Green 14 I
020722

B.C. RESEARCH

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8/9/78
Xerox copy given to M.D.R.

July 14, 1978

Mr. M.D. Rowswell
Executive Vice President
Kerr Addison Mines Ltd.
P.O. Box 91
Commerce Court West
Toronto, Ontario

Dear Mr. Rowswell:

We have run several shakeflask tests on the Grum concentrate to determine if the sulfides contained are amenable to biological extraction.

Our first set of tests were performed on a sample of zinc rougher concentrate, a sample of zinc cleaner concentrate, and a sample of lead cleaner concentrate.

Upon completion of the tests, tailassays were performed on the leach residues and, by adding metal values dissolved, we calculated the head assays.

Table 1 shows the extractions obtained but, as I explained to you earlier, when the tests were terminated, the zinc cleaner concentrate was still leaching, thus its extraction was not completed.

As can be seen from Figure 1, frequent pH adjustments had to be made on the lead concentrate and, initially on the zinc rougher concentrate in order to get the leaching pH sufficiently low to provide the correct pH for the leaching bacteria. Once leaching started however, all these concentrates proved to be strong acid producers.

In a second set of tests, we added a sufficiently large amount of acid to the concentrate to offset its acid demand in the hope of obtaining a better leach. During these tests we found out that when the excess acid produced is neutralized with a strong alkaly, like NaOH, some of the zinc precipitates, probably as a basic zinc sulfate. The leach curves of Fig. 2 clearly show how the leach was stopped when after 750 h, NaOH was added. This phenomena, which we have never observed before, was noticed again when I tried to leach the zinc cleaner concentrate under automatic pH control using NaOH. It took approximately 200 hours (Fig. 2) before leaching recommenced and maximum extraction was obtained after a total of 1400 hours. Total extractions (Table 1) were better than those from the first test. It appears that the zinc cleaner concentrate is of sufficiently small particle size that further size reduction is not necessary but ball-

milling to 98% -400 mesh is necessary for the Zn rougher and Pb cleaner concentrates.

I have run two more series of tests on the zinc cleaner concentrate to determine if we could offset the excess acid production during the biological stage of the leach with either more concentrate or calcium carbonate.

As shown in Figure 3, adding concentrate does not work. So much concentrate was needed that the pulp density became too high. The sample which had $CaCO_3$ added leached well and after 650 h had reached a 47 g/ℓ zinc concentration, equivalent to 90% + extraction, and, at the time of this report, is still leaching. An additional test with $CaCO_3$ as neutralizing reagent shows similar good extraction and a faster leaching rate (Figure 4).

Conclusions

We feel confident that the Grum concentrates can be treated with the biological leaching process. The determining factor will be the rate at which we can solubilize the zinc from the various concentrates. Fast rates, similar to those to be obtained in commercial leaching plants, can be produced in the laboratory only in tank tests.

To make a proper assessment, we will have to run a series of three tank tests, one on each concentrate. It is probable that by first leaching the lead concentrate to remove as much of the zinc as possible, the leach solutions obtained can then be used to leach the zinc rougher concentrate and the solution from that leach to finally leach the zinc cleaner concentrate. In that manner, a very high grade zinc solution can be obtained, particularly if we use a leach of 20% pulp density. The residues of the three tank leaches can then be treated separately or combined, to see if any of the remaining values can be extracted.

If we perform such a series of tank tests, we will follow the build up of all soluble metal values, accurately determine leach rates, assay the residues for Pb, Zn, Hg, Ag and anything else that may be of interest to you. In addition, we will provide you with a preliminary flowsheet of the anticipated commercial leach plant. Since the duration and workload of such leaching tests are impossible to estimate in advance, I would prefer to provide you with an estimate of the cost range I think may be required. I estimate that a minimum of $10,000 will be required and if we run into many problems, cost may run as high as $15,000. However, we would advise you well in advance if it appears that the $10,000 will be exceeded.

Yours very truly,

B.C. RESEARCH

A. Bruynesteyn
Manager, Mineral Leaching Studies
Division of Applied Biology

AB:cf
Encls.

