REPORTS 929/17 #9
TAILINGS
TAILINGS STORAGE FACILITY DESIGN REPORT – VOLUME II – APPENDICES
BY: KNIGHT PIÉSOLD LTD.
DATED: MAY 26, 1995

IMPERIAL METALS CORP.
MT. POLLEY PROJECT

TAILINGS STORAGE FACILITY DESIGN REPORT (REF. NO. 1625/1)

VOLUME II - APPENDICES

MAY 26, 1995

Knight Piésold
CONSULTING ENGINEERS

IMPERIAL METALS CORP.
MT. POLLEY PROJECT

TAILINGS STORAGE FACILITY
DESIGN REPORT
(REF. NO. 1625/1)

VOLUME II - APPENDICES

MAY 26, 1995

Suite 1400
750 West Pender Street
Vancouver, British Columbia
Canada V6C 2T8
Telephone (604) 685-0543
Telefax (604) 685-0147
CIS: 72360,477

Knight Piésold Ltd.
CONSULTING ENGINEERS

Knight Piésold Ltd.
CONSULTING ENGINEERS

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MT. POLLEY PROJECT

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VOLUME II - APPENDICES

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TAILINGS STORAGE FACILITY
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VOLUME II - APPENDICES

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APPENDIX A

REPORT ON PROJECT WATER MANAGEMENT
(REF. NO. 1624/1)

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REPORT ON PROJECT WATER MANAGEMENT
(REF. NO. 1624/1)

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REPORT ON PROJECT WATER MANAGEMENT
(REF. NO. 1624/1)

SECTION 1.0 - INTRODUCTION

This report provides an overview of the source and fate of all water associated with the Mt. Polley Project. An overall project water balance was completed by integrating the water balances for the mine site with the tailings facility. The objectives of the water balance analyses are to demonstrate that the tailings facility and open pit can be operated to ensure that no surface discharge of excess water will be required, and by selective addition of surface runoff from waste dumps and undisturbed catchment areas, the make-up water requirements from Polley Lake can be minimized.

A probabilistic water balance analysis using @RISK was developed to describe the effects of a statistical range of precipitation conditions over the entire life of the project. From the corresponding results, estimates were made of the probable requirements for fresh make-up water, probable tailings pond volume and probable volumes of additional water to be diverted out of the project area.

The @RISK Analysis and Modelling program is a software package that allows the input of a statistical distribution to describe an uncertain quantity. Instead of using a finite value to describe a particular quantity, individual values are repeatedly selected from a specified statistical distribution describing that quantity. These selected values are then used in subsequent calculations to generate a distribution of results that accounts for the uncertainty in the initial quantity.

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SECTION 2.0 - HYDROMETEOROLOGY

2.1 GENERAL

The hydrometeorological information used for the preparation of this report was taken from the most recent information incorporated in the Mine Development Certificate. A summary of the data is given in Table 2.1.

This section provides an overview of the applicable hydrometeorological information and how it was used to complete this analysis.

2.2 PRECIPITATION

A normal probability distribution was used to model the expected seasonal variability in precipitation data as shown in Figure 2.1. This distribution was chosen after using the software package BESTFIT to determine the underlying distribution of long term annual precipitation records for relevant AES stations in the region.

Since precipitation data at the site is limited, mean precipitation records for climatologically similar stations in the area were used to estimate a mean annual site precipitation of 755 mm. A coefficient of variation of 0.16 was determined for the standard deviation of 121 mm. These conditions were applied to the tailings facility and adjacent additional tailings catchment areas. To account for higher elevation, the waste dumps, pit area and mill site were modelled with a mean precipitation of 810 mm, a coefficient of variation of 0.16 and a standard deviation of 130 mm. The increased precipitation value is consistent with elevation correlations previously presented in the Stage I application documents. This data is summarized on Table 2.1.

2.3 SNOWMELT

Snowfall at the site was considered to melt only during the months of September, April and May. All snowfall in September was assumed to melt during the month

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and all snowfall accumulated during the remainder of the year was assumed to melt equally in April and May.

2.4 EVAPORATION

Evaporation data is consistent with previous analyses incorporated in the Mine Development Certificate (MDC). The annual evaporation rate of 423 mm at the site has been assumed to be constant for all years of operation and precipitation conditions.

2.5 RUNOFF

Runoff coefficients used in this analysis are consistent with values used in the Mine Development Certificate and included variable runoff coefficients based on dry, average and wet years. Dry years were defined as years when the total precipitation was less than or equal to 1.3 standard deviations below the mean (10 year dry), and wet years were defined as years when the total precipitation was at least 1.3 standard deviations above the mean (10 year wet). Runoff coefficients are presented in the following section.

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SECTION 3.0 - PROJECT COMPONENTS

The overall project components and development sequence are described in previous documents incorporated in the MDC. The main mine components incorporated in the model are illustrated on Figure 3.1 and include disturbed and undisturbed areas at; open pits, waste dumps, mill site, tailings facility, and also the additional undisturbed catchment areas (Areas A and B) immediately upgradient from the tailings area.

The project water balances consider the staged development of the various components of the project as summarized in:

- Table 3.1 - Open Pit Development
- Table 3.2 - Waste Dump Development
- Table 3.3 - Tailings Storage Facility Development

In addition, specific assumptions incorporated in the water balance analyses are included in Table 3.4. These assumptions are consistent with those used in previous water balances for the tailings impoundment and mine site conducted in 1991.

SECTION 4.0 - WATER BALANCE AND MAKE-UP WATER SUPPLY

4.1 GENERAL

The updated Water Management Plan for the Mt. Polley Project includes the following objectives:

- To minimize the volume of fresh water abstracted from Polley Lake.
- To limit the period of water removal from the Polley Lake/Hazeltine Creek system to high flow periods.
- To regulate additional surface water runoff into the tailings pond.
- To prevent the accumulation of excess water within the tailings impoundment so that the impoundment and open pit can be operated as a closed system with no surface water release.
- To supply make-up water for the milling process from within the project catchment area.
- To minimize the requirement for regulated discharges of surface runoff from the waste dumps.

These objectives will be managed simultaneously during operations by provision of surface water collection ditches around the project perimeter and by judicious transfer of "fresh" surface runoff from designated undisturbed catchment areas adjacent to the tailings impoundment.

The Starter Dam for the tailings impoundment will be constructed approximately one year prior to mill start-up, and will entrap the freshet runoff so that adequate quantities of water are available for mill start-up and the first years of operation.

During on-going operations, the size of the tailings supernatant pond will be controlled, to a large extent by mine operators, by the annual precipitation and evaporation regime and by the water released from the settled tailings. Process fresh water make-up requirements from Polley Lake will be minimized by utilization of water sources in the following priority:

- Tailings supernatant.
- Open pit dewatering.
- Open pit groundwater depressurization wells.
- Mill site and waste dump runoff.
- Runoff diversion structures will be operated to provide supplementary water from diverted catchment areas A and B upslope of the tailings impoundment.
- Transfer of excess stream flow from Polley Lake/Hazeltine Creek during peak flow periods.

A series of water balances have been carried out to evaluate the annual process requirements for fresh make-up water and the overall water surpluses or deficits for the Mt. Polley Project. Water balances have been carried out for all 14 years of the project life, under a range of hydrometeorological conditions and for the various catchment areas.

The monthly water balance incorporates inflows from the open pit into the tailings storage facility. Additional surface runoff from the millsite, the various waste dump areas and additional undisturbed catchment areas have also been determined separately. Runoff collection ditches are assumed to control the addition of surface runoff into the system.

Linked water balances have been carried out for all 14 years of the mine life. An example of the linked water balances for average precipitation conditions are included in Appendices A and B. Appendix A includes the tailings facility and open pit as per the existing MDC, and Appendix B includes separate water balances for the mine site area plus the additional undisturbed catchment area A immediately upgradient from the tailings impoundment. The information in these two sets of tables is linked, and when the tailings pond volume drops below a minimum specified volume of 1.5 million m^3, all available surface runoff is diverted into the process. Catchment Area B is not included in the water balances and is therefore considered to represent a contingency source of additional water to compensate for any process shortfalls.

