Giant Yellowknife Mines Limited
Yellowknife Division

TAILINGS RETREATMENT PLANT

1988 GOLD EXTRACTION VERSUS MINE PLAN

A REVIEW OF PRE START-UP INVESTIGATIONS

November 7, 1988

Respectfully submitted by:

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SUMMARY

Examination of TRP project files has shown that gold "extraction to solution" for the 1988 operating season is within the bounds predicted by the database (very limited) for the area mined. Cumulative testwork indicates the liberated gold in tailings is readily solubilized, however the ratio of liberated/refractory gold (% recoverable) varies over large sections of the tailings ponds. Thus, without changing the TRP process flowsheet, there is an opportunity to improve the project cash flow in 1989 by mining of more favourable feed stock. Further core drilling and laboratory testing are required to support this mine planning option. Samples representing the total core depth must be tested to be consistent with the current mining method.

TRP gold production is a complex function of feed grade, refractory index, dam location, mining method, and tonnage rate. Thus the TRP operating budget objective may best be simplified to a basis of ounces gold production.

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1.0 INTRODUCTION

Laboratory work by the Giant Mill and Lakefield Research to determine the response of GYML tailings to conventional cyanidation showed that gold extractions can vary from 25% to 45% depending on pond location, sample depth and grade. A pilot plant campaign was operated on a Central Pond/Polishing Pond blended (top 10-15') sample to check for any major operating and process problems. No insurmountable problems were evident and the pilot plant averaged 38.9% gold extraction. An 8000 tpd TRP facility was constructed and the budget for the first season's operation was set at 40% gold recovery. By the end of September, 1988 the TRP had averaged 30.3% gold extraction to solution and there were no obvious reasons to explain this shortfall.

It was felt that a review of the documented project history (especially by a newcomer to Giant) might spark a fresh perspective on 1988 TRP plant performance and indicate a strategy for increasing project revenues.

2.0 FINDINGS

All four Lakefield reports (Ref 1-4) and applicable GYML reports (Ref 5-15) were reviewed.

About 7.5 million tons of tailings in several pond areas was characterized using 27 drill holes. All drill holes were assayed in detail. However, not all holes were subjected to metallurgical evaluation. For that laboratory work completed, the basis for preparing test composites was varied widely between test programs, i.e.:

- Select several 2 ft sections from an 80 ft core depth.
- Composite several adjacent holes in total.
- Prepare top or bottom composites from several holes.

All documented laboratory test data are included in Appendix I by tailings dam source. The individual test results were mathematically combined where appropriate to provide an indication of the cyanidation response of the total depth of core.

From the data in Appendix I, and other key research results, my comments have been structured into the following sections:

2.1 Variation in Metallurgical Factors with Dam Depth

There are two general metallurgical trends within the dams:

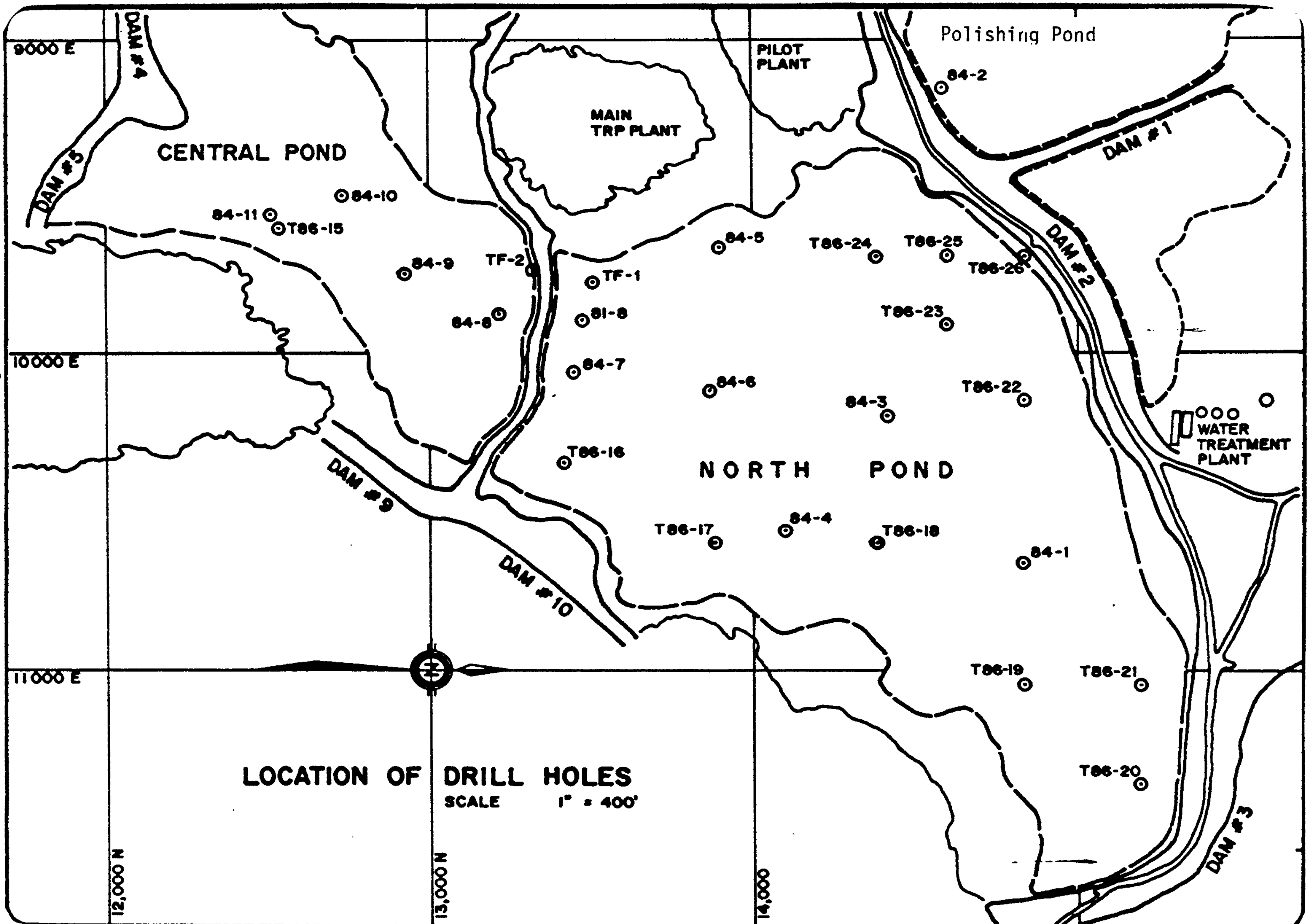
- The gold assay increases with sample depth - effect of general mill efficiency improvements over the years.

- The % extractable gold decreases with sample depth - non refractory gold in flotation tailings may be currently forming a higher ratio to refractory calcine losses.

On net balance, the amount of recoverable gold/ton mined does increase with depth within the tailings dams. These trends are evident in the data of Appendix I for those drill holes subjected to laboratory cyanidation tests by sectional depth.

2.2 Variation in Metallurgical Factors Between Drill Holes

Figure 1 shows the location of the 27 drill holes over the area of the North and Central tailings dams. Table 1 contains a summarized list of metallurgical factors (from Appendix I) for those drill holes with sufficient supporting laboratory data. The recoverable ounces/100 tons mined is noted versus dam location in Figure 2. Data for the Polishing Pond and southeast corner of the North Pond are lumped over wide areas due to the method of laboratory sample compositing.



TAILINGS DAM DRILL HOLE LOCATIONS

FIGURE 1

TABLE 1

GOLD EXTRACTABILITY VS. DRILL HOLE

Hole No.	Gold Grade oz/ton	24 hr. Gold Extraction %	24 hr. Gold Extraction (1)oz/100 tons
84-4	0.078	*30.2	2.3
84-5	0.104	*31.5	3.3
84-9	0.087	*26.1	2.3
84-10	0.055	*31.5	1.7
84-1, 86-18, 19 } 86-21, 22 }	0.073	43.4	3.2
(2) Polishing Pond			
Hole Groups -		30.1 to 39.0	2.4 to 4.6
Overall -	0.087	34.2	3.3

Notes:

* Data averaged from variable numbers of core section results. Tests on total drill hole composites required for confidence.

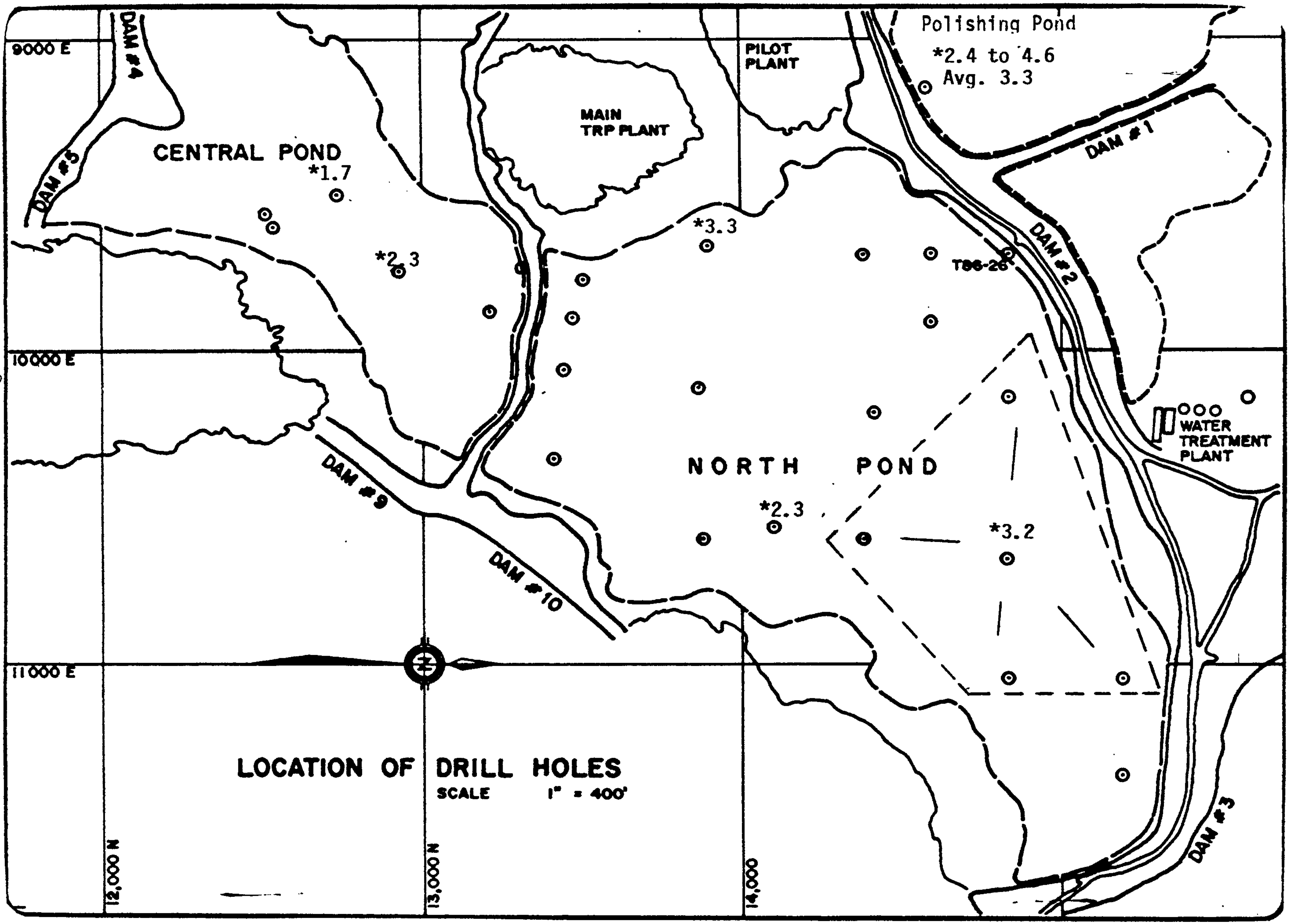
(1) Carbon adsorption losses not included.

(2) Lakefield Research Data.

FIGURE 2

DISTRIBUTION OF RECOVERABLE GOLD INDEX

*Oz Recoverable Gold/100 Tons Mined



Due to the coarse hole spacing and the wide hole to hole variations in % extraction (26 to 43) and recovery index (1.7 to 4.6 ounces/100 tons), it is difficult to gauge how large an area is affected by the data from a single drill hole. Alternatively, for composites of many holes (southeast North Pond), it is impossible to assess the degree of variation in performance within the drilled off block.

A potential planning pitfall is trying to predict recovery or recoverable ounces from grade data alone. Each pond seems to have its own general level of gold refractory index. Within a pond, the refractory index (or extraction variation for a single grade range) can also vary widely, eg. for North Pond:

Hole 84-4	.078 oz/ton Au	30.2% Extraction
Southeast Area	.073 oz/ton Au	43.4% Extraction

Clearly, several recommendations are in order to allow meaningful budget preparation and mine planning, i.e.:

- o Drill off the area to be mined with a close drill grid during the preceding winter.
- o Conduct laboratory gold extraction tests on samples representing the total depth of each core.
- o Standardize and document the laboratory test procedure in detail.