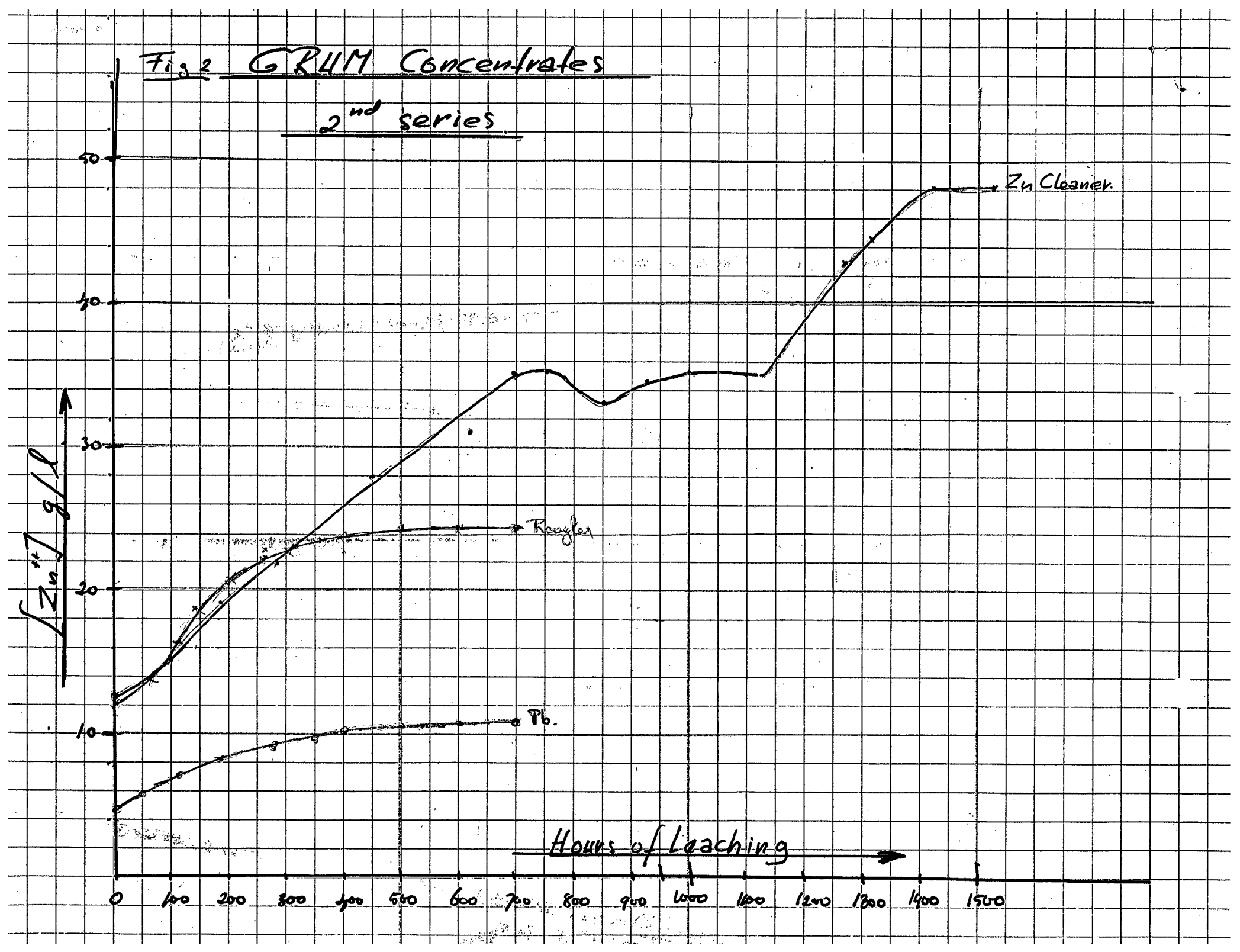
TABLE 1

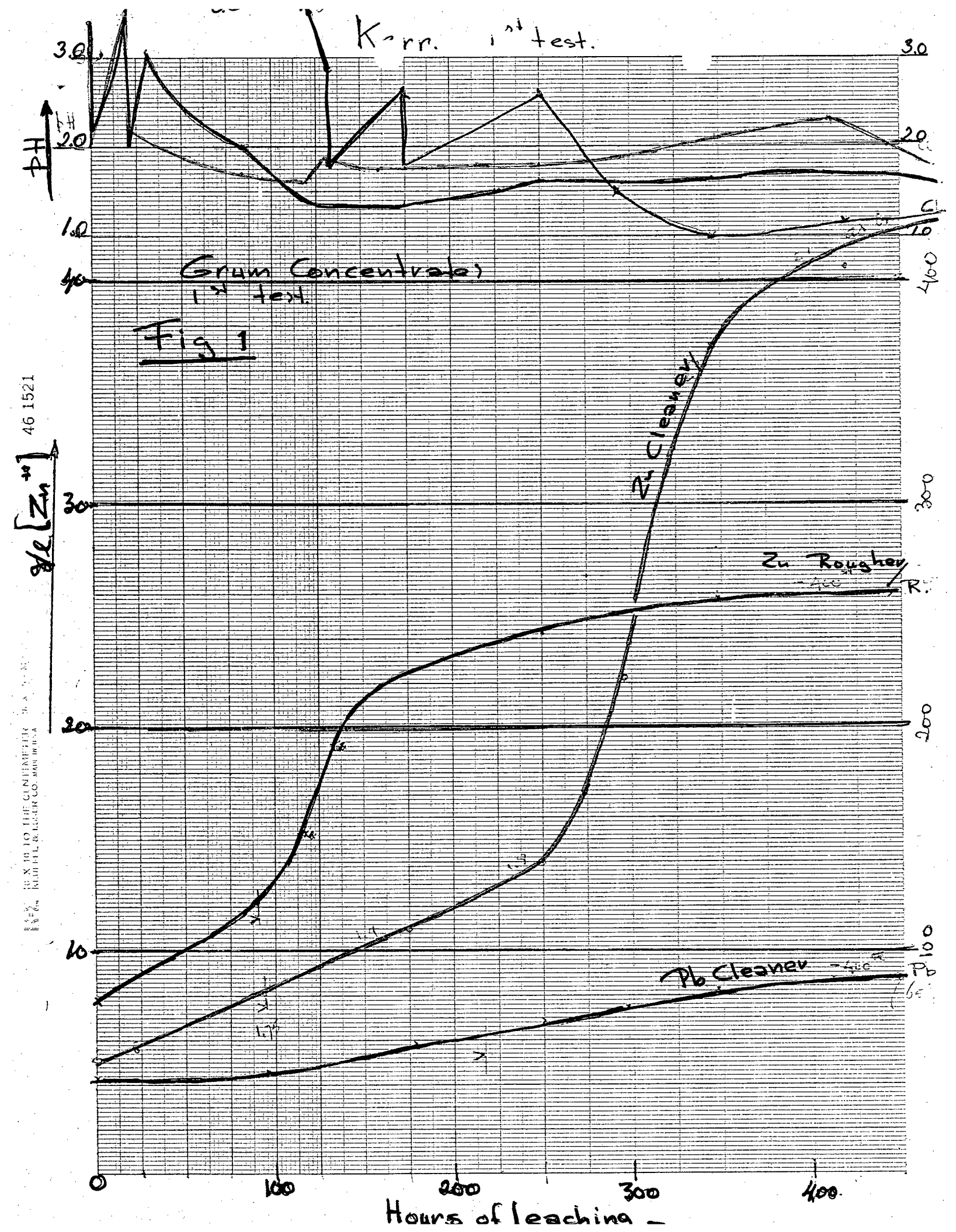
Head and Tail Assays
Grum Concentrates

		Test #1				Test #2			
		Head assay Zn%	Tail assay Zn%	Tail assay Pb%	Extrac. %	Head assay Zn%	Tail assay Zn%	Tail assay Pb%	Extrac. %
Zn rougher	as is	22.2	8.4	3.1	73.7	25.3	13.1	1.4	63.2
	-400#	27.6	5.2	4.8	91.7	26.2	2.8	2.3	94.5
Zn cleaner	as is	54.6	31.1	6.7	76.5	58.1	17.8	4.4	90.9
	-400#	51.0	40.1	6.7	60.5	58.5	20.1	7.9	90.6
Pb cleaner	as is	14.6	5.24	51.8	24.7	12.8	8.6	51.8	24.3
	-400#	12.9	4.4	56.3	65.2	10.3	2.5	57.8	76.0

Fig 2 GRUM Concentrates

2nd series




K-rr. 1st test.
pH
3.0
2.0
1.0
Grum Concentrate
1st test.
Fig 1
46 1521
Zn Cleaner
Zn Rougher
Pb Cleaner
Zn
Pb
400
300
200
100
0
100
200
300
400
Hours of leaching