4.2 WATER BALANCE

The fundamental objective of the overall Water Management Plan is to operate the project so that surface discharge of excess water from the tailings impoundment and open pit will not be required. Table 4.1 summarizes the various components of the water balance for average precipitation conditions (as shown in Appendices A and B) over the life of the project assuming Catchment Area B will not be required. The main components of the water balances are illustrated graphically on Figure 4.1 for the Year 1 water balance previously presented in 1991 and on Figure 4.2 for the current 1995 Year 1 water balance which minimizes make-up water recovery from Polley Lake. The main difference between the two options is that in the 1995 water balance model, the make-up water requirements are reduced by incorporating additional runoff water collection from waste dumps and the additional catchment area at the tailings facility, plus it utilizes ponded water that is contained in the tailings impoundment at start-up.

The annual water balance summaries for Years 1 and 14 previously developed in 1991 are compared to results from the updated water management plan in Tables 4.2 and 4.3. The updated values presented in this table were developed using similar water balance tables to those in the MDC and were conducted separately from the linked water balance results included in Appendix A, in order to provide an independent check on the @RISK water balance results.

The variation in the volume of the tailings pond for average precipitation conditions is illustrated on Figure 4.3. The pond volume reaches a minimum during the winter months when there is little surface runoff and reaches a maximum volume in the summer after the freshet. Figure 4.3 also includes a smoothed average curve which tracks the tailings pond volume at the end of September in each year. The 50th percentile curve for September pond volumes, as determined in the @RISK analyses is also included for comparison.

The computer program @RISK was used to assess the risks of:

- accumulating too much water in the tailings impoundment over the life of the project,

- depleting the volume of water in the tailings pond so that an external source of make-up water would be required.

The @RISK program randomly selects separate annual precipitation values for each of the 14 years of operation and linked water balances are conducted. The water balances "link" the tailings facility and mine site water balances and also link the pond volumes from year to year. This process was repeated for 1000 iterations in order to provide estimates of the tailings pond volume, runoff water and make-up water requirements for various extreme combinations of wet and dry precipitation years. These results are illustrated on Figures 4.4, 4.5 and 4.6, and are discussed in the following section. It is evident that the updated water management strategy will achieve the permitted requirements for prevention of surface water discharge from the tailings facility and open pit, while minimizing the amount of make-up water removed from Polley Lake.

4.3 MAKE-UP WATER REQUIREMENTS

A fundamental requirement for the updated project water balances is that an adequate volume of water has to be stored at the tailings impoundment to compensate for low runoff periods during the cold winter months and during dry

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summer months. It has been estimated that a minimum volume of 1.5 million m^3 of water will need to be in storage prior to mill start-up. It is intended that this water will be obtained by constructing the tailings impoundment at least one year prior to mill start-up to allow capture of one year of direct surface runoff including the freshet. The amount of surface runoff which will be collected prior to start-up for various precipitation conditions is presented on Tables 4.4 to 4.7 and summarized as follows:

Summary of Water Available at Start-Up		
Precipitation Condition	Surface Runoff Water (m^3) Available	
	with Catchment Area A	with Catchment Areas A & B
Average Year	1,455,000	1,992,000
10 Year Dry	1,084,000	1,445,000
50 Year Dry	921,000	1,220,000
10 Year Wet	1,900,000	2,657,000

These results indicate that if extremely dry conditions are encountered, up to 300,000 m^3 of water may also need to be abstracted from either Polley Lake or Hazeltine Creek during peak freshet flows to supplement stored water in the first year of operation as 1.5 million m^3 of water must be stored prior to start-up.

The tailings pond volumes determined by the @RISK analyses for the linked water balances extending over the 14 year project life are shown on Figure 4.4. An initial pond volume of 1.5 million m^3 has been included at start-up and runoff from waste dumps and catchment Area A have been included when necessary to provide adequate water for milling. The monthly fluctuations in the volume of the tailings pond have not been included on this summary figure. Figure 4.5 illustrates the amount of excess surface runoff from all waste dumps plus the 240 ha of Catchment Area A that is not diverted into the mill process. It does not include for additional runoff available from Catchment Area B.

Comparison of Figures 4.4 and 4.5 illustrates that virtually all available runoff is diverted into the process under average and dry precipitation conditions for the first

two to three years. The volume of stored water in the tailings impoundment is also reduced during this period. However, the analyses indicate that no additional make-up water will be required from Polley Lake except during the most extreme combinations of dry years. Figure 4.6 illustrates that there is about a 5% chance that some minor amount of additional make-up water will be required.

In practice, there is also a minimum pond volume which must be maintained in the tailings impoundment in order to compensate for ice accumulation in winter and to allow trouble free operation of the reclaim barge. Therefore, it will be necessary to include contingency provisions to transfer additional water into the tailings impoundment during operations. This additional water can be obtained from:

- selective diversion from Catchment Area B upgradient from the tailings impoundment, and/or

- transfer of excess flows from Polley Lake or Hazeltine Creek during peak flow periods. Minimum stream flows for fisheries releases would be maintained during any pumping period.

4.4 WATER MANAGEMENT PLAN

The objective of the project Water Management Plan in the early years will be to route all project water flows from disturbed areas into the process or into associated mine site activities such as dust suppression. An additional objective is to selectively route runoff from upslope Catchment Areas A and B into the tailings impoundment in order to eliminate the need for an external source of make-up water from Polley Lake. In the later years of operation the objective will be to monitor and release selected surface water inflow components which meet the required quality standards in order to manage the final volume of ponded water in the tailings impoundment at closure. The following activities will be incorporated in the Water Management Plan:

(i) Maximize the capture of surface and groundwater flows from within the project area.

(ii) Maximize the use of the poorest quality water recovered from within the project area in the milling process and in associated activities (such as dust suppression).

(iii) Minimize the deliberate introduction of excess clean fresh water from Polley Lake and Hazeltine Creek.

(iv) Monitor the quality of surface runoff from disturbed areas and groundwater flows within the project site.

(v) Release only the best quality water from within the project boundaries and in accordance with permitted requirements, as is necessary to maintain an overall project water balance under actual hydrometeorological conditions.

(vi) Manage the operation of the tailings supernatant pond to optimize the volume of water stored on the tailings surface during operations and at closure.

(vii) Develop and maintain a detailed data base to allow water balances for the site to be as accurate as possible and thereby become useful tools for predicting annual make-up water requirements and for scheduling releases of clean surface runoff water as appropriate.

SECTION 5.0 - SUMMARY AND CONCLUSIONS

A revised water management plan has been developed for the Mt. Polley project. Detailed water balances have been conducted for each year of the project using average precipitation conditions. Water balances have also been developed for 1000 different 14 year combinations of annual precipitation in order to assess the risk of either accumulating too much water in the system or increasing the make-up water requirements. These revised water balances indicate that:

(i) Discharge of excess water from the tailings facility and open pit will not be necessary. These results confirm the findings of the previous project water balances conducted in 1991.

(ii) It is possible to eliminate the requirement for a water supply dam on Polley Lake.

The updated water management plan requires early construction of a starter dam at the tailings impoundment in order to capture surface runoff for one year prior to the projected early start-up in October, 1996. Surface runoff from undisturbed catchment areas immediately adjacent to the tailings impoundment will be routed into the facility in order to provide a minimum pond volume of 1.5 million m^3 prior to start-up. This initial volume of water is projected to be drawn down during the first few years of operation, even if all mine site runoff and runoff from the additional Catchment Area A is routed into the mill process. However, the amount of surface runoff increases during the later years of operation when the waste dumps increase in area and surface runoff also increases. Therefore, the amount of surface runoff obtained from undisturbed catchment areas will decrease after the first few years of operation.