Nov 7, 1988 TRP VS [illegible] + [illegible] D. [illegible]

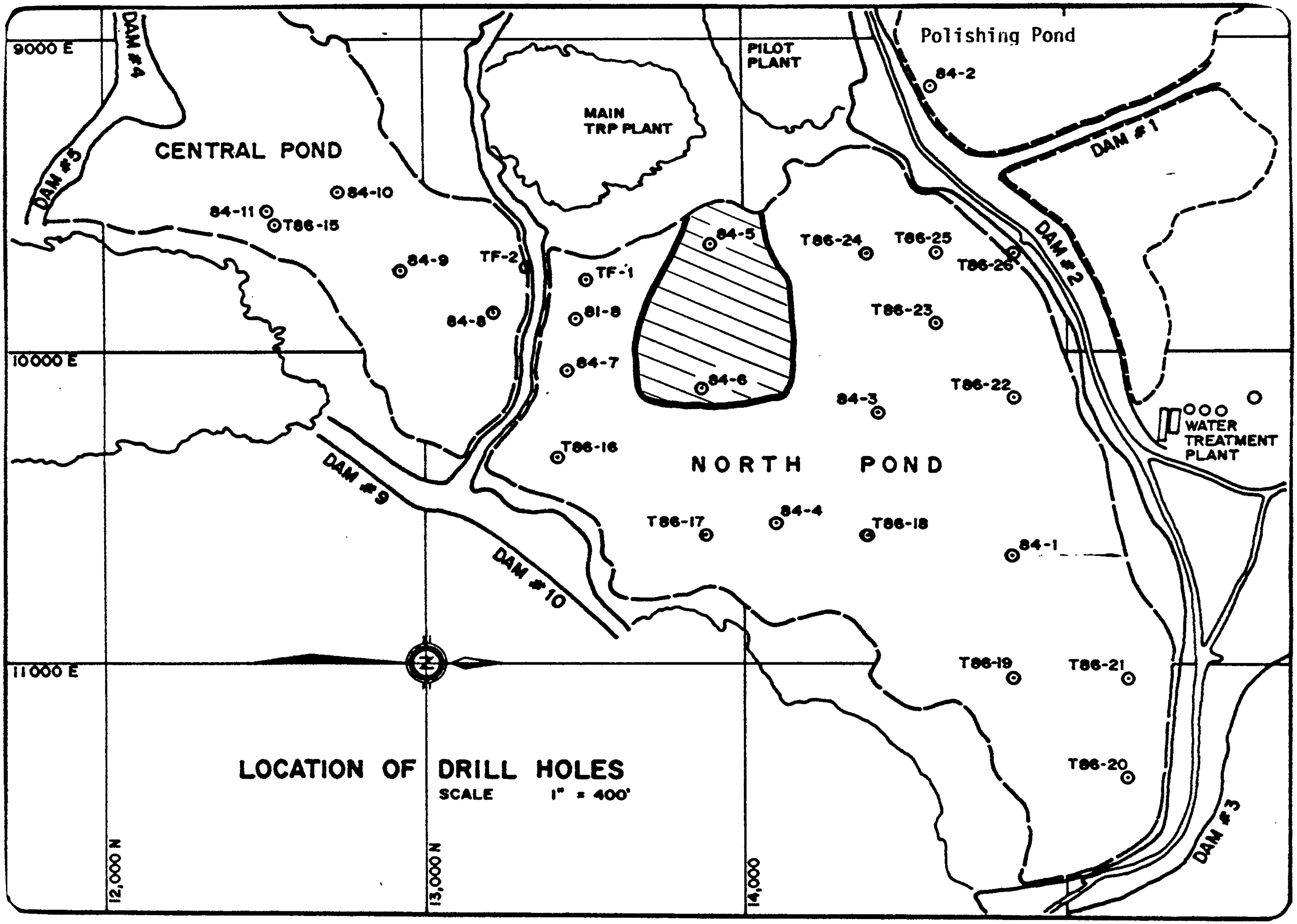
2.3 Mine Planning - General

Adequate work was done to establish the total gold reserve of the tailings dams. However, the metallurgical evaluation was sufficient only to show that in the order of 30-40% of the gold could be recovered over the life of the project. There was not enough test data for yearly budget preparation on gold production (mine planning). The % extractable gold is not determined solely by tailings dam gold grade. Available data suggest that the refractory index of the contained gold also varies over the area of the dams.

2.4 1988 Gold Extraction Performance Vs. Target

The TRP budget for 1988 was 40% gold recovery from material grading 0.067 oz/ton. To September 23, 1988 (prior to the bulldozing of surface material) TRP performance was a gold extraction to solution of 30.4% from material grading 0.079 oz/ton.

The bulk of the mining for the 1988 season occurred in that area of the North Pond highlighted in Figure 3. To September 23, over 90% of the TRP feed originated from this source. There are only two drill holes within this area, ie. Holes 84-5 and 84-6.



1988 MINED AREA
(crosshatched)

FIGURE 3

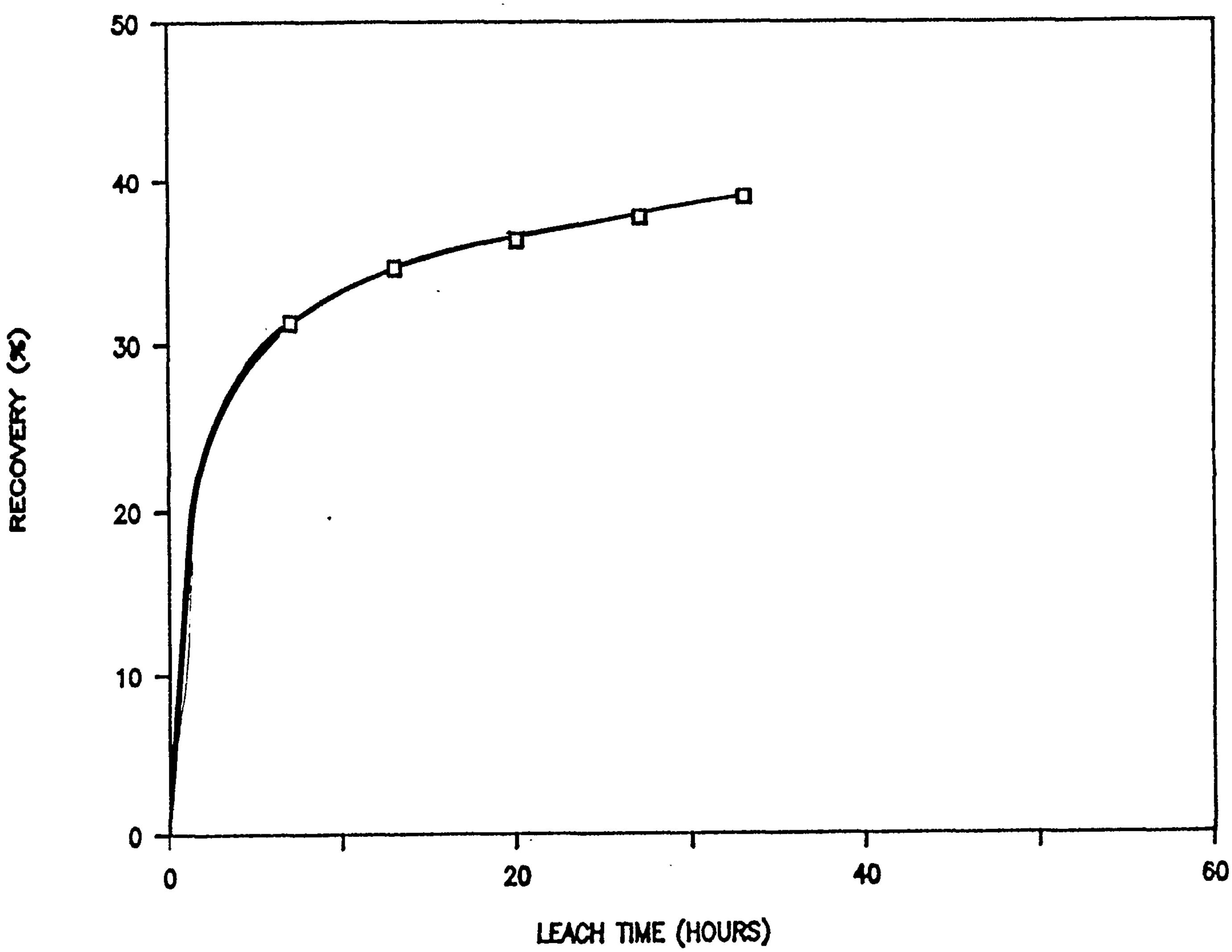
Laboratory cyanidation testwork was only conducted on Hole 84-5; and this was done in several 2 ft sections versus the total core depth. The complete gold extraction data available on this hole from three separate laboratory reports (Ref 1,2 and 5) is detailed in Appendix I. Overall gold recovery would be less, depending on carbon adsorption efficiency. Integrating all the extraction information yields a gold extraction of 31.5%. This is the highest extraction that could be expected from the area mined.

The conclusion is that 1988 TRP gold cyanidation performance is within the bounds of the very limited data available that could have been used to set targets. This does not necessarily mean that gold extraction was optimum, only that a major deviation is not evident.

2.5 Extraction Characteristic of GYML Tailings

Figure 4 contains the pilot plant recovery vs. time curve or gold extraction characteristic of GYML tailings. This cyanidation response curve was typical of all the laboratory results as well. The bulk of the contained gold is solubilized within the first 4 to 8 hours; thereafter the rate of extraction is slow but steady. There are two different leaching regimes in operation:

PILOT PLANT GOLD EXTRACTION CURVE



A. 4 to 8 hours - the gold is already soluble in the in-situ tailings or dissolves readily on contact with cyanide.

B. Greater than 8 hours - the gold here is hindered from dissolving by the following likely mechanisms:

- o surface area - coarse nuggets
- o access channels - solution flow through pores and micro-fissures
- o gold surface tarnish on coating.

The point here is that the leaching characteristic contributes to two expected extraction performance trends:

- o insensitivity to test method
- o insensitivity to operating variables.

2.6 Methods for Extraction Evaluation

On a laboratory scale, various testing techniques have been used on the same tailings samples to yield equivalent extraction dresults in 24 hours, i.e.:

- o bottle rolls and agitated vat techniques
- o various speeds for agitated vat tests, 400 - 700 ppm
- o fresh moist samples and those pre-dried at 450°F.

The inference is that gold extraction is not sensitive to mixing regime and that no preg robbing species are present. Thus, equivalent extraction results should be expected from any size of suitably mixed reactor - lab bottle, pilot plant, or commercial plant.

The corollary is that extraction of gold to solution in the TRP Plant should be adequately predicted by laboratory evaluation of <u>representative</u> feed material.

2.7 <u>Sensitivity to Operating Parameters</u>

In the laboratory, process variables have been changed in an effort to increase gold extraction. These have included:

- o NaCN concentrations, 0.33 to 2.0 g/L
- o Pulp density, 30 to 50%
- o Retention time, >24 hours
- o pH, 10.5 to 11.0
- o Degree of grinding, Nil to 13.2 kWh/t
- o Intensive pre-scrubbing, 10 min.
- o Acid pre-reaction, 0.1 M HCl (Ref 7)

Within testing error, final gold extractions have not been sensitive to any of the above variables. Roasting the TRP feed at 1500° F (Ref 15) is the only process which has had a major impact - an increase in extraction from 37% to 67%. This indicates the basic refractory nature of the tailings.

The inference is that there will be little metallurgical control over a tailings cyanidation plant. As long as free cyanide exists in solution, most of the obtainable gold will yield easily, and the rest will require a long wait. In a 6 stage CIL process on GYML tailings, it is expected that the extraction will be essentially finished after the second tank; the remaining four tanks being required for carbon adsorption.

2.8 Pilot Plant Performance

The TRP pilot plant operated for two months and yielded gold extractions chiefly in the 35 to 40% range, and averaged 38.9%. The question is can this extraction result be used to predict performance for the 1988 season or for the 5 year project life as a whole? The answer is no - unless the specific pilot plant feed material is representative of that mined for 1988 or to be mined during the project life. This may have been difficult and/or cost prohibitive.

The four sources of pilot plant feed material are indicated in Figure 5. For accessibility, these areas were chosen close to roads. As a backhoe was used to dig the samples, the maximum retrievable depth was 25 feet and most of the sample trenchs were a nominal 10-15 feet deep.

Coincidentally, the grade of the pilot plant feed was very close to the 5 year project average (0.0645 oz/ton vs. 0.0670 oz/ton). However, the top portion of a number of drill holes have shown much higher gold extractions than average and thus the sample locations may have been partially "high-graded". The data in Table 2 shows this trend for Holes 88-1, 88-12 (Ref 13,14).

Laboratory work by T.R. Raponi (Ref 9) on stockpiled pilot plant feed composite showed that gold extractions of 36-38% could be expected. This prediction was fairly close and demonstrated that laboratory bottle rolls testwork could be used to characterize the performance of TRP feed. This also implied that the TRP flowsheet could be scaled-up to commercial size with no sacrifice in gold extraction from equivalent feed material.

With the variation in drill hole extraction results throughout the tailings ponds, it would be meaningless to compare the performance of 60 tons from four edge spots (pilot plant feed) to the 7.5 million tons in the dams. The pilot plant served other purposes, which was to:

- o Identify mechanical problem areas
- o Obtain process flowsheet and design data
- o Demonstrate the process and train staff.

TABLE 2

POLISHING POND CYANIDATION RESULTS
GIANT MILL LAB *PROGRAM

Drill Hole	Depth	Gold Head, oz/ton Assay	Gold Head, oz/ton Calculated	Gold Extraction %
88-1	Total Core	0.103	0.114	30.0
88-2	" "	0.107	0.113	26.5
88-3	" "	0.106	0.106	29.8
88-4	" "	0.103	0.098	29.9
88-5	" "	0.100	0.104	28.6
88-6	" "	0.103	0.100	27.0
88-7	" "	0.102	0.102	30.6
88-8	" "	0.105	0.105	33.4
88-9	" "	0.103	0.104	27.5
88-10	" "	0.102	0.104	24.5
88-12	" "	0.099	0.102	30.1
Avg.		0.103	0.105	28.91
88-12	0-10	0.101	0.124	49.6
	10-20	0.138	0.152	24.1
88-1	0-10	0.101	0.125	49.6
	10-20	0.138	0.151	24.1
	20-30	0.104	0.119	26.1
88-10	Total, CIL	0.095	0.106	30.7
	Total, repulp	0.095	0.101	30.8

NOTE:

* Data from References 10 to 14

2.9 Extraction from the Polishing Pond

The most recent Lakefield report (Ref. 4) has a spurious extraction prediction for overall polishing pond composite tailings. This leach curve in Figure 6 is from one test and it indicates that over 40% extraction can be achieved in 24 hours. However, as shown in Appendix I, testwork on the five components of this composite would have predicted 34.2% gold extraction. Clearly, the work must be repeated to validate any synergistic effect.

