	1.11	2.22
1ST Pb CLEANER TAILS CYCLE 6	184.5	3.88	23.06

4	169.6	41.42	19.14
5	164.5	39.21	19.10
6	178.2	38.07	20.03
ZN CONCENTRATE CYCLE 1	85.4	1.10	53.17
2	119.8	1.67	53.49
3	161.0	1.71	54.37
4	141.1	1.84	55.43
5	172.5	1.68	54.17
6	190.7	1.84	51.35
1ST ZN CLEANER TAILS CYCLE 1	38.3	2.13	11.10
2	38.2	1.67	6.57
3	39.2	2.45	10.24
4	51.2	2.75	33.35
5	43.5	2.00	25.32
6	32.5	2.74	20.12
ZN ROUGHER TAILS CYCLE 1	406.2	.93	1.25
2	463.6	.94	1.40
3	557.7	1.10	1.85
4	599.4	1.16	2.30
5	583.4	1.08	2.08
6	596.7	1.11	2.22
1ST Pb CLEANER TAILS CYCLE 6	184.5	3.88	23.06
2ND " " " "	95.4	6.47	29.54
3RD " " " "	61.4	9.52	31.19
4th " " " "	24.5	8.76	31.75
Pb SCAVENGER CONC " "	98.5	7.23	22.31
ZN CLEANER SCAV CONC " "	25.1	3.81	47.55
ZN RGHR SCAV CONC " "	32.0	3.16	30.57
2ND ZN CLEANER TAIL " "	30.8	2.74	20.12
HEAD	[illegible]	[illegible]	[illegible]

TABLE 4

VAN 91
B4

CALCULATED CIRCUIT RESULTS

	WEIGHT		ASSAY		% DISTRIBUTION	
	GMS	%	% Pb	% Zn	Pb	Zn
Pb CONC	170	17.3	40.8	19.2	86.5	20.8
Zn CONC	190	19.3	1.8	54.6	4.2	66.0
Zn CLNR TAILS	35	3.6	2.5	22.3	1.1	5.0
Zn RGHR TAILS	590	59.9	1.1	2.2	8.2	8.2
FLOAT TAILS	625	63.5	1.2	3.3	9.3	13.2
HEADS	985	100.0	8.02	15.72	100.0	100.0

VAN '97

B4

SAMPLE	WEIGHT GMS	% Pb	% Zn
Pb CONCENTRATE CYCLE 1	173.0	36.68	20.64
2	235.4	31.38	21.12
3	206.0	33.33	20.96
4	189.5	37.97	21.76
5	193.2	36.15	19.73
6	188.3	36.27	19.27
7	197.1	36.79	20.08
ZN CONCENTRATE CYCLE 1	118.0	1.08	54.71
2	146.3	1.26	55.61
3	150.3	1.22	54.31
4	184.4	1.20	54.61
5	200.7	1.29	53.20
6	185.7	1.37	55.01
7	194.1	1.44	54.00
1ST ZN CLEANER TAILS CYCLE 1	36.2	1.42	11.52
2	30.1	1.55	11.24
3	27.6	1.92	10.16
4	34.8	2.13	11.40
5	37.2	2.16	9.44
6	30.3	2.39	13.18
7	33.2	2.31	14.79
ZN RGHR TAILS CYCLE 1	410.6	.62	.94
2	504.0	.70	1.20
3	505.7	.82	1.54
4	565.6	.84	1.58
5	548.3	.96	1.58
6	584.4	.97	1.83
7	583.8	1.00	1.72
1ST Pb CLEANER TAILS CYCLE 7	160.9	4.73	22.19

6	188.3	36.27	19.27
7	197.1	36.79	20.08
ZN CONCENTRATE CYCLE 1	118.0	1.08	54.71
2	146.3	1.26	55.61
3	150.3	1.22	54.31
4	184.4	1.20	54.61
5	200.7	1.29	53.20
6	185.7	1.37	55.01
7	194.1	1.44	54.00
1ST ZN CLEANER TAILS CYCLE 1	36.2	1.42	11.52
2	36.1	1.55	11.24
3	37.6	1.92	10.16
4	34.8	2.13	11.40
5	37.2	2.16	9.44
6	30.3	2.39	13.18
7	33.2	2.31	14.79
ZN RGHR TAILS CYCLE 1	410.6	.62	.94
2	504.0	.70	1.20
3	505.7	.82	1.54
4	565.6	.84	1.58
5	548.3	.96	1.58
6	584.4	.97	1.83
7	583.8	1.00	1.72
1ST Pb CLEANER TAILS CYCLE 7	160.9	4.73	22.19
2ND " " " " "	96.3	6.62	25.05
3RD " " " " "	41.6	7.79	26.78
4TH " " " " "	32.2	8.81	26.63
Pb SCAVENGER CONC " "	72.5	7.79	23.89
ZN CLEANER SCAV CONC " "	13.0	2.58	22.55
ZN SCAVENGER CONC " "	49.9	2.65	24.09
DECANTS ALL CYCLES	37.8	11.75	22.64
HEAD	699.8	[illegible]	16.14

TABLE 6

VAN 97
B4

CALCULATED CIRCUIT RESULTS

PRODUCT	WEIGHT		ASSAY		% DISTRIBUTION	
	GMS	%	% Pb	% ZN	% Pb	% ZN
Pb CONC	195	19.3	36.5	20.0	88.3	24.4
ZN CONC	195	19.3	1.4	54.0	3.4	65.9
ZN CLNR TAILS	35	3.5	2.3	14.0	1.0	3.1
ZN RGHR TAILS	585	57.9	1.0	1.8	7.3	6.6
FLOAT TAILS	620	61.4	1.1	2.5	8.3	9.7
HEAD	1010	100.0	8.0	15.9	100.0	100.0