The water balance has been evaluated for each year of the 14 year project life and under various precipitation conditions. Water balances have been conducted for over 1000 different combinations of mine life precipitation conditions and the risks of significant water accumulation or depletion have been assessed. These probability analyses indicate that it is extremely unlikely that any additional make-

up water, beyond the projected fresh water requirements of 24.9 m^3/hr, will be required from Polley Lake. However, it is recommended that a contingency water supply of about 300,000 m^3/yr be included in the revised permit application. It is anticipated that this volume of water would only be removed from either Polley Lake or Hazeltine Creek during high flow periods and would only remove water which is not required for minimum fisheries flow releases.

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TABLE 2.1
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
PRECIPITATION DETAILS USED IN ANALYSIS

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DESCRIPTION	VALUE			
Lower Elevations (ie. TSF)				
Mean annual precipitation (mm)	755			
"Dry" annual precipitation (mm)	601			
"Wet" annual precipitation (mm)	909			
"Max." annual precipitation (mm)	1050			
"Min." annual precipitation (mm)	450			
Mean annual rainfall (mm)	451			
Mean annual snowfall (mm)	304			
Coefficient of variation	0.16			
Standard deviation (mm)	121			
Higher Elevations (ie. mill site, waste dumps, etc.)				
"Elevation" factor	1.07285			
Mean annual precipitation (mm)	810			
"Dry" annual precipitation (mm)	645			
"Wet" annual precipitation (mm)	975			
Coefficient of variation	0.16			
Standard deviation (mm)	130			
Proportions of Total Precipitation:				
Rainfall	0.60			
Snowfall	0.40			
Monthly Proportions of Precipitation:				
	Rainfall (mm)	Proportion as Rainfall	Snowfall (mm)	Proportion as Snowfall
Oct	48.3	0.11	12.1	0.04
Nov	17.3	0.04	40.0	0.13
Dec	7.6	0.02	67.2	0.22
Jan	6.8	0.02	68.7	0.23
Feb	6.0	0.01	52.1	0.17
Mar	6.0	0.01	38.5	0.13
Apr	24.2	0.05	18.9	0.06
May	45.3	0.10	5.3	0.02
Jun	81.5	0.18	0.0	0.00
Jul	65.7	0.15	0.0	0.00
Aug	83.1	0.18	0.0	0.00
Sep	58.9	0.13	1.5	0.00
Total (mm)	450.7		304.3	

TABLE 3.1
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
OPEN PIT DEVELOPMENT

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END OF YEAR	PIT CATCHMENT AREAS (ha)			TOTAL AREA (ha)
	CENTRAL	NORTH	WEST	
0	0.0	0.0	0.0	0.0
1	17.6	0.0	0.0	17.6
2	17.6	0.0	0.0	17.6
3	*25.5*	0.0	0.0	25.5
4	*25.5*	0.0	0.0	25.5
5	25.5	14.9	0.0	40.4
6	25.5	14.9	0.0	40.4
7	25.5	14.9	*24.3*	64.7
8	25.5	14.9	24.3	64.7
9	25.5	14.9	24.3	64.7
10	25.5	14.9	24.3	64.7
11	25.5	14.9	24.3	64.7
12	25.5	14.9	24.3	64.7
13	25.5	14.9	24.3	64.7
14	25.5	14.9	24.3	64.7

Notes:

1. Pit areas in italics are conservative estimates only.
2. Pit areas measured from mining sequence plans c/o Wright Engineers ("Feasibility Study", Vol. 1 of 5).

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TABLE 3.2
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
WASTE DUMP DEVELOPMENT

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YEAR	WASTE (T x1000)	CUM. WASTE (T x1000)	DUMP CATCHMENT AREAS (ha)						TOTAL WASTE AREA (ha)
			EAST		NORTH		WEST		
			WASTE	UNDIST'BD	WASTE	UNDIST'BD	WASTE	UNDIST'BD	
0	1217.0	1217.0							
1	2774.9	3991.9	10.0	70.0	0.0	0.0	0.0	0.0	10.0
2	2720.2	6712.1	14.7	65.3	0.0	0.0	0.0	0.0	14.7
3	2342.2	9054.3	19.3	60.7	0.0	0.0	0.0	0.0	19.3
4	1812.7	10867.0	24.0	56.0	0.0	0.0	0.0	0.0	24.0
5	9496.2	20363.2	28.7	51.3	9.3	75.7	0.0	0.0	38.0
6	7649.2	28012.4	33.3	46.7	18.7	66.3	0.0	37.0	52.0
7	10839.3	38851.7	38.0	42.0	28.0	57.0	2.3	34.8	68.3
8	11103.3	49955.0	42.7	37.3	37.3	47.7	4.5	32.5	84.5
9	8591.8	58546.8	47.3	32.7	46.7	38.3	6.8	30.3	100.8
10	1152.4	59699.2	52.0	28.0	56.0	29.0	9.0	28.0	117.0
11	0.0	59699.2	52.0	28.0	56.0	29.0	9.0	28.0	117.0
12	0.0	59699.2	52.0	28.0	56.0	29.0	9.0	28.0	117.0
13	0.0	59699.2	52.0	28.0	56.0	29.0	9.0	28.0	117.0
14	0.0	59699.2	52.0	28.0	56.0	29.0	9.0	28.0	117.0

Notes: - dump areas for years 1 and 14 taken from Stage 1 Environmental and Socionomic Impact Assessment, Responses to Comments by the Agencies. All areas for intermediate years are interpolated linearly.

TABLE 3.3
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY DEVELOPMENT

Area of total impoundment = 230 ha

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END OF YEAR	AREAS (ha)					
	UNPREP'D BASIN	TOT. PREP'D BASIN	PREP'D BASIN	BEACH (incl. pond)	BEACH ONLY	POND
t=0	96	134	119	15	0	15
1	96	134	64	70	48.9	21.1
2	54	176	67	109	81.9	27.1
3	54	176	38	138	104.8	33.2
4	26	204	44	160	120.7	39.3
5	26	204	19	185	139.6	45.4
6	15	215	22	193	141.6	51.4
7	15	215	13	202	144.5	57.5
8	6	224	18	206	142.6	63.4
9	6	224	15	209	139.4	69.6
10	0	230	17	213	137.3	75.7
11	0	230	13	217	135.2	81.8
12	0	230	10	220	132.1	87.9
13	0	230	6	224	130.1	93.9
14	0	230	3	227	127	100

Notes:
1) Unprep'd Basin = Total Impoundment - Prep'd Basin.
2) Prep'd Basin taken from Filling Schedule and Staged Construction.
3) Prep'd Basin has been increased by 5% in order to equal total impoundment area after 10 years.
4) Beach (incl. pond) taken from D/A/C curve.
5) Pond volume varied linearly from 15ha at t=0 to 100ha at end of year 14.

