

June 20, 1977

MEMORANDUM TO: M. D. Rowswell

FROM: H. Lyall Ames

RE: Grum Ore Testing

As requested by Mr. Rowswell on June 14, 1977, I have studied two metallurgical reports dealing with Grum ore testing.

- (1) Lakefield Research of Canada Ltd. Report No. 7, June 1, 1977
- (2) Mattagami Lake Mines Ltd., Report No. 6, May 27, 1977.

The purpose of this study was to determine (1) why the metallurgical results from the two laboratories were different and (2) which of the flowsheets suggested should be used as a basis for the Pilot Plant run scheduled for September of this year.

I am not familiar with the last few years testing on this ore and therefore, some questions that come to mind have likely been answered in previous reports or discussions. However, I have the following comments for your consideration.

1. FLWSHEET

There is little basic difference between the two flowsheets being considered.

- (1) K. V. Konigsmann Memorandum, June 6, 1977
- (2) Lakefield Research Report No. 7, Page 50, June 1, 1977

Therefore, development of the Pilot Plant circuitry presents no particular problems. Actually, the L. R. flowsheets were prepared for laboratory testing procedures and do not likely represent specifically their recommendations for the Pilot Plant.

Both flowsheets show regrinding of the lead and zinc rougher concentrates. This is almost accepted practice on this type of ore. L.R. suggested that another regrind step might be used on the lead cleaner tailing (Page 4). This modification can be tried in a later phase of the Pilot Plant operation if metallurgical results indicate that it is advisable.

2. LEAD

Some typical lead rougher and final concentrate assays with corresponding recoveries are given in the table below for comparison. They are open circuit tests except three M.L. ones (283, 259, and 282). As can be seen, the rougher recoveries are in good agreement but the concentrate grades are not. I think that if the flotation differential in the M.L. primary floats could be improved, the overall lead metallurgy would be comparable.

(1) Sample F-3 Hard

Lead Rougher Con	-	L.R. (167) - 67% Pb	Recovery	91.0%
	-	M.L. (232) - 30.5% Pb	"	91.4%
Lead Final Con	-	L.R. (167) - 74.3% Pb	"	81.1%
	-	M.L. (283) - 58.1% Pb	"	79.3%

(2) Sample H-3

Lead Rougher Con	-	L.R. (169) - 59.7% Pb	Recovery	81.1%
	-	M.L. (228) - 26.8% Pb	"	83.6%
Lead Final Con	-	L.R. (169) - 68.8% Pb	"	77.0%
	-	M.L. (259) - 58.9% Pb	"	80.3%
	-	M.L. (282) - 55.3% Pb	"	77.8%

In these particular tests the main reagent differences (and which I think all favour L.R. tests) are as follows:

- (1) L.R. always used 3 #/T of soda ash whereas M.L. used 2 #/T in some tests.
- (2) L.R. always added at least 1 #/T of zinc sulphate and sometimes 2 #/T whereas M.L. used only 0.5 #/T for one test, 1.0 #/T for two tests and none for two tests.
- (3) L.R. used 0.30 #/T sodium cyanide whereas M.L. used only 0.20 #/T in all tests

I suggest that M.L. carry out some open circuit tests using exactly the same procedure as L.R. except with their own reagents and dosages. This will establish any differences in metallurgy due solely to reagents thereby eliminating one of the main variables. In the meantime, L.R. is planning recycling tests, presumably similar to the M.L. procedures, and these results should help to clarify the recovery and grade discrepancies.

3. ZINC

The zinc metallurgy is opposite to that of the lead. In this case the M.L. test results are better than those of L.R. It is understandable that the M.L. recycling procedure should reduce zinc losses in the middling products. However, this is not the complete explanation for the discrepancies as even the L.R. rougher recoveries are too low in relation to the corresponding concentrate grades.

Sample F-3 Fuggy

Zinc Final Con	- M.L. (310) - 58.7% Zn	Recovery	89.6%
Zinc Rougher Con	- L.R. (168) - 43.8% Zn	"	89.5%

Sample 6-3

Zinc Final Con	- M.L. (316) - 51.3% Zn	Recovery	82.9%
Zinc Rougher Con	- L.R. (166) - 37.9% Zn	"	82.5%

In my experience, all the following differences in reagents, conditioning and grinding favour the M.L. tests.

- (1) M.L. added 50% more  $\text{CaO}$  in one test and 100% more in another.
- (2) M.L. added 33% more  $\text{CuSO}_4$  in one test.
- (3) M.L. added the zinc collector (0.07 #/T 343) to the conditioner whereas L.R. added none.
- (4) M.L. conditioned the pulp for 5 minutes whereas L.R. conditioned one sample for 2 minutes and one for none.
- (5) I think the M.L. grinding was finer by about 10% at 200 mesh.

Again, I think that the only way to resolve the reported metallurgical differences is for each testing group to try the other's procedure and technique. I think that the different circuits are compatible and that with similar grinds and some combination of the reagents used by each company the best metallurgy for both metals will be forthcoming on ores similar, of course, to the samples discussed in the two reports.

#### 4. SODA ASH

It is surprising that both investigators used 2.0 - 3.0 lbs. per ton of soda ash as more or less standard on all the samples. In my experience with ore types as different as Grums I would expect a considerably greater variation in soda ash requirements. This is irrespective of pH. In other words, some samples may require up to 4 or 5 lbs. per ton regardless of the pH obtained. I think that 2 lbs. could be low with some Grum ~~ores~~. Too little soda ash will adversely affect lead recovery while, of course, too high an amount will float excessive zinc into the lead concentrate.

#### 5. CYANIDE

Personally, I would expect that 0.3 lbs. per ton of cyanide would be required on most of the samples. I think that the six different classifications of ore should be considered ~~as~~ individual orebodies in no way connected with each other.

#### 6. LIME

The same observations can be made with this reagent. Again, different amounts and actually different pH levels may be required on different samples.

#### 7. CONDITIONING/AERATION

Presumably pyrrhotite, magnetic and barite determinations have been made on the different samples. If the pyrrhotite content is much over 5%, aeration at the head of the mill may be advisable. I would be surprised if M.L. has not already checked this. Different barium contents also are indicative of different metallurgical behaviour.

The two-minute conditioning time as used by L.R. zinc flotation seems unusually short. I like 5 - 10 minutes.

#### 8. SODIUM SULPHITE

This reagent has undoubtedly been tried but it should be remembered that it is beneficial with only some ores and then only under certain conditions. For test purposes 2.0 #/T is required.

#### 9. Concentrate Grades

Comparing metal recoveries would be considerably simplified if they could be related to specific concentrate grades such as 57% lead and 54% zinc. These are not objectives but merely base points. A finer split between a series of concentrates would be required and also some interpolation between results on the basis of grade-recovery relationships at these levels of grade.