Of a more serious nature, the work completed by Giant Mill staff (see Table 2) suggests that overall gold extractability from the polishing pond is 29%. The Giant program is very credible in that excellent gold mass balances were achieved:

Comparison of Testwork Average Gold Mass Balances

	Giant	Lakefield
Assayed Head, oz/ton Au	0.103	0.086
Calculated Head, oz/ton Au	0.105	0.096
Mass Balance	102%	112%

1988 Perf.
vs. Pilot Plant
& LABS

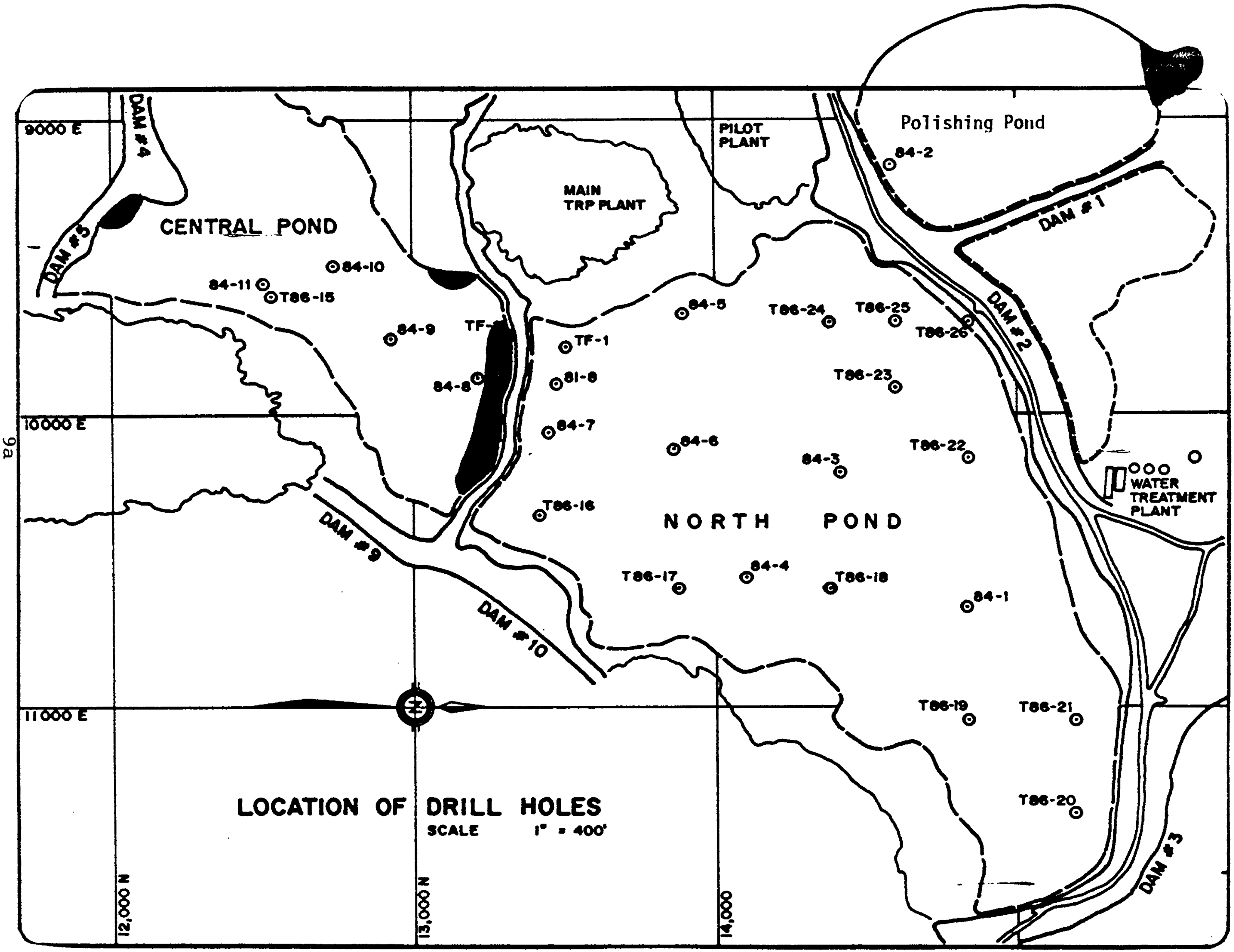
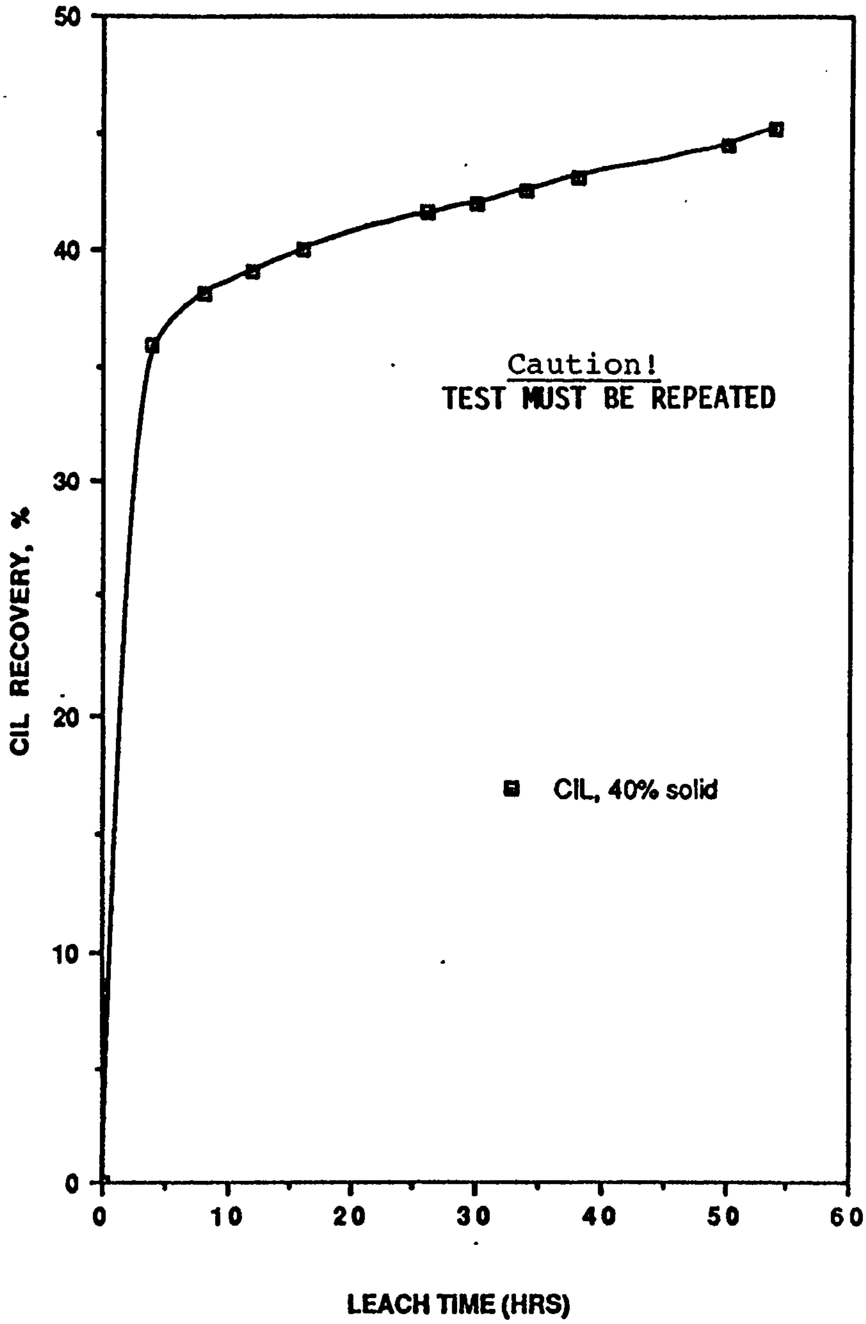


FIGURE 5

PILOT PLANT FEED SOURCES (shaded)

POLISHING POND GOLD EXTRACTION CURVE (Ref. 4)



3.0 CONCLUSIONS

The September 23, 1988 YTD TRP recovery of 30.4% is close to what would be expected for the area mined based on the limited metallurgical database available to characterize that feed. Thus any shortfall relative to the plant budget figure may be more a failure in mine planning than in TRP plant process performance. There is no documented evidence (laboratory, pilot plant or commercial plant) to indicate that gold extraction by cyanidation of GYML tailings is sensitive in any process variable - controllable or not.

4.0 RECOMMENDATIONS

1. Mine planning for the 1989 season should take into consideration a "laboratory recovery index" for the area in question. The key planning criteria should be:

   - o Sufficient detail - say 8 to 10 drill cores to describe the 1.53 million tons

   - o Test the whole core length - cyanidation must be on samples representing the total core to be consistent with the mining method

   - o Sensitivity analysis - a structured laboratory program should be conducted to indicate the sensitivity of gold extraction to process variables using an overall composite sample. This work will flag any opportunities for process optimization during the coming season.

   - o Standardize the laboratory cyanidation test in detail - i.e. speed of bottle rolls, sample size, leach time, residue cake washing procedure, etc.

2. Where possible, core samples from historical drill holes should be tested on a "whole depth" basis. This will assist in categorizing the recovery potential of major tailings areas and contribute to the development of a 4 year mine plan.

3. On the basis of metallurgy alone, the southeast corner of the North Pond has good gold production potential, i.e.:

   - Grade - 0.073 oz/ton
   - Cyanidation performance - 43.8% extraction
   - Recovery - 3.17 oz Au/100 tons.

   Available data should be firmed up (hole by hole evaluation) and consideration be given to increasing project cash flow by mining the "sweet areas" as early as possible.

4. Efforts should be continued to investigate flowsheet changes/additions for enhanced project gold recovery. Ways to concentrate the refractory gold in TRP tailings should be a key program. Flotation and magnetic separation are potential processes.

5.0 REFERENCES

1. "The Recovery of Gold from Tailings Samples Submitted by Giant Yellowknife Mines Limited", Lakefield Research Project No. LR 3173, Progress Report No. 1, September 4, 1986.

2. Ibid, Progress Report No. 2, February 16, 1987.

3. Ibid, Progress Report No. 3, March 30, 1987.

4. "The Recovery of Gold from Samples Submitted by Giant Yellowknife Mines Limited", Lakefield Research Project No. LR 3515, Progress Report No. 1, August 24, 1988.

5. "Tailings Retreatment Program", Memo: B. Cross to K.S. Morton, March 30, 1984.

6. "Tailings Dam Drilling Project - 1984 Results and Conclusions", Memo: G. Halverson to K. Morton, February 22, 1984.

7. "Tailings Retreatment Program", Memo: B. Cross to K.S. Morton, March 5, 1984.

8. "Tailings Reclaim Project", Feasibility Study Report by S.E. El-Alfy, September 1987.

9. "Cyanidation Testwork on Feed Material for the T.R.P. Pilot Plant", Memo: T.R. Raponi to G.B. Halverson, April 21, 1987.

10. "Cyanidation Testwork on Polishing Pond Composite Samples", Memo: M.E. Goodfellow to T.R. Raponi, April 22, 1988.

11. "Cyanidation Testwork on Polishing Pond Composite Samples", Memo: M.E. Goodfellow to T.R. Raponi, April 27, 1988.

12. "Cyanidation Testwork on Polishing Pond Composite Samples - #3", Memo: M.E. Goodfellow to T.R. Raponi, May 5, 1988.

13. "Cyanidation Testwork on Top, Middle and Bottom Composite Samples from the Polishing Pond", Memo: M.E. Goodfellow to T.R. Raponi, May 11, 1988.

14. "Cyanidation Testwork on Top 20' of a Composite Sample from the Polishing Pond", Memo: M.E. Goodfellow to T.R. Raponi, May 26, 1988.

15. "Roasting/Cyanidation Testwork on Composite Samples of Test Hole #7 From the Polishing Pond", Memo: L. Dufour to T.R. Raponi, June 27, 1988.