TABLE 3.4
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
ASSUMPTIONS USED IN WATER BALANCE ANALYSIS

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DESCRIPTION		VALUE		
General Details:				
Daily ore throughput (tpd)		13,425		
Tailings % solids		35%		
Tailings S.G.		2.78		
Yr. 1 initial pond volume (m^3)		1,500,000		
Water content of ore		4%		
Min fresh water makeup (% of water in with slurry)		2.4%		
Initial tailings dry density (t/m^3)		0.9		
Final tailings dry density (t/m^3)	Yr.1	1.1		
	Yr.2	1.2		
	Yr.3 - 14	1.3		
Pit g/w infiltration (m^3/month)		39,818		
Beach evaporation factor		0.8		
Dust control (m^3/month)		25,000		
Runoff Coefficients:		dry	ave	wet
Unprepared basin		20%	24%	29%
Prepared basin		90%	90%	90%
Tailings beach		90%	90%	90%
Pit area		45%	50%	55%
Waste rock		58%	60%	62%
Undisturbed catchment		20%	24%	29%
Mill site		65%	70%	75%

TABLE 4.1
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
ANNUAL WATER BALANCES FOR AVERAGE CONDITIONS - CATCHMENT AREA "A"

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YEAR	WATER AVAILABLE (m^3)	TAILINGS POND VOL. (m^3)		MAKEUP WATER REQ'D (m^3)	EXCESS DIVERTED WATER (m^3)
		MIN.	MAX.		
0	1,500,000	1,500,000	1,500,000		
1	1,136,187	765,590	1,432,777	0	0
2	1,233,138	610,223	1,341,963	0	0
3	1,440,914	866,681	1,663,887	0	150,014
4	1,441,040	1,090,844	1,760,095	0	435,218
5	1,507,113	1,120,791	1,861,307	0	549,537
6	1,491,361	1,136,205	1,929,259	0	770,682
7	1,603,921	1,181,655	2,032,575	0	756,609
8	1,674,549	1,215,669	2,100,044	0	876,349
9	1,735,786	1,276,298	2,172,620	0	922,218
10	1,824,823	1,341,827	2,264,337	0	957,312
11	1,889,491	1,420,501	2,343,190	0	967,572
12	1,933,176	1,474,927	2,398,170	0	977,832
13	1,652,895	1,518,504	2,132,030	0	1,287,699
14	1,703,906	1,270,389	2,194,337	0	945,683

Note : Excess Diverted Water is surplus runoff not diverted into tailings impoundment.

TABLE 4.2

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT

WATER BALANCE SUMMARY - ANNUAL WATER SURPLUS

	Annual Surplus in Tailings Facility (m^3)				
	Initial Case (1991)		New Case (1995)		
	Year 1	Year 14	Year 1	Year 7	Year 14
50 Year Dry	0	0	0	0	0
10 Year Dry	0	0	0	0	0
Average Year	0	3,856(1)	0	0	0
10 Year Wet	0	440,148(1)	0	87,098	74,626
50 Year Wet	0	680,032(1)	0	311,451	309,400

Note:

1. The Initial Case (1991) does not include water usage for dust control or enhanced evaporation losses (approximately 400,000 m^3/yr). The New Case (1995) includes for dust control (150,000 m^3/year) but not enhanced evaporation (250,000 m^3/year).

TABLE 4.3

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT

ADDITIONAL MAKE-UP WATER REQUIREMENTS

Precipitation Conditions	Permitted Option: Scenario 2 - Total Pit Inflow to Tailings Area or to Process	
	1991 Model (m^3/year)	1995 Model (m^3/year)
Year 1 - 50 Year Dry	1,580,709	0
Year 1 - 10 Year Dry	1,490,936	0
Year 1 - Average Year	1,259,725	0
Year 1 - 10 Year Wet	973,150	0
Year 1 - 50 Year Wet	861,263	0
Year 14 - 50 Year Dry	646,609	0
Year 14 - 10 Year Dry	415,057	0
Year 14 - Average Year	0	0
Year 14 - 10 Year Wet	0	0
Year 14 - 50 Year Wet	0	0

Notes:

1. The additional make-up water required is in addition to the 4.6 percent minimum fresh make-up water required (418,611 m^3/yr) to the mill. Of this, 200,000 m^3/yr is water in ore, and the remainder is for fresh water requirements (ie: potable water, etc.)
2. The new 1995 water balance model assumes that approximately 1.5 million m^3 of water is stored in the tailings impoundment in October of each year.
3. Year 1 water balances indicate that ponded water in the tailings facility may need to be supplemented with additional make-up water if the tailings pond volume becomes too low for practical operations. Therefore, a contingency make-up water allowance of 300,000 m^3 may need to be extracted during freshet from the Polley Lake system under extreme dry start-up conditions during the first few years of operations.

Knight Piésold Ltd.
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TABLE 4.4

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY

WATER AVAILABLE AT START-UP
Average Year Precipitation

Catchment Areas		Runoff Coeff.
Stage 1 Tailings Facility Basin =	134 ha	90%
Tailings Facility Unprepared Basin =	96 ha	24%
Diverted Catchment Area A =	240 ha	24%
Diverted Catchment Area B =	310 ha	24%

Total annual precipitation = 755 mm

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.1	58.9	450.7
B	Snowfall (mm/month - water equivalent)	12.1	40.0	67.2	68.7	52.1	38.5	18.9	5.3	0.0	0.0	0.0	1.5	304.3
C	Lake evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m³)													
1	Tailings Facility Catchment Area Runoff	58,250	20,864	9,166	8,201	7,236	7,236	29,185	421,618	98,289	79,234	100,219	71,033	910,530
2	Diverted Catchment Area A Runoff	27,821	9,965	4,378	3,917	3,456	3,456	13,939	201,370	46,944	37,843	47,866	33,926	434,880
3	Diverted Catchment Area B Runoff	35,935	12,871	5,654	5,059	4,464	4,464	18,005	260,102	60,636	48,881	61,826	43,822	561,720
4	Unprepared Basin Runoff	11,128	3,986	1,751	1,567	1,382	1,382	5,576	80,548	18,778	15,137	19,146	13,571	173,952
5	Total Monthly Precipitation Runoff	133,134	47,686	20,949	18,744	16,538	16,538	66,705	963,637	224,647	181,095	229,057	162,352	**2,081,082**
6	Cumulative Monthly Precipitation Runoff	133,134	180,820	201,768	220,512	237,050	253,589	320,294	1,283,931	1,508,578	1,689,673	1,918,730	2,081,082	
	<WATER OUT> (m³)													
	Surface Area of Start-up Pond (ha)	5	5	5	5	5	5	5	13	21	21	21	34	
7	Evaporation from Start-up Pond	750	0	0	0	0	0	0	6,110	23,520	22,470	19,320	17,000	**89,170**
	<AVAILABLE WATER IN TSF> (m³)													
8	Total Monthly Available Water	132,384	47,686	20,949	18,744	16,538	16,538	66,705	957,527	201,127	158,625	209,737	145,352	**1,991,912**
9	Cumulative Monthly Available Water	132,384	180,070	201,018	219,762	236,300	252,839	319,544	1,277,071	1,478,198	1,636,823	1,846,560	1,991,912	

Assumptions:

1. Snowfall is given in equivalent depth of rainfall and is assumed to accumulate on catchment areas until May when it melts with 90% recovery in the tailings facility and 24% recovery from the diverted catchment areas.

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TABLE 4.5

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY

WATER AVAILABLE AT START-UP
10 Year Dry Precipitation

Catchment Areas		Runoff Coeff.
Stage I Tailings Facility Basin =	134 ha	90%
Tailings Facility Unprepared Basin =	96 ha	20%
Diverted Catchment Area A =	240 ha	20%
Diverted Catchment Area B =	310 ha	20%