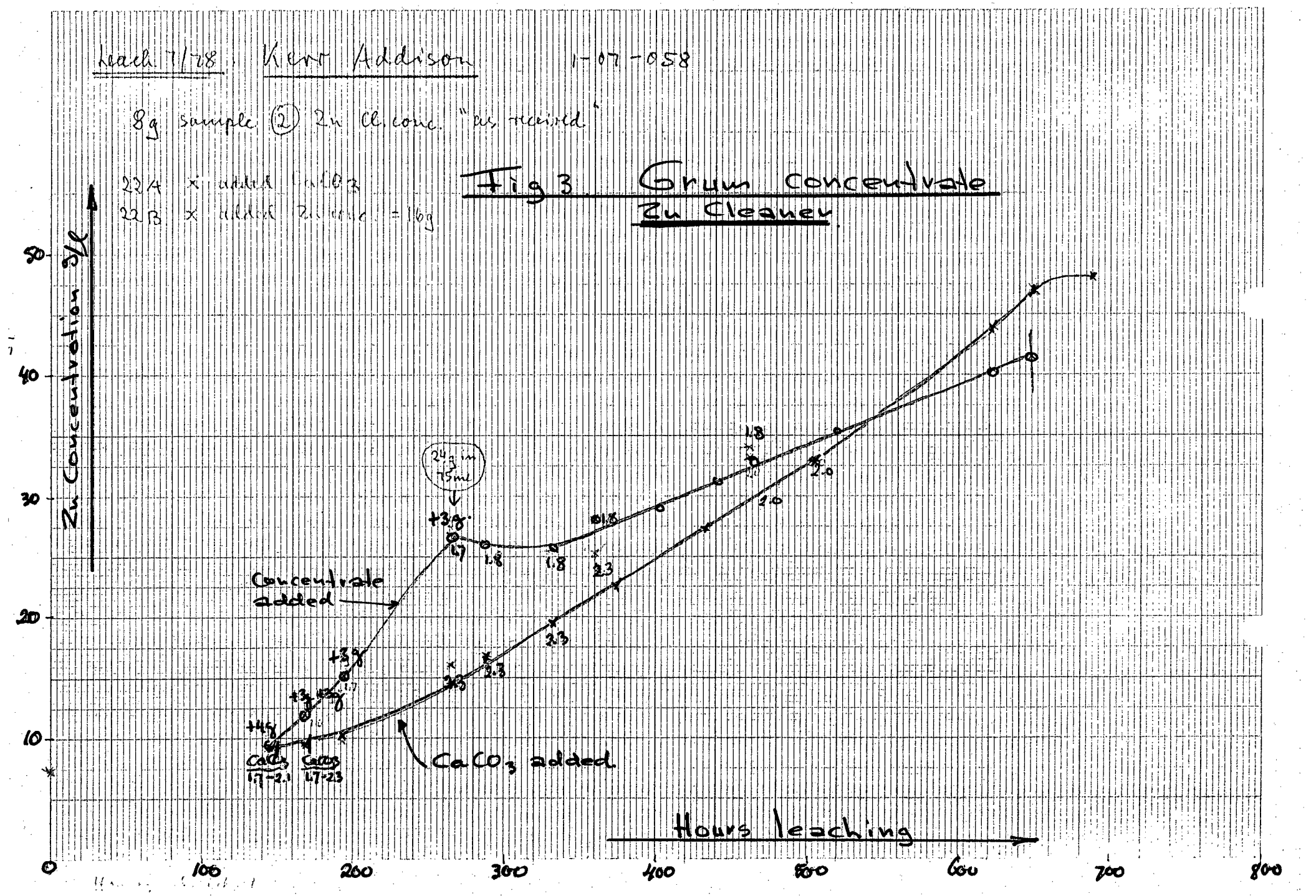
Leach 7/28 Kent Addison 1-07-058

8g sample ② Zn Cl. conc. "as received"