APPENDIX I

Metallurgical Characterization

Of Drill Core Samples

APPENDIX I

METALLURGICAL CHARACTERIZATION OF DRILL CORE SAMPLES

Pond/Hole #	Core Depth Feet	GOLD Grade oz/ton	GOLD Extraction %	GOLD Oz Recoverable per 100 tons
North Pond				
T 84-2	16-18	0.033	46.1	1.52
	30-32	0.076	29.6	2.25
	Avg.	(1) 0.062		
T 84-3	28-30	0.072	47.4	3.41
	64-66	0.139	29.6	4.11
	Avg.	0.081		
T 84-4	14-16	0.030	46.0	1.38
	20-22	0.046	39.5	1.82
	*24-26	0.079	29.4	2.32
	*34-36	0.081	50.5	4.09
	36-38	0.070	33.1	2.32
	44-46	0.070	26.5	1.86
	*54-56	0.142	19.1	2.71
	Avg.	0.078	30.2	2.34
T 84-5	24-26	0.056	33.4	1.87
	*26-28	0.064	39.0	2.50
	36-38	0.084	27.0	2.27
	*40-42	0.140	24.7	3.46
	58-60	0.164	30.9	5.07
	*68-70	0.139	32.3	4.49
	Avg.	0.104	31.5	3.28
T 84-6		0.081	NO DATA	
T 84-7	18-20	0.051	42.7	2.18
	60-62	0.142	29.0	4.12
	Avg.	0.073		
T 84-1, 86-18, }	Top Composite	0.041	45.2	1.85
86-19,21,22 }	Bottom Composite	0.106	42.4	4.49
	Avg.	0.073	43.4	3.17

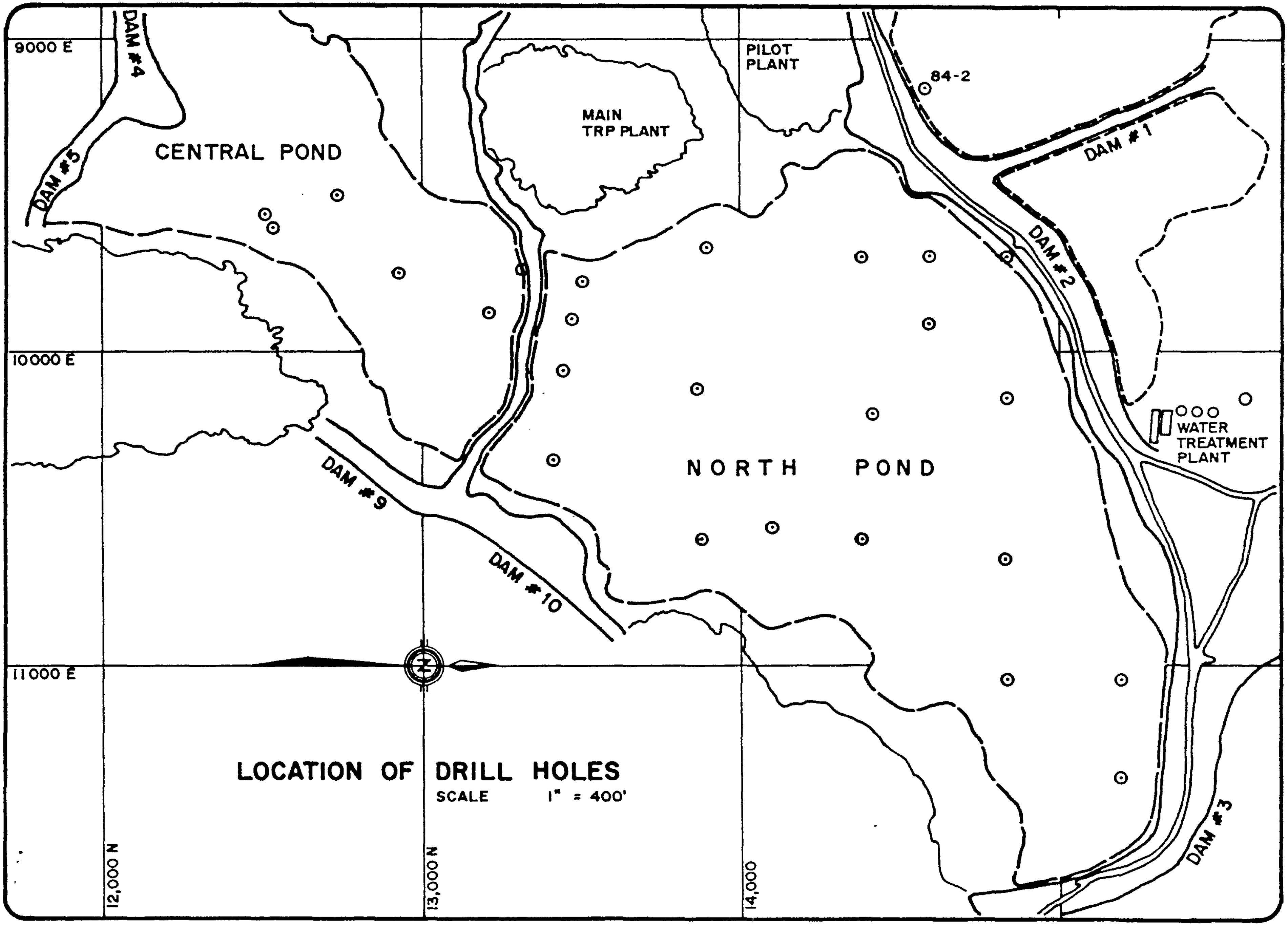
Pond/Hole #	Core Depth Feet	GOLD Grade oz/ton	Extraction %	Oz Recoverable per 100 tons
Central Pond				
T 84-8	22-24	0.035	32.0	1.12
	52-54	0.086	23.5	2.02
	Avg.	0.068		
T 84-9	8-10	0.038	29.3	1.11
	30-32	0.043	36.3	1.56
	*32-34	0.054	42.3	2.28
	*44-46	0.071	27.8	1.97
	62-64	0.176	22.6	3.98
	*70-72	0.100	24.0	2.40
	74-76	0.106	24.6	2.61
	Avg.	0.087	26.1	2.27
T 84-10	8-10	0.040	28.0	1.12
	*26-28	0.045	37.5	1.69
	*32-34	0.086	27.8	2.39
	Avg.	0.055	31.5	1.73
T 84-11	10-12	0.036	32.6	1.17
	*20-22	0.043	42.0	1.81
	Avg.	0.051		
(2) Polishing Pond				
88-1,2,3	Complete holes	0.095	35.0	3.32
88-4,5	" "	0.079	30.5	2.41
88-6,7	" "	0.119	39.0	4.64
88-8,12	" "	0.098	37.0	3.63
88-9,10	" "	0.084	31.1	2.61
88-1 to 88-12 Composite		0.097	34.2	3.32
Pilot Plant				
Areas per Figure 5	Nominal 10-12 ft	0.064	38.9	2.49

Notes:

#Samples were pulverized prior to cyanidation (Ref. 5).

(1) Average assays from detailed drill log data (Ref. 6).

(2) Lakefield Research Data (Ref 4).



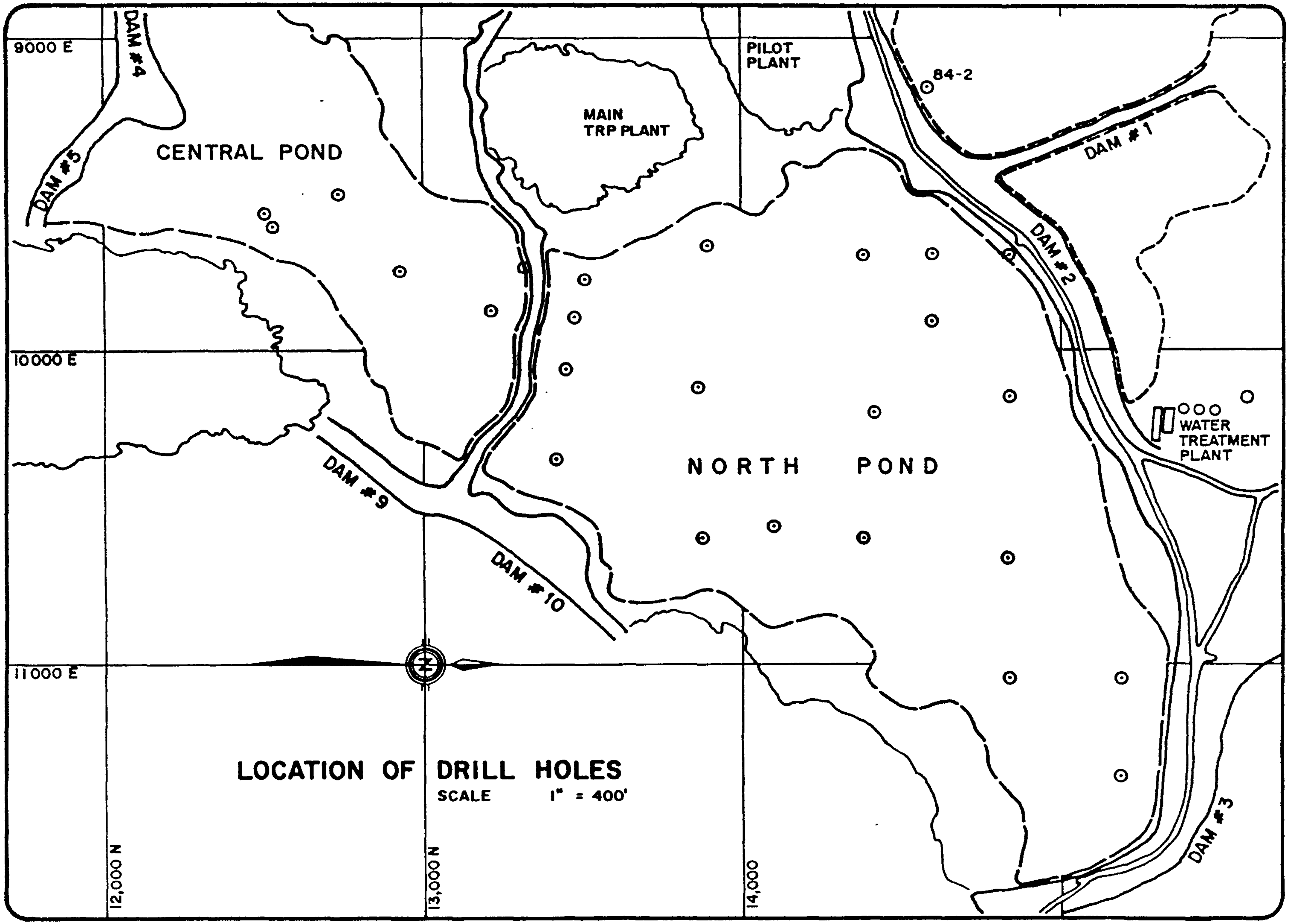
LOCATION OF DRILL HOLES

SCALE 1" = 400'

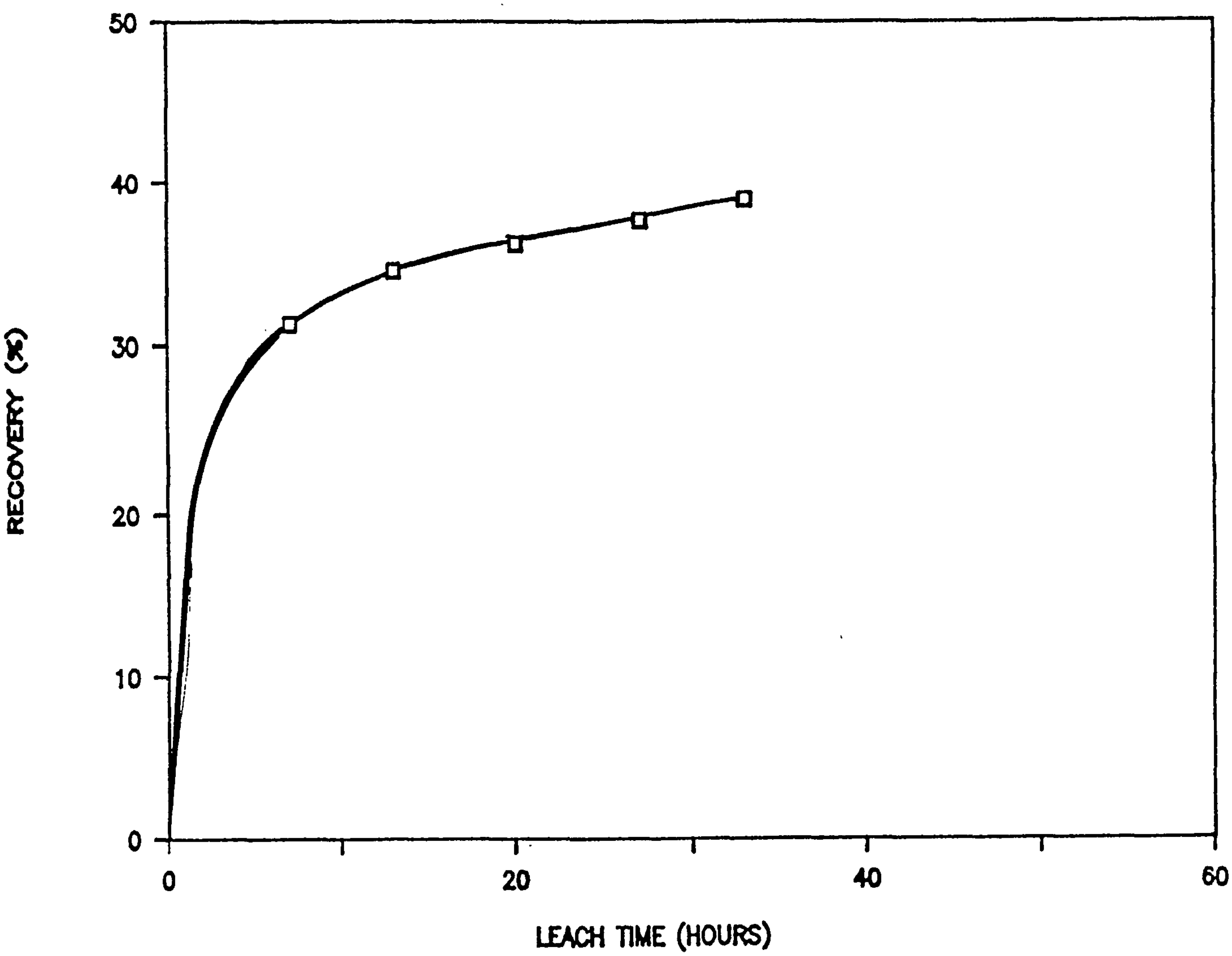
						.0785	.081					Avg Assay					.074	0.081	0.077						.075	