Total annual precipitation = 601.3 mm

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	38.5	13.8	6.1	5.4	4.8	4.8	19.3	36.1	64.9	52.3	66.2	46.9	359.1
B	Snowfall (mm/month - water equivalent)	9.6	31.8	53.5	54.7	41.5	30.7	15.0	4.2	0.0	0.0	0.0	1.2	242.2
C	Lake evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m³)													
1	Tailings Facility Catchment Area Runoff	46,431	16,643	7,357	6,512	5,789	5,789	23,276	335,630	78,269	63,074	79,837	56,561	725,168
2	Diverted Catchment Area A Runoff	18,480	6,624	2,928	2,592	2,304	2,304	9,264	133,584	31,152	25,104	31,776	22,512	288,624
3	Diverted Catchment Area B Runoff	23,870	8,556	3,782	3,348	2,976	2,976	11,966	172,546	40,238	32,426	41,044	29,078	372,806
4	Unprepared Basin Runoff	7,392	2,650	1,171	1,037	922	922	3,706	53,434	12,461	10,042	12,710	9,005	115,450
5	Total Monthly Precipitation Runoff	96,173	34,472	15,238	13,489	11,990	11,990	48,211	695,193	162,120	130,645	165,368	117,156	**1,502,047**
6	Cumulative Monthly Precipitation Runoff	96,173	130,645	145,883	159,372	171,363	183,353	231,565	926,758	1,088,878	1,219,524	1,384,891	1,502,047	
	<WATER OUT> (m³)													
	Surface Area of Start-up Pond (ha)	0	5	5	5	5	5	5	13	13	13	13	21	
7	Evaporation from Start-up Pond	0	0	0	0	0	0	0	6,110	14,560	13,910	11,960	10,500	**57,040**
	<AVAILABLE WATER IN TSF> (m³)													
8	Total Monthly Available Water	96,173	34,472	15,238	13,489	11,990	11,990	48,211	689,083	147,560	116,735	153,408	106,656	**1,445,007**
9	Cumulative Monthly Available Water	96,173	130,645	145,883	159,372	171,363	183,353	231,565	920,648	1,068,208	1,184,944	1,338,351	1,445,007	

Assumptions:

1. Snowfall is given in equivalent depth of rainfall and is assumed to accumulate on catchment areas until May when it melts with 90% recovery in the tailings facility and 20% recovery from the diverted catchment areas.

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TABLE 4.6

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY

WATER AVAILABLE AT START-UP
50 Year Dry Precipitation

Catchment Areas		Runoff Coeff.
Stage I Tailings Facility Basin =	134 ha	90%
Tailings Facility Unprepared Basin =	96 ha	20%
Diverted Catchment Area A =	240 ha	20%
Diverted Catchment Area B =	310 ha	20%

Total annual precipitation = 508.9 mm

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	32.6	11.7	5.1	4.6	4.0	4.0	16.3	30.5	54.9	44.3	56.0	39.7	303.7
B	Snowfall (mm/month - water equivalent)	8.2	27.0	45.3	46.3	35.1	26.0	12.7	3.6	0.0	0.0	0.0	1.0	205.2
C	Lake evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m³)													
1	Tailings Facility Catchment Area Runoff	39,316	14,110	6,151	5,548	4,824	4,824	19,658	284,254	66,209	53,426	67,536	47,878	613,733
2	Diverted Catchment Area A Runoff	15,648	5,616	2,448	2,208	1,920	1,920	7,824	113,136	26,352	21,264	26,880	19,056	244,272
3	Diverted Catchment Area B Runoff	20,212	7,254	3,162	2,852	2,480	2,480	10,106	146,134	34,038	27,466	34,720	24,614	315,518
4	Unprepared Basin Runoff	6,259	2,246	979	883	768	768	3,130	45,254	10,541	8,506	10,752	7,622	97,709
5	Total Monthly Precipitation Runoff	81,435	29,227	12,740	11,491	9,992	9,992	40,717	588,779	137,140	110,661	139,888	99,171	1,271,232
6	Cumulative Monthly Precipitation Runoff	81,435	110,661	123,401	134,892	144,884	154,876	195,593	784,372	921,512	1,032,174	1,172,062	1,271,232	
	<WATER OUT> (m³)													
	Surface Area of Start-up Pond (ha)	0	5	5	5	5	5	5	8	13	13	13	13	
7	Evaporation from Start-up Pond	0	0	0	0	0	0	0	3,760	14,560	13,910	11,960	6,500	50,690
	<AVAILABLE WATER IN TSF> (m³)													
8	Total Monthly Available Water	81,435	29,227	12,740	11,491	9,992	9,992	40,717	585,019	122,580	96,751	127,928	92,671	1,220,542
9	Cumulative Monthly Available Water	81,435	110,661	123,401	134,892	144,884	154,876	195,593	780,612	903,192	999,944	1,127,872	1,220,542	

Assumptions:

1. Snowfall is given in equivalent depth of rainfall and is assumed to accumulate on catchment areas until May when it melts with 90% recovery in the tailings facility and 20% recovery from the diverted catchment areas.

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TABLE 4.7

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY

WATER AVAILABLE AT START-UP
10 Year Wet Precipitation

Catchment Areas		Runoff Coeff.
Stage I Tailings Facility Basin =	134 ha	90%
Tailings Facility Unprepared Basin =	96 ha	29%
Diverted Catchment Area A =	240 ha	29%
Diverted Catchment Area B =	310 ha	29%

Total annual precipitation = 908.7 mm

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	58.1	20.8	9.1	8.2	7.2	7.2	29.1	54.5	98.1	79.1	100.0	70.9	542.3
B	Snowfall (mm/month - water equivalent)	14.6	48.2	80.9	82.7	62.7	46.3	22.8	6.4	0.0	0.0	0.0	1.8	366.4
C	Lake evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m³)													
1	Tailings Facility Catchment Area Runoff	70,069	25,085	10,975	9,889	8,683	8,683	35,095	507,605	118,309	95,395	120,600	85,505	1,095,892
2	Diverted Catchment Area A Runoff	40,438	14,477	6,334	5,707	5,011	5,011	20,254	292,946	68,278	55,054	69,600	49,346	632,455
3	Diverted Catchment Area B Runoff	52,232	18,699	8,181	7,372	6,473	6,473	26,161	378,389	88,192	71,111	89,900	63,739	816,921
4	Unprepared Basin Runoff	16,175	5,791	2,533	2,283	2,004	2,004	8,101	117,179	27,311	22,021	27,840	19,739	252,982
5	Total Monthly Precipitation Runoff	178,913	64,052	28,023	25,251	22,172	22,172	89,611	1,296,119	302,089	243,581	307,940	218,329	**2,798,251**
6	Cumulative Monthly Precipitation Runoff	178,913	242,965	270,987	296,238	318,410	340,582	430,192	1,726,312	2,028,401	2,271,981	2,579,921	2,798,251	
	<WATER OUT> (m³)													
	Surface Area of Start-up Pond (ha)	5	5	5	5	5	5	5	21	34	34	34	50	
7	Evaporation from Start-up Pond	750	0	0	0	0	0	0	9,870	38,080	36,380	31,280	25,000	**141,360**
	<AVAILABLE WATER IN TSF> (m³)													
8	Total Monthly Available Water	178,163	64,052	28,023	25,251	22,172	22,172	89,611	1,286,249	264,009	207,201	276,660	193,329	**2,656,891**
9	Cumulative Monthly Available Water	178,163	242,215	270,237	295,488	317,660	339,832	429,442	1,715,692	1,979,701	2,186,901	2,463,561	2,656,891	

Assumptions:

1. Snowfall is given in equivalent depth of rainfall and is assumed to accumulate on catchment areas until May when it melts with 90% recovery in the tailings facility and 29% recovery from the diverted catchment areas.