224 × added 1.0g

228 × added Zn conc = 16g

Fig 3 Grum concentrate Zn Cleaner

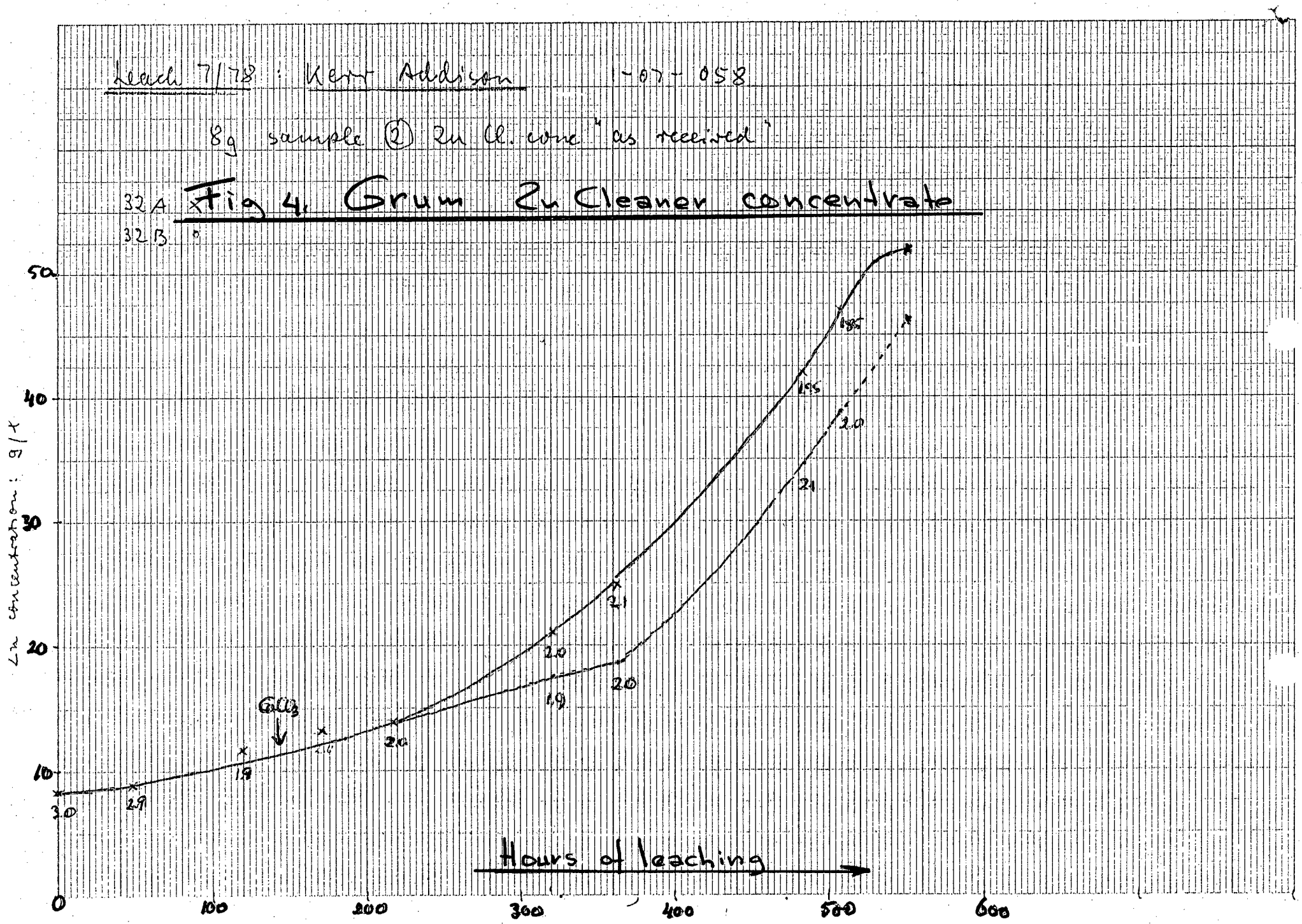


Leach 7/78 : Kerr Addison 1-07-058

8g sample ② Zn Cl. conc "as received"

32A
32B

Fig 4. Grum Zn Cleaner concentrate



Gram 14

B.C. RESEARCH

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August 17, 1978

I.D.B.
A.H.C.
P.S.C.
W.J.
D.A.L.
S.P.
J.B.S.
FILE

Mr. M.D. Rowswell
Executive Vice President
Kerr Addison Mines Ltd.
P.O. Box 91
Commerce Court West
Toronto, Ontario.

Dear Mr. Rowswell:

Further to my letter of July 14, 1978, we have completed the mercury assays on the leach residues of the three concentrates. As mentioned, we tried to determine silver levels in the residue also, but there is so little silver that standard wet assay techniques on the small quantities of residue we obtain from our leach tests (less than 8g) does not give any results. To do a proper tail assay we would need at least 30g of residue, preferably more.

Table 2, which is an addendum to Table 1 of my July 14th letter, shows the grams of residue obtained from the 8 grams of concentrate used for each leach test, the mercury content of the residue and the concentration factor.

Thus, 10 tonnes of zinc cleaner concentrate will yield $^{10}/_{3.65} = 2.74$ tonnes of residue containing 5.13 kg of mercury and, as shown on Table 1, 550.7 kg of zinc and 216.5 kg of lead.

As mentioned in our letter of July 14th, we will be pleased to confirm these results on a larger scale test.

Yours very truly,

B.C. RESEARCH

A. Bruynesteyn
Manager, Mineral Leaching Studies
Division of Applied Biology

AB/mgh
Enclosure

AUG 21 1978

Mercury Assays of Leach Residues and
Residue Concentration Factors

Table 2

	Weight g	Mercury g/tonne	Concentration factor
Zn rougher			
as is	5.65	318	1.41
- 400#	4.15	412	1.93
Zn cleaner			
as is	2.35	1736	3.40
- 400#	2.19	1874	3.65
Pb cleaner			
as is	9.05	94	0.88
- 400#	7.85	100	1.02