TABLE 3-2 ASSAY RESULTS

DEPTH	81-1	TF-1	TF-2	T84-1	T84-2	T84-3	T84-4	T84-5	T84-6	T84-7	T84-8	T84-9	T84-10	T84-11	T86-15	T86-16	T86-17	T86-18	T86-19	T86-20	T86-21	T86-22	T86-23	T86-24	T86-25	T86-26
0-2	0.034			ICE	ICE	ICE	0.029	0.040	0.046			ICE	0.032	ICE	0.048	0.042	0.024			0.028			0.045			0.045
2-4	0.034			ICE	0.033	0.036	0.032	0.040	0.042			ICE	0.053	0.040	0.047	0.042	0.038	0.040		0.031	0.065		0.031	0.028		0.053
4-6	0.034	0.039		0.092	0.037	0.039	0.036	0.040	0.048	0.046	ICE	0.042	0.040	0.036	0.049	0.049	0.041	0.042		0.026	0.051		0.035	0.038	0.034	0.039
6-8	0.034	0.039	0.038	0.040	0.049	0.188	0.042	0.040	0.043	0.052	0.073	0.050	0.040	0.041	0.048	0.040	0.032	0.039		0.027	0.048		0.030	0.030	0.029	0.041
8-10	0.034	0.041	0.052	0.053	0.044	0.053	0.062	0.040	0.041	0.043	0.040	0.051	0.048	0.047	0.048	0.040	0.035	0.044		0.027	0.041	0.038	0.043	0.040	0.030	0.045
10-12	0.087	0.042	0.052	0.072	0.044	0.042	0.045	0.040	0.048	0.042	0.041	0.054	0.043	0.042	0.048	0.045	0.034	0.043		0.030	0.035	0.034	0.048	0.040	0.032	0.050
12-14	0.087	0.042	0.052	0.108	0.052	0.042	0.053	0.040	0.051	0.043	0.044	0.053	0.048	0.046	0.048	0.050	0.045	0.042		0.030	0.033	0.038	0.042	0.042	0.034	0.045
14-16	0.087	0.043	0.053	0.048	0.049	0.040	0.045	0.036	0.048	0.043	0.044	0.058	0.050	0.046	0.048	0.046	0.042	0.045	0.031	0.022	0.024	0.050	0.045	0.054	0.030	0.052
16-18	0.087	0.042	0.051	0.045	0.049	0.042	0.053	0.039	0.055	0.049	0.048	0.058	0.051	0.046	0.040	0.039	0.043	0.042	0.059	0.011	0.025	0.067	0.042	0.041	0.056	0.040
18-20	0.087	0.043	0.049	0.054	0.054	0.039	0.054	0.040	0.046	0.056	0.039	0.058	0.050	0.046	0.040	0.042	0.048	0.043	0.037	0.015	0.030	0.045	0.043	0.042	0.050	0.044
20-22	0.127	0.044	0.049	0.043	0.071	0.039	0.070	0.048	0.067	0.046	0.043	0.058	0.048	0.043	0.047	0.047	0.063	0.040	0.029	0.011	0.031	0.045	0.058	0.069	0.040	0.039
22-24	0.127	0.045	0.048	0.069	0.068	0.046	0.051	0.059	0.075	0.061	0.041	0.058	0.047	0.040	0.049	0.086	0.070	0.062	0.043	0.015	0.063	0.055	0.082	0.067	0.086	0.045
24-26	0.127	0.043	0.055	0.082	0.046	0.050	0.079	0.061	0.076	0.044	0.038	0.049	0.062	0.048	0.049	0.069	0.069	0.090	0.046	0.017	0.049	0.054	0.068	0.078	0.058	0.049
26-28	0.089	0.049	0.045	0.082	0.052	0.066	0.073	0.064	0.069	0.053	0.048	0.049	0.045	0.050	0.057	0.076	0.073	0.073	0.088	0.019	0.049	0.059	0.073	0.085	0.059	0.045
28-30	0.089	0.057	0.048	0.082	0.058	0.078	0.076	0.060	0.087	0.067	0.063	0.053	0.056	0.049	0.048	0.093	0.073	0.073	0.065	0.021	0.048	0.070	0.076	0.079	0.068	0.047
30-32	0.089	0.061	0.047	0.082	0.080	0.079	0.081	0.102	0.088	0.074	0.047	0.058	0.085	0.052	0.049	0.097	0.063	0.072	0.061	0.023	0.078	0.078	0.064	0.076	0.064	0.049
32-34	0.064	0.061	0.048	0.082	0.069	0.099	0.084	0.096	0.078	0.098	0.052	0.054	0.086	0.049	0.046	0.070	0.090	0.058	0.057	0.021	0.087	0.099	0.072	0.088	0.079	0.049
34-36	0.064	0.059	0.048	0.082	0.087	0.095	0.081	0.113	0.080	0.085	0.048	0.060	0.085	0.059	0.055	0.093	0.113	0.078	0.075	0.032	0.097	0.118	0.080	0.092	0.079	0.064
36-38	0.064	0.071	0.045	0.082	0.053	0.078	0.073	0.085	0.080	0.112	0.059	0.112	0.085	0.066	0.092	0.078	0.136	0.083	0.079	0.033	0.108	0.080	0.080	0.152	0.118	0.099
38-40	0.085	0.070	0.060	0.082	0.080	0.070	0.087	0.090	0.079	0.076	0.046	0.066	0.085	0.067	0.071	0.114	0.119	0.089	0.107	0.036	0.104	0.020	0.085	0.133	0.139	0.098
40-42	0.085	0.058	0.061	0.082	0.129	0.079	0.074	0.140	0.082	0.075	0.046	0.066	0.085	0.060	0.076	0.112	0.104	0.112	0.084	0.038			0.124	0.113	0.159	0.077
42-44	0.143	0.053	0.050	0.082	0.129	0.082	0.113	0.144	0.075	0.081	0.050	0.066	0.035	0.078	0.076	0.186	0.162	0.101	0.143	0.071			0.156	0.167	0.119	0.103
44-46	0.143	0.065	0.056	0.201	0.129	0.105	0.079	0.274	0.079	0.100	0.058	0.071	0.085	0.050	0.064	0.087	0.139	0.129	0.089	0.012			0.104	0.147	0.149	0.124
46-48	0.141	0.073	0.092	0.192	0.129	0.105	0.106	0.112	0.068	0.100	0.079	0.098	0.085	0.085	0.074	0.117	0.123	0.160	0.079	0.008			0.139	0.101	0.119	0.135
48-50	0.141	0.072	0.090	0.534	0.129	0.105	0.120	0.102	0.084	0.100	0.094	0.078	0.085	0.085	0.081	0.122		0.139	0.108	0.009			0.087		0.086	0.077
50-52	0.141	0.077	0.093	0.086	0.129	0.105	0.119	0.122	0.090	0.100	0.091	0.085	0.085	0.085	0.087	0.147		0.091	0.168				0.128		0.083	0.070
52-54	0.116	0.072	0.095	0.082	0.129	0.105	0.094	0.146	0.104	0.078	0.109	0.085	0.085	0.085	0.112	0.072		0.133	0.089				0.086		0.080	0.092
54-56	0.116	0.073	0.091	0.074	0.129	0.105	0.142	0.146	0.133	0.071	0.109	0.103	0.085	0.085	0.139	0.057		0.152					0.119		0.119	0.090
56-58	0.180	0.100	0.090	0.159	0.129	0.105	0.124	0.146	0.130	0.103	0.086	0.090	0.085	0.085	0.127	0.055		0.108					0.082		0.060	0.127
58-60	0.180	0.098	0.090	0.150	0.129	0.105	0.089	0.151	0.171	0.122	0.085	0.099	0.085	0.085	0.127	0.022		0.104					0.079		0.048	0.158
60-62	0.180	0.105	0.098	0.179	0.129	0.086	0.122	0.174	0.113	0.132	0.085	0.133	0.085	0.085	0.127			0.114					0.051		0.030	0.140
62-64		0.104	0.098	0.134	0.129	0.119	0.116	0.104	0.097	0.160	0.085	0.151	0.085	0.085	0.091										0.023	0.136
64-66			0.092	0.140	0.129	0.136	0.123	0.064	0.100	0.120	0.058	0.085	0.085	0.085	0.066											0.116
66-68			0.092	0.282	0.129	0.153	0.110	0.100	0.100	0.120	0.047	0.085	0.085	0.085												0.141
68-70			0.132	0.496		0.112	0.099	0.139	0.100		0.085	0.100	0.085	0.085												0.143
70-72			0.132				0.030	0.100	0.083		0.097	0.110	0.085	0.085												0.128
72-74							0.039	0.069	0.091		0.092	0.114	0.085	0.085												0.079
74-76								0.028	0.088		0.092	0.159														0.101
76-78								0.056	0.284		0.092	0.138														0.071
78-80									0.110		0.092	0.135														0.095
80-82									0.082		0.083	0.112														0.038
82-84									0.058		0.088															0.129
84-8'									0.041		0.108															
86-6	—										0.104															


9000 E
10000 E
11000 E
12,000 N
13,000 N
14,000
DAM #4
DAM #5
DAM #9
DAM #10
DAM #1
DAM #2
DAM #3
CENTRAL POND
MAIN
TRP PLANT
PILOT
PLANT
84-2
NORTH POND
WATER
TREATMENT
PLANT
LOCATION OF DRILL HOLES
SCALE 1" = 400'

PILOT PLANT GOLD EXTRACTION CURVE



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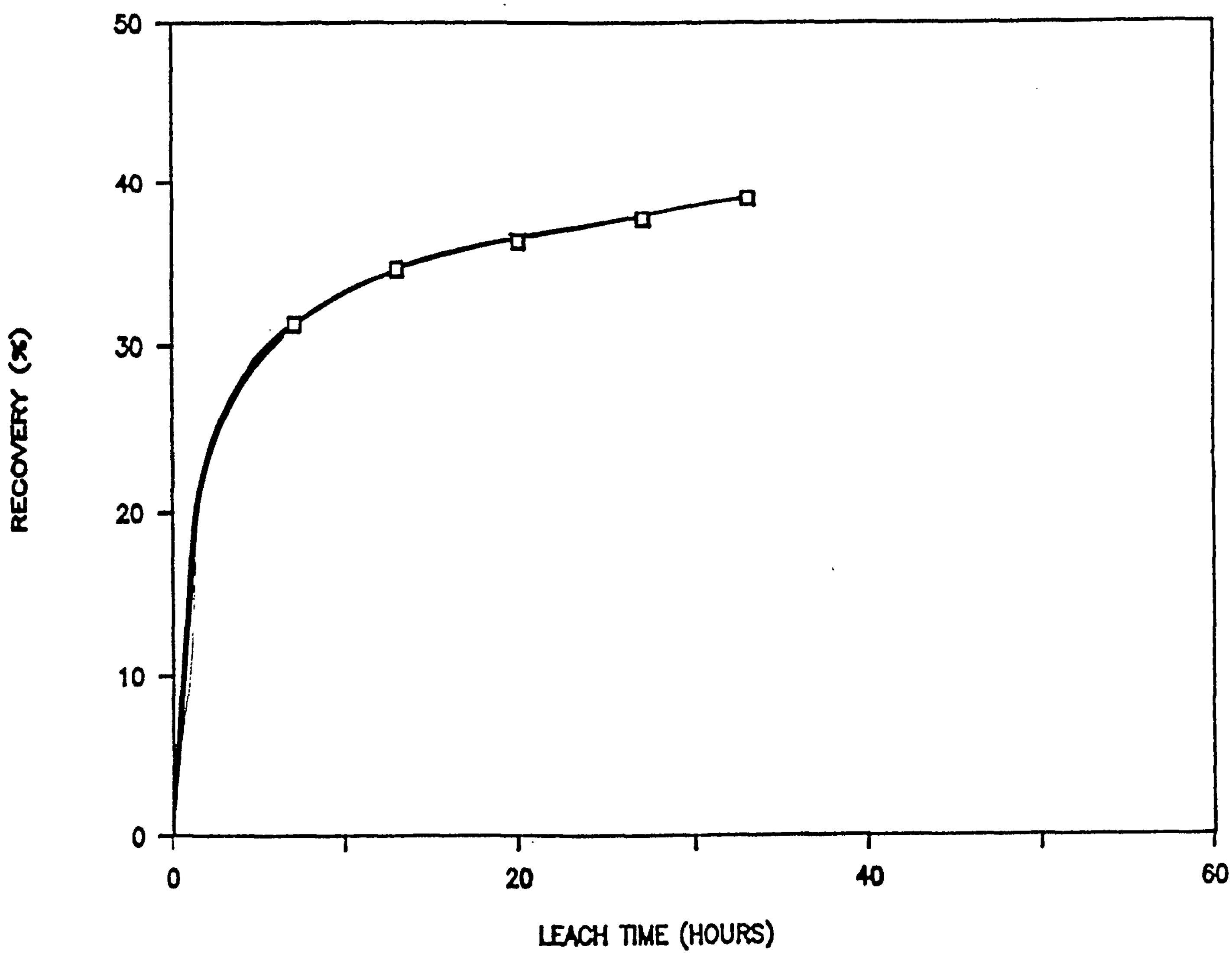