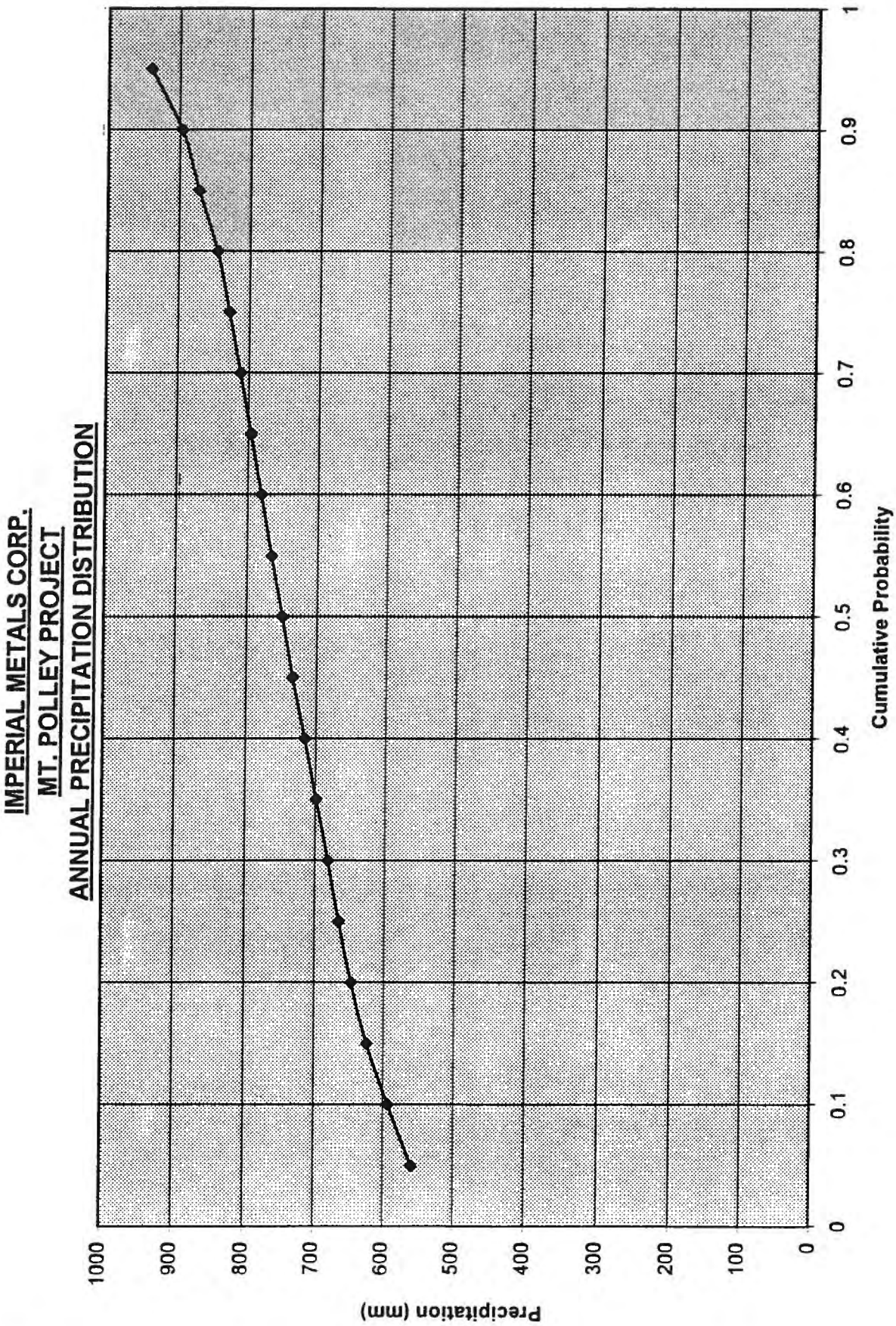

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FIGURE 2.1

IMPERIAL METALS CORPORATION

MT. POLLEY PROJECT

OVERVIEW OF WATER BALANCE COMPONENTS

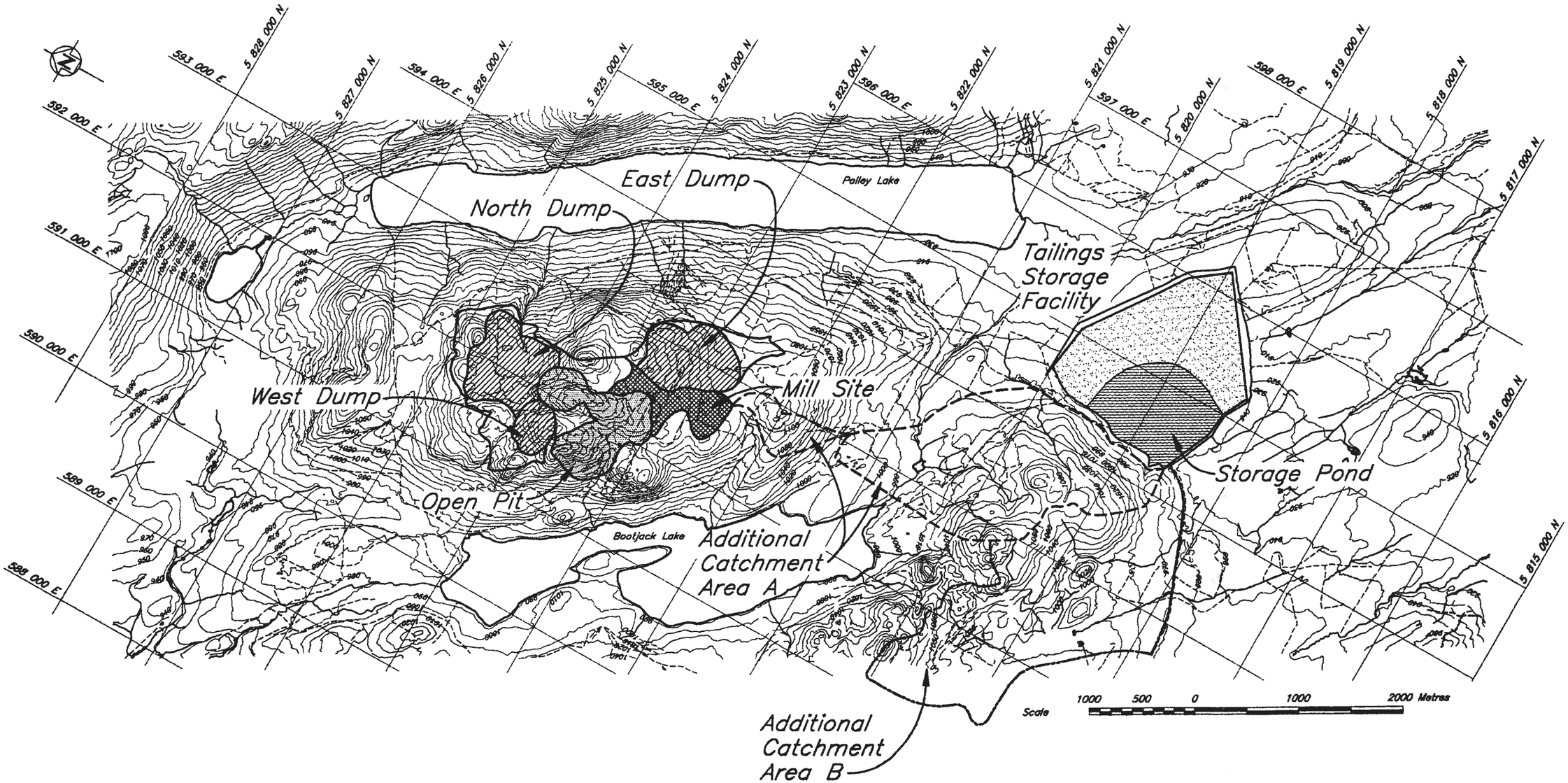

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FIGURE 3.1

CAD FILE: \PROJECT\1624\FIG\B1 Plot scale 1=40 STD. 1 PLOT USER 2

IMPERIAL METALS CORPORATION

MT. POLLEY PROJECT

WATER BALANCE FLOW VOLUMES - AVERAGE CONDITIONS: YEAR 1

EXISTING PERMIT