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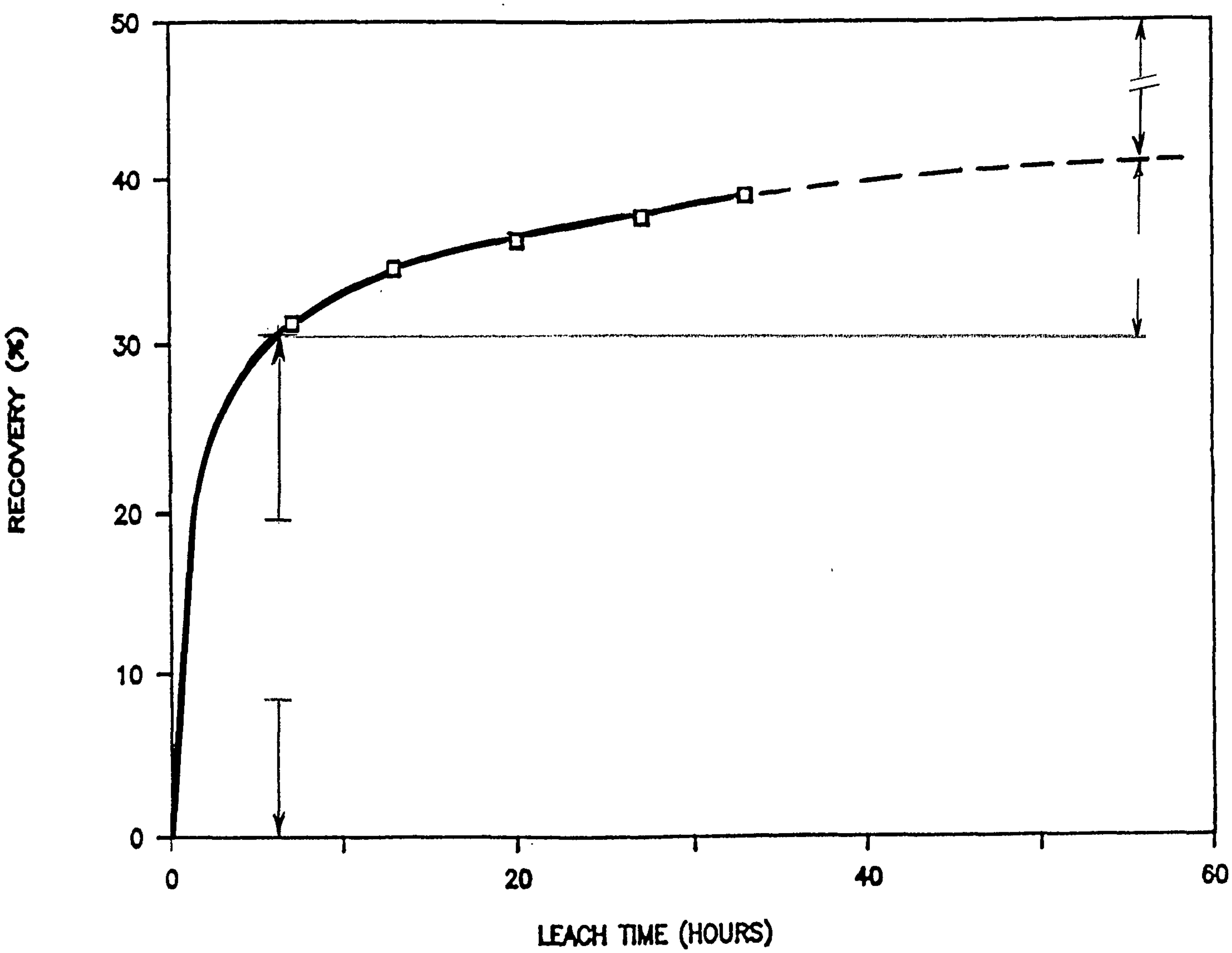

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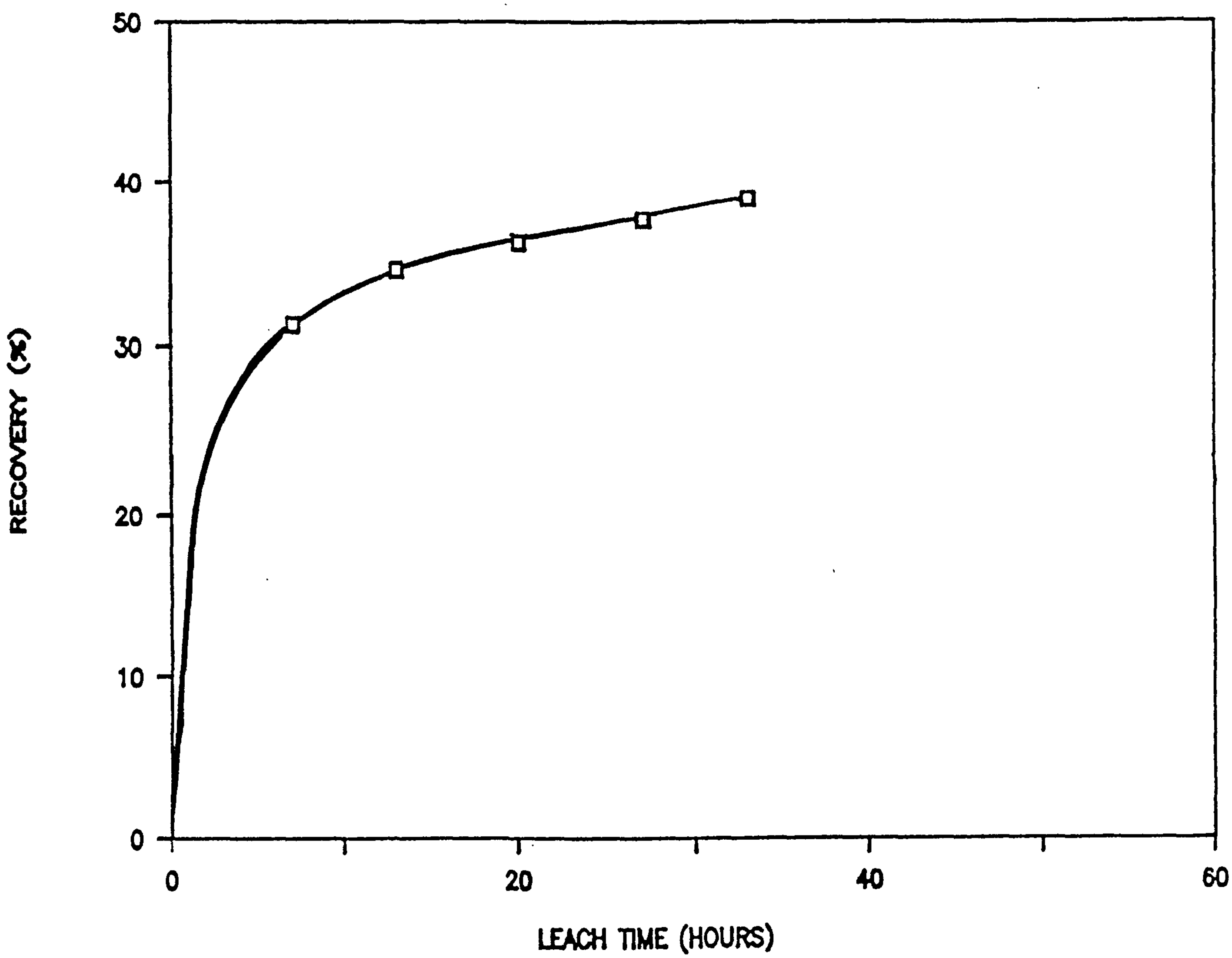

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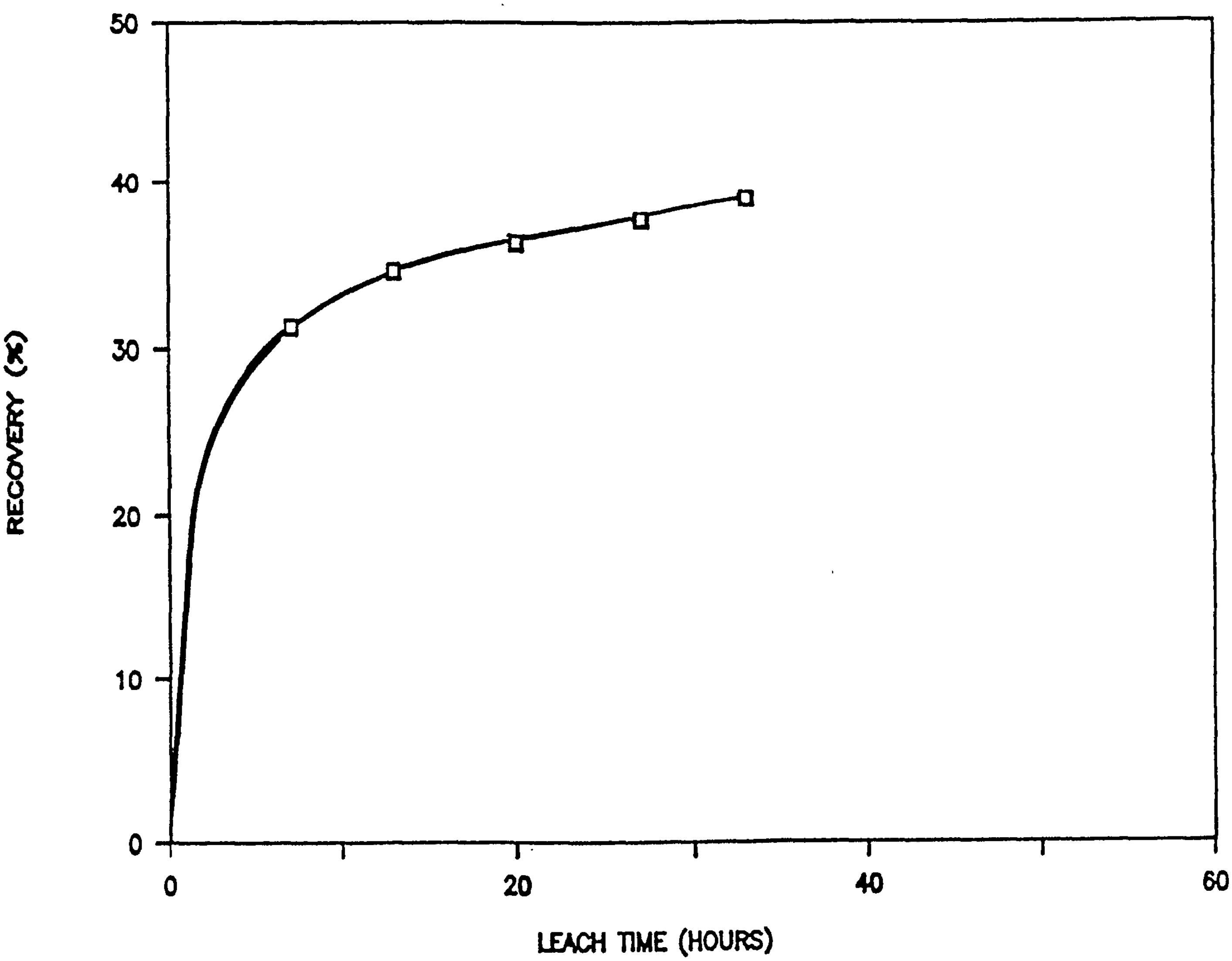

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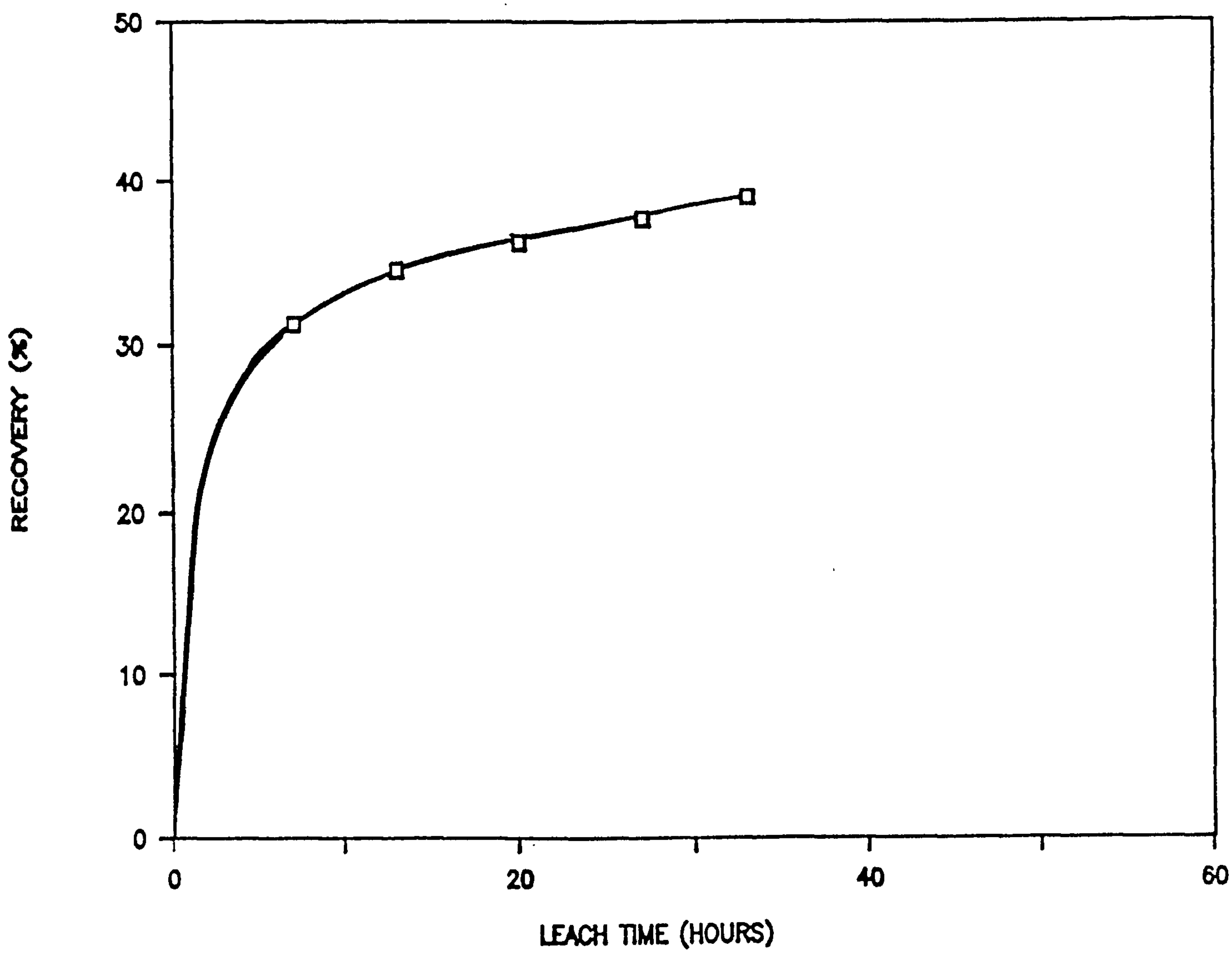


File note: DAS

Oct 26/88

Effect of Cone Depth on Recovery. – Bulldozing

- Let's say top 10' has a grade of 0.05 g/ton
  recovery of 40%.

- 10 – 70' has a grade of 0.09 g/ton
  recovery of 30%

1 : 1 mix

$$\text{Combined Recovery} = \frac{.05 \times .4 + .09 \times .3}{.05 + .09} = \frac{.047}{.14} \times 100$$

$$= 33.6\ \%$$

- Worst Case

  Top 10' .01 grade.
  35 % recovery.

  Bottom 70' .10 grade.
  30% recovery.

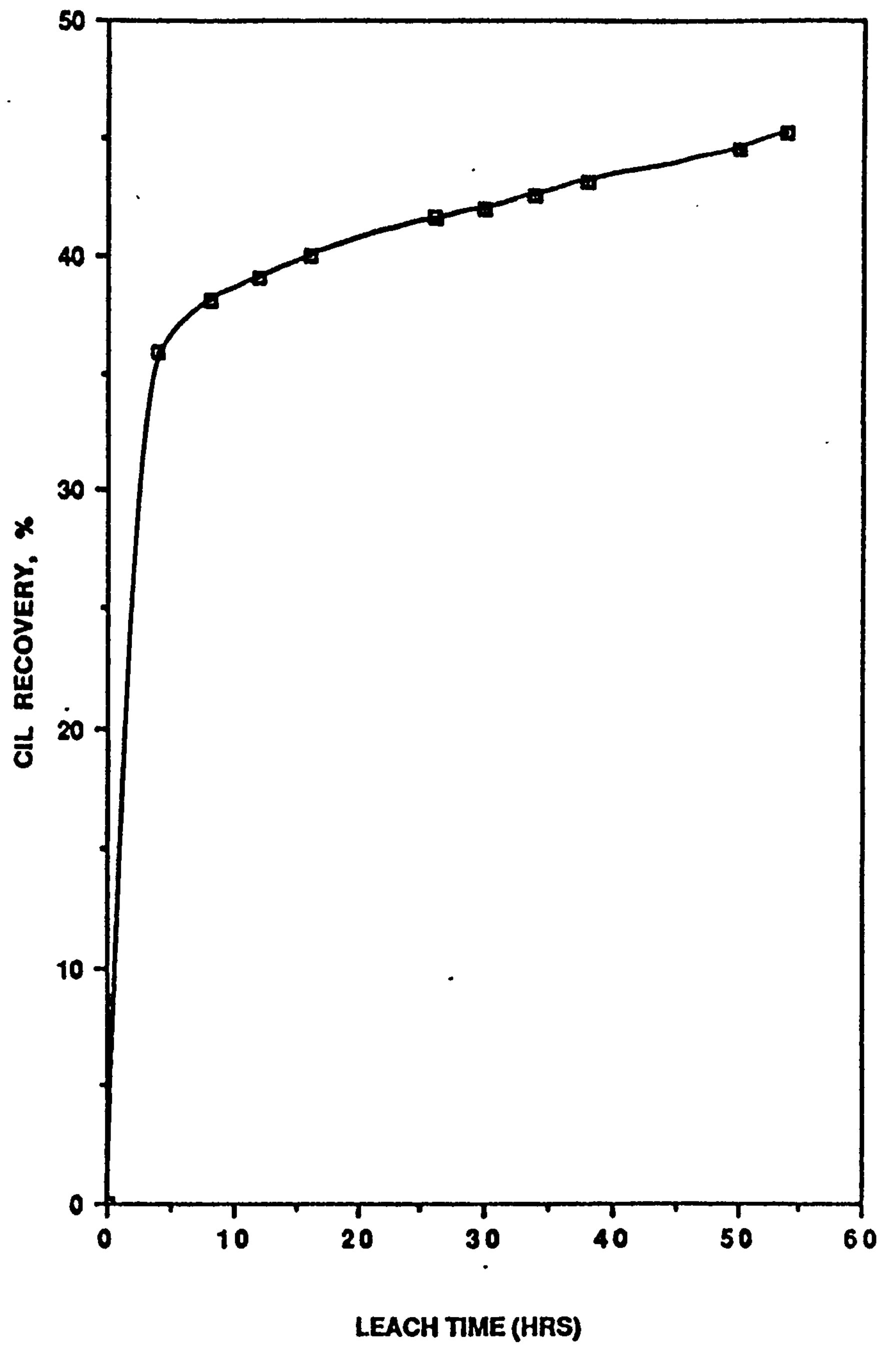
  Split 7 Top / 1 Bottom

$$\text{Combined Recovery} = \frac{70 \text{ tons} \times .01 \times .35 + 10 \text{ tons} \times .10 \times .3}{70 \times .01 + 10 \times .1}$$

$$= \frac{0.245 + 0.30}{1.7} \times 100 = 32.06\ \%$$

∴ Grade always increases with inclusion of Top material.

GOLD EXTRACTION CURVE



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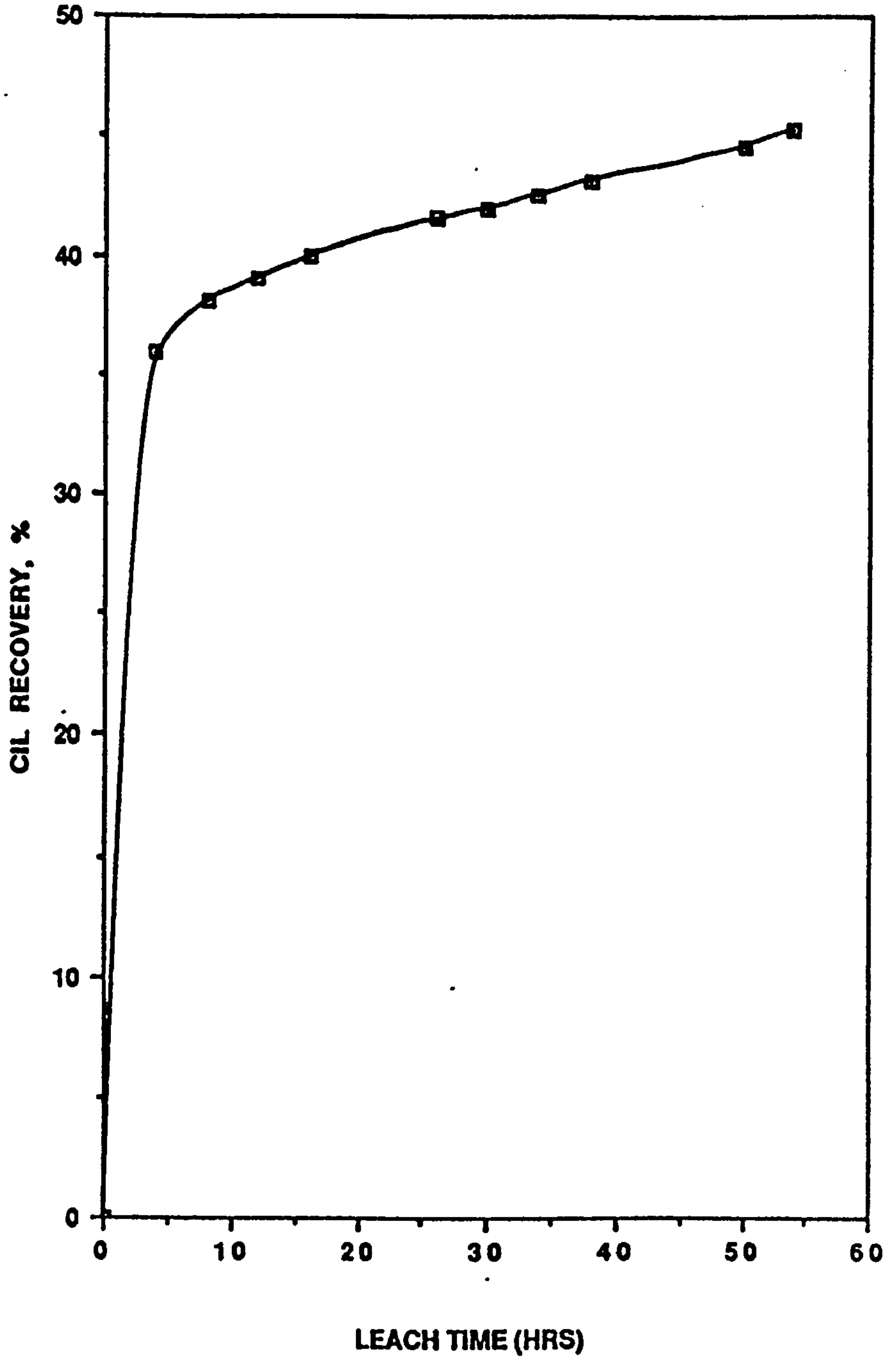

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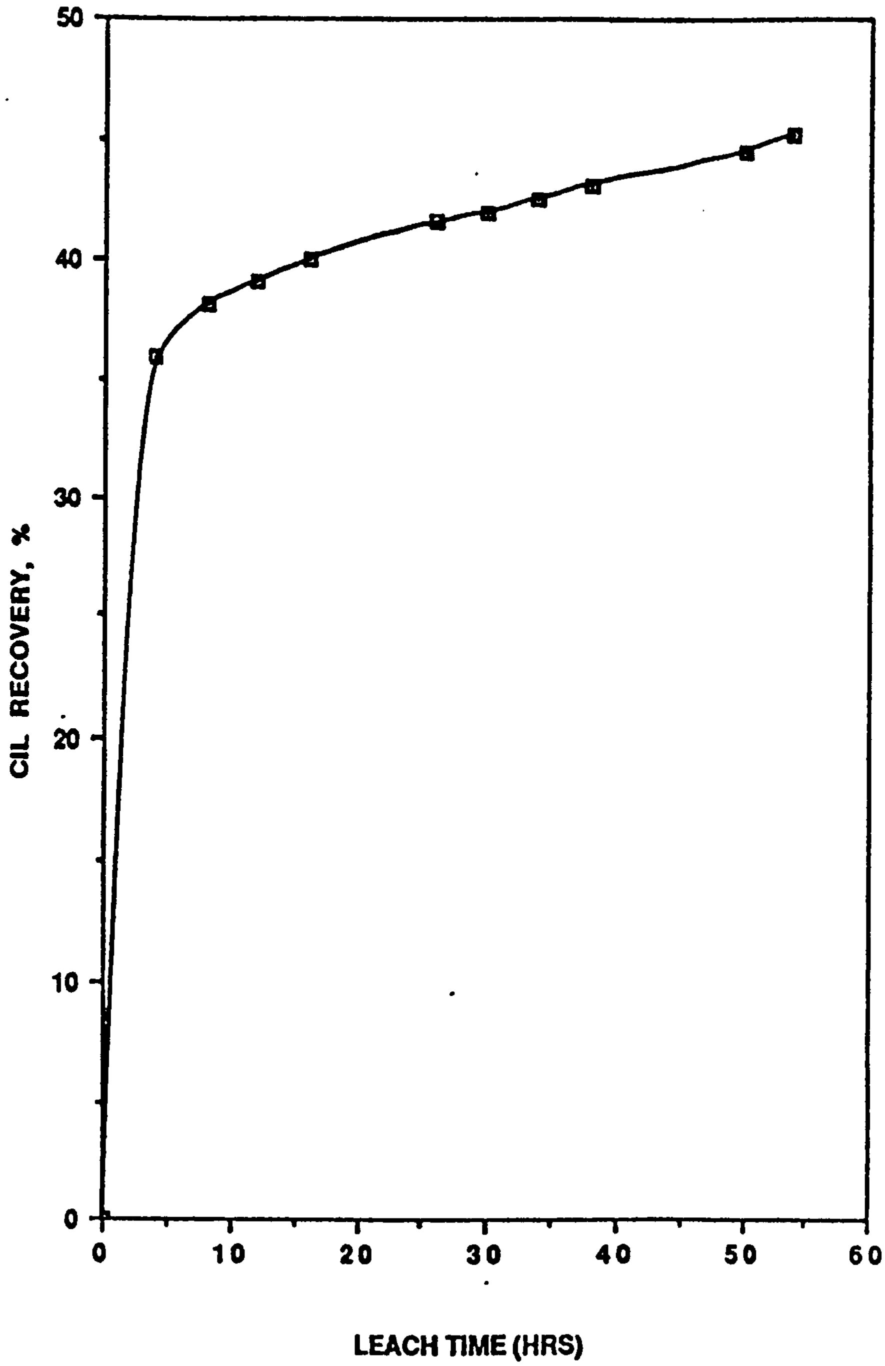