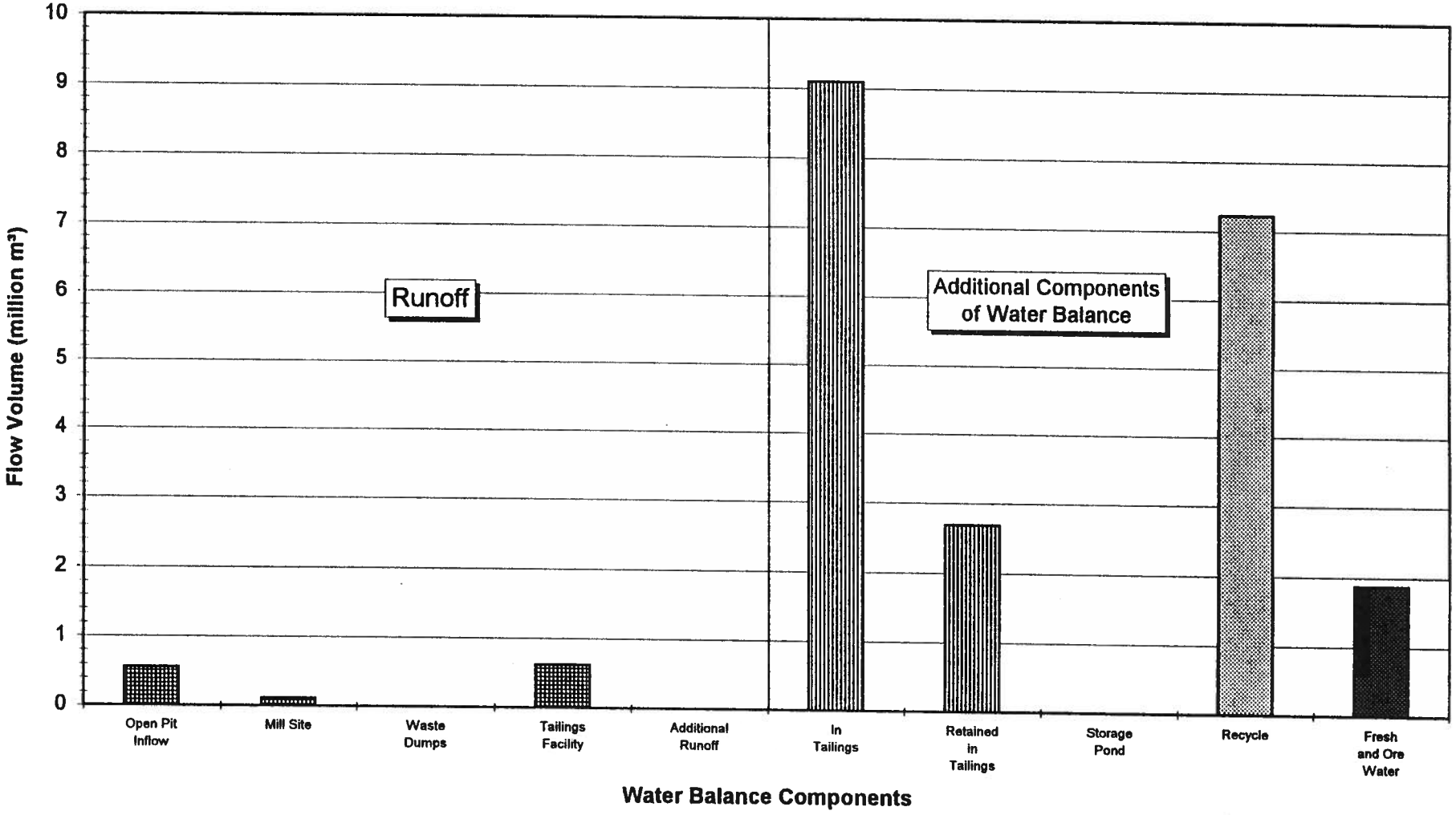

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FIGURE 4.1

1624.A7

IMPERIAL METALS CORPORATION

MT. POLLEY PROJECT

WATER BALANCE FLOW VOLUMES - AVERAGE CONDITIONS : YEAR 1

NEW OPTION

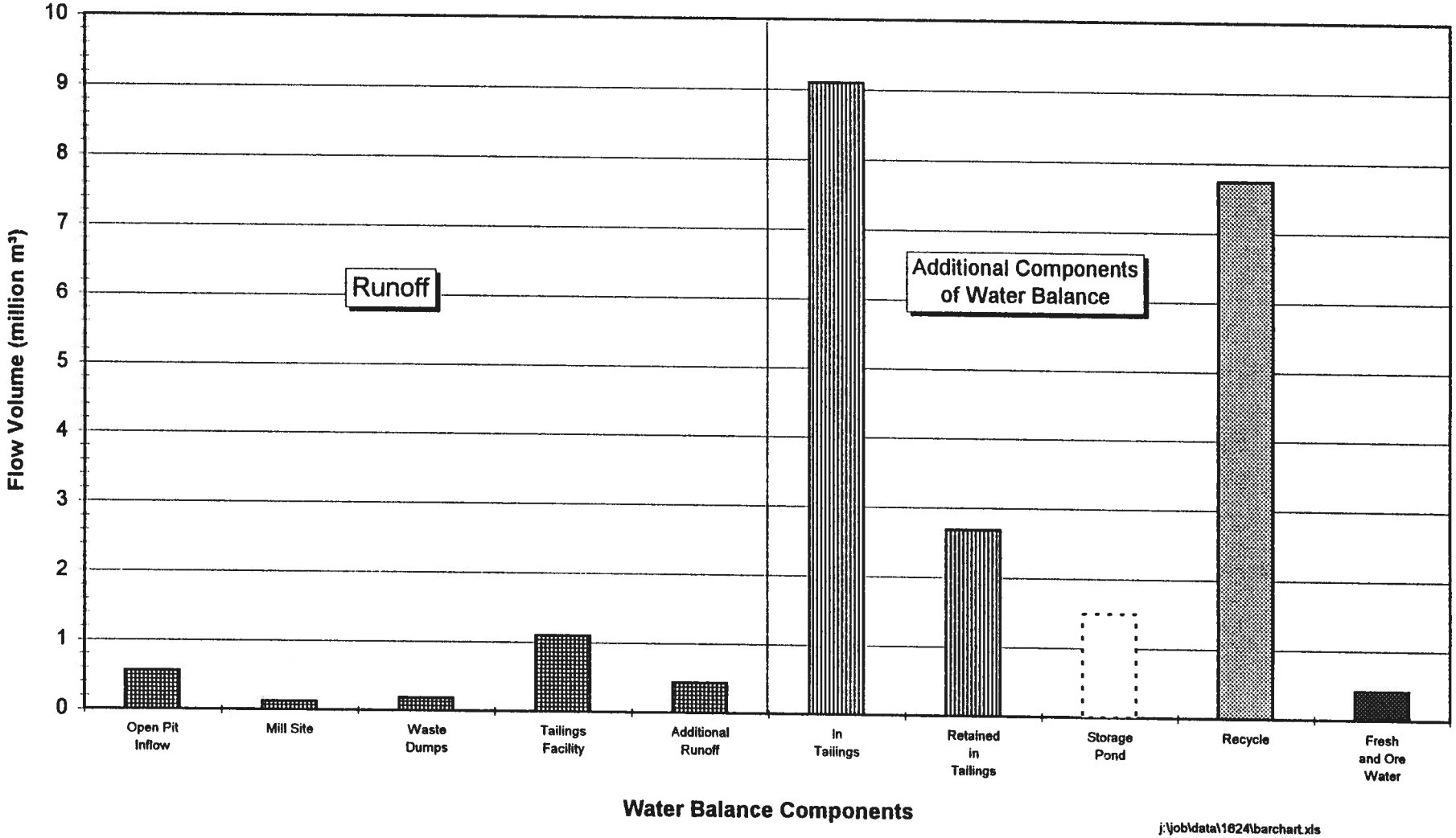

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FIGURE 4.2

1624.A8

1624.A5

IMPERIAL METALS CORP.
MT. POLLEY PROJECT
VARIATION IN TAILINGS POND VOLUME FOR AVERAGE PRECIPITATION CONDITIONS