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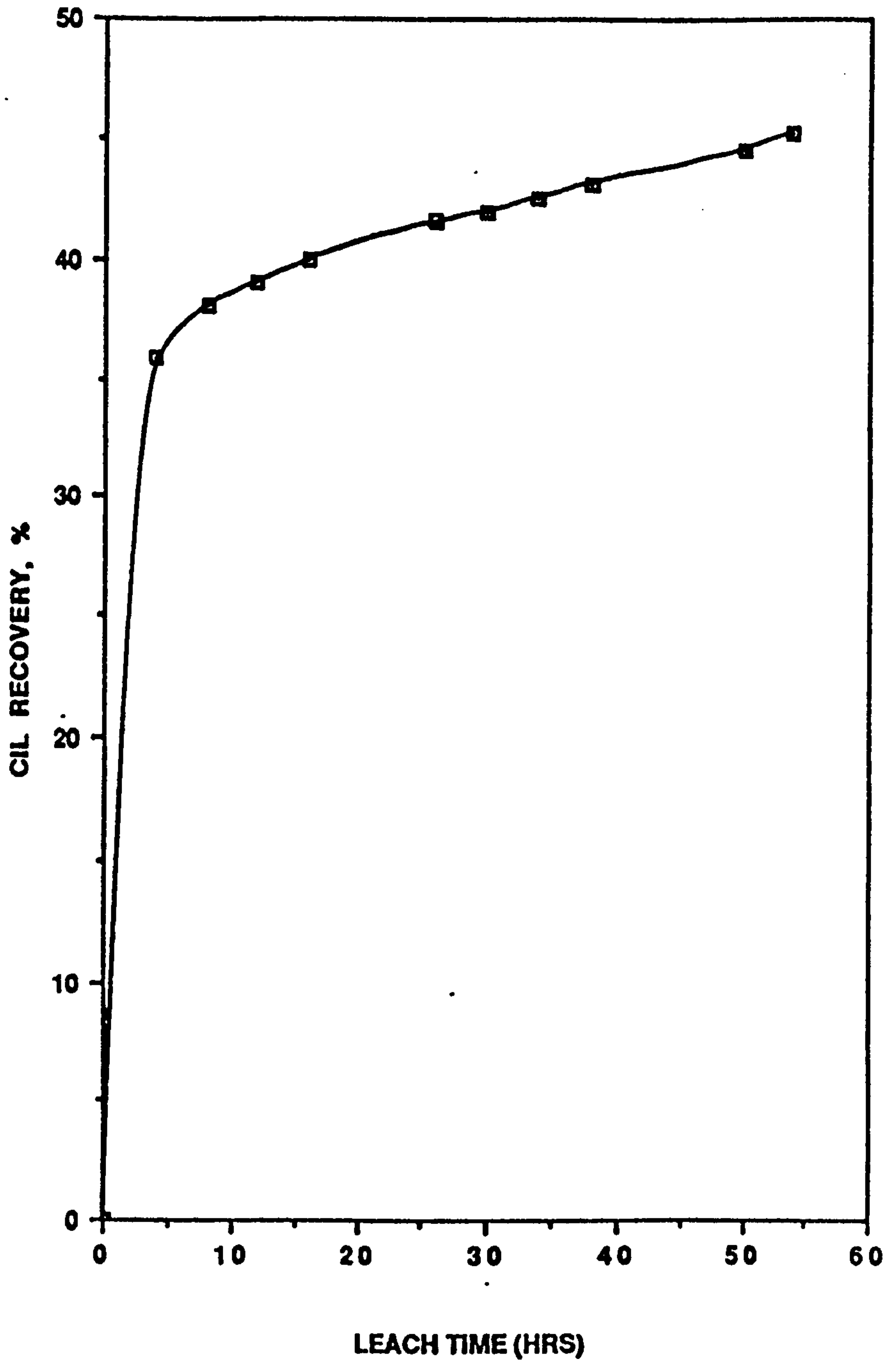

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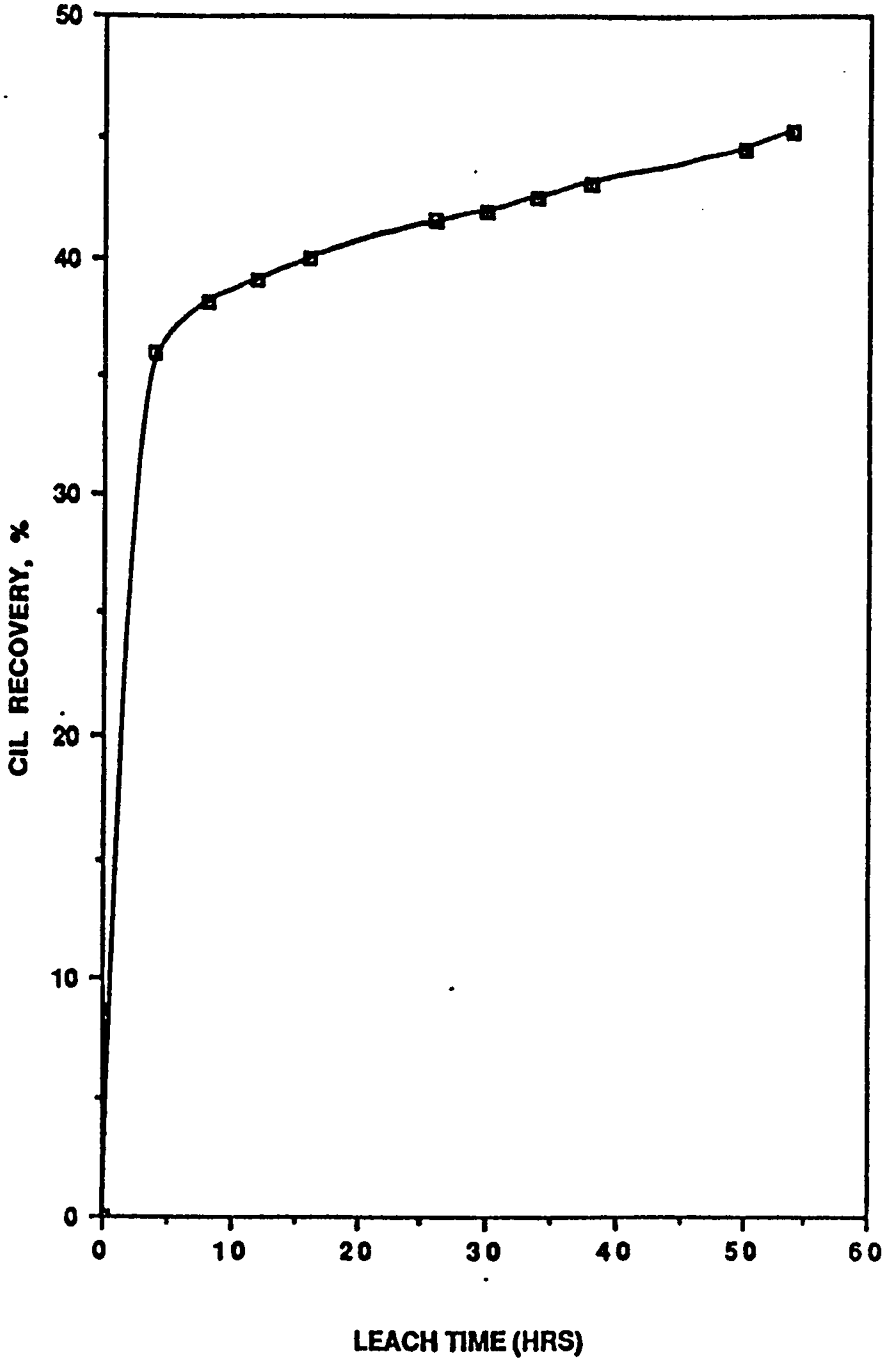
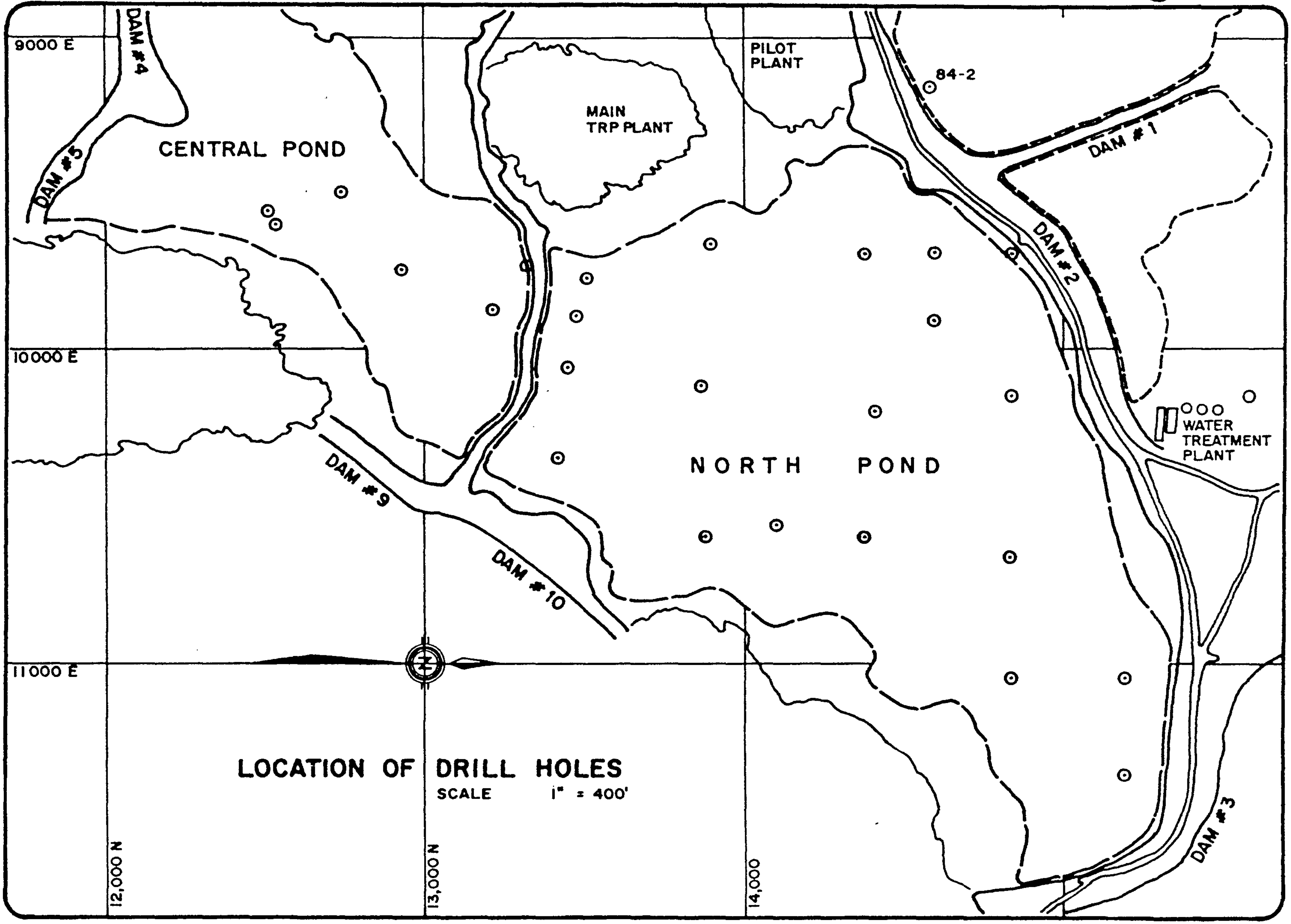
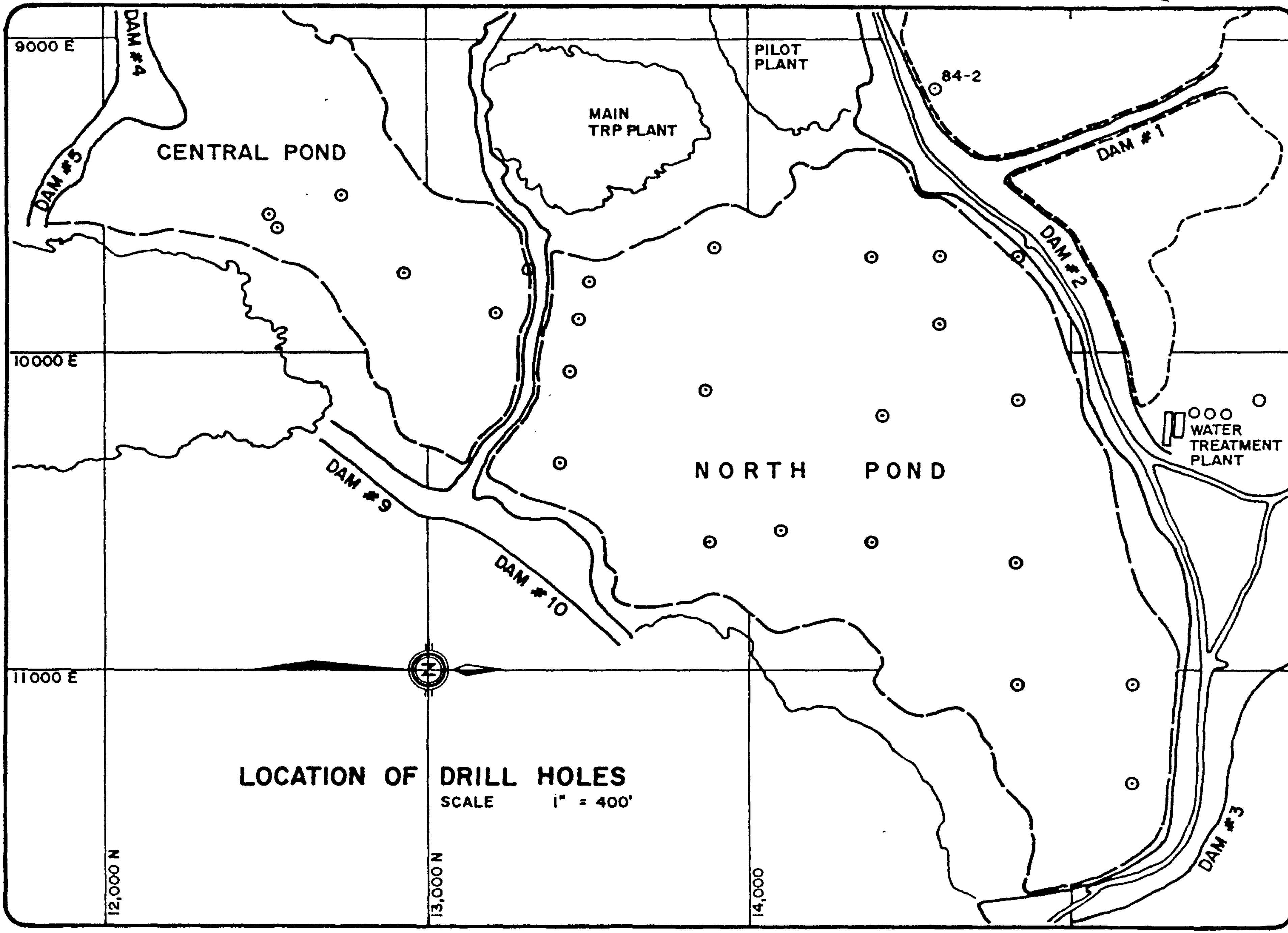




LOCATION OF DRILL HOLES

SCALE 1" = 400'



LOCATION OF DRILL HOLES
SCALE 1" = 400'