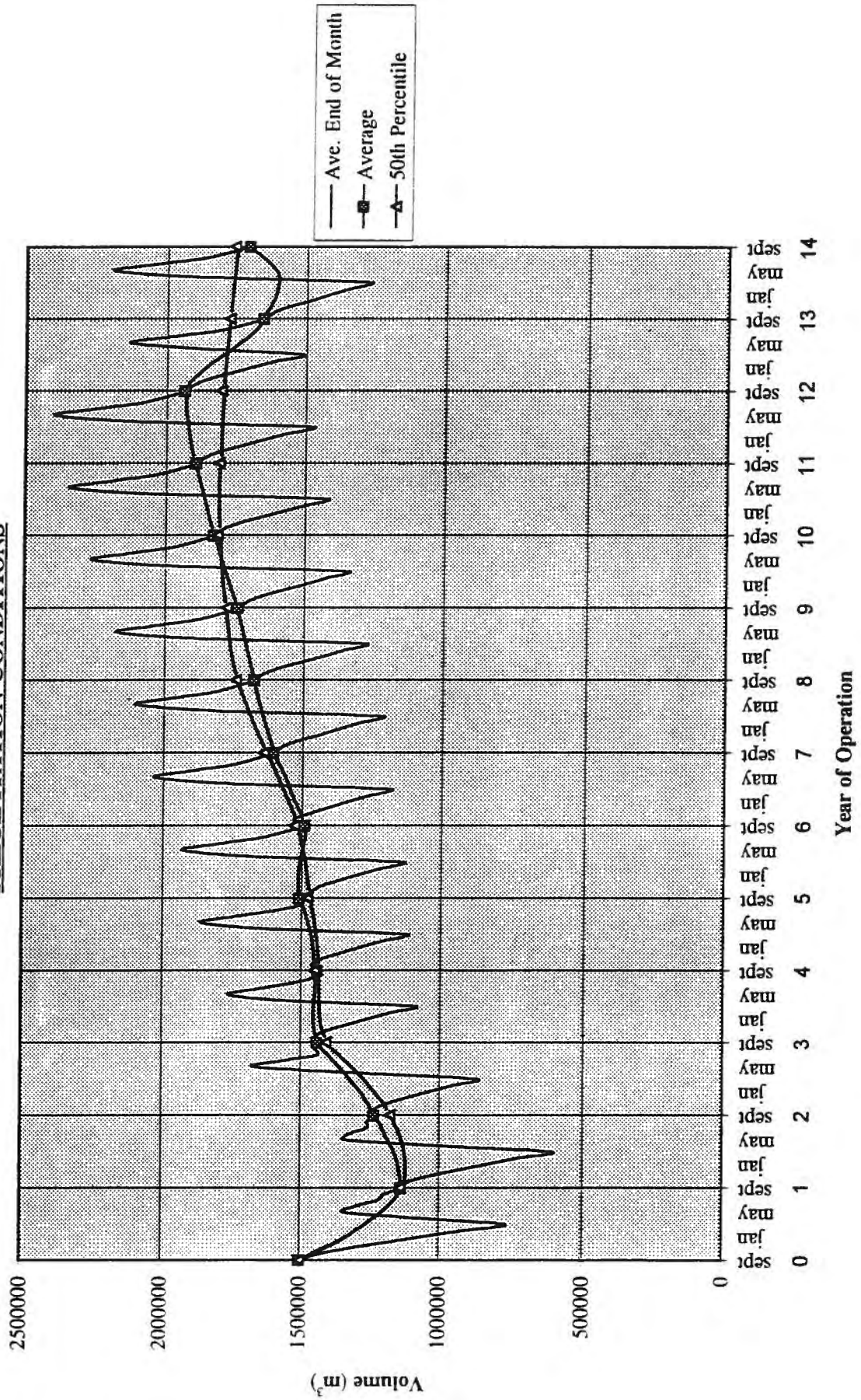

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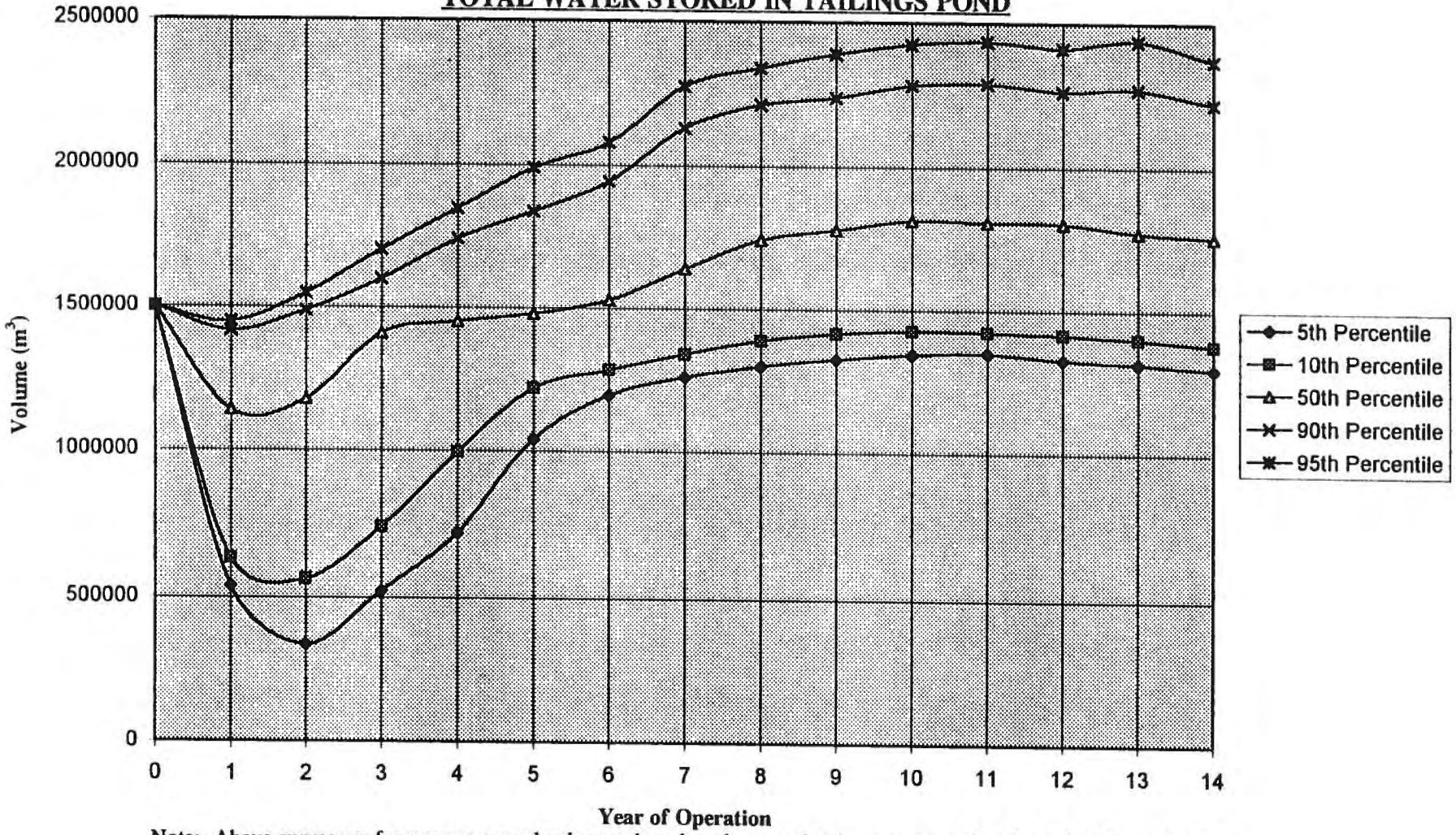
FIGURE 4.3

IMPERIAL METALS CORP.
MT. POLLEY PROJECT
TOTAL WATER STORED IN TAILINGS POND



Note: Above curves are for average annual values and are based on pond volumes measured at the end of September in each year. Actual pond volumes fluctuate during each year.

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FIGURE 4.4

1624.A6

1624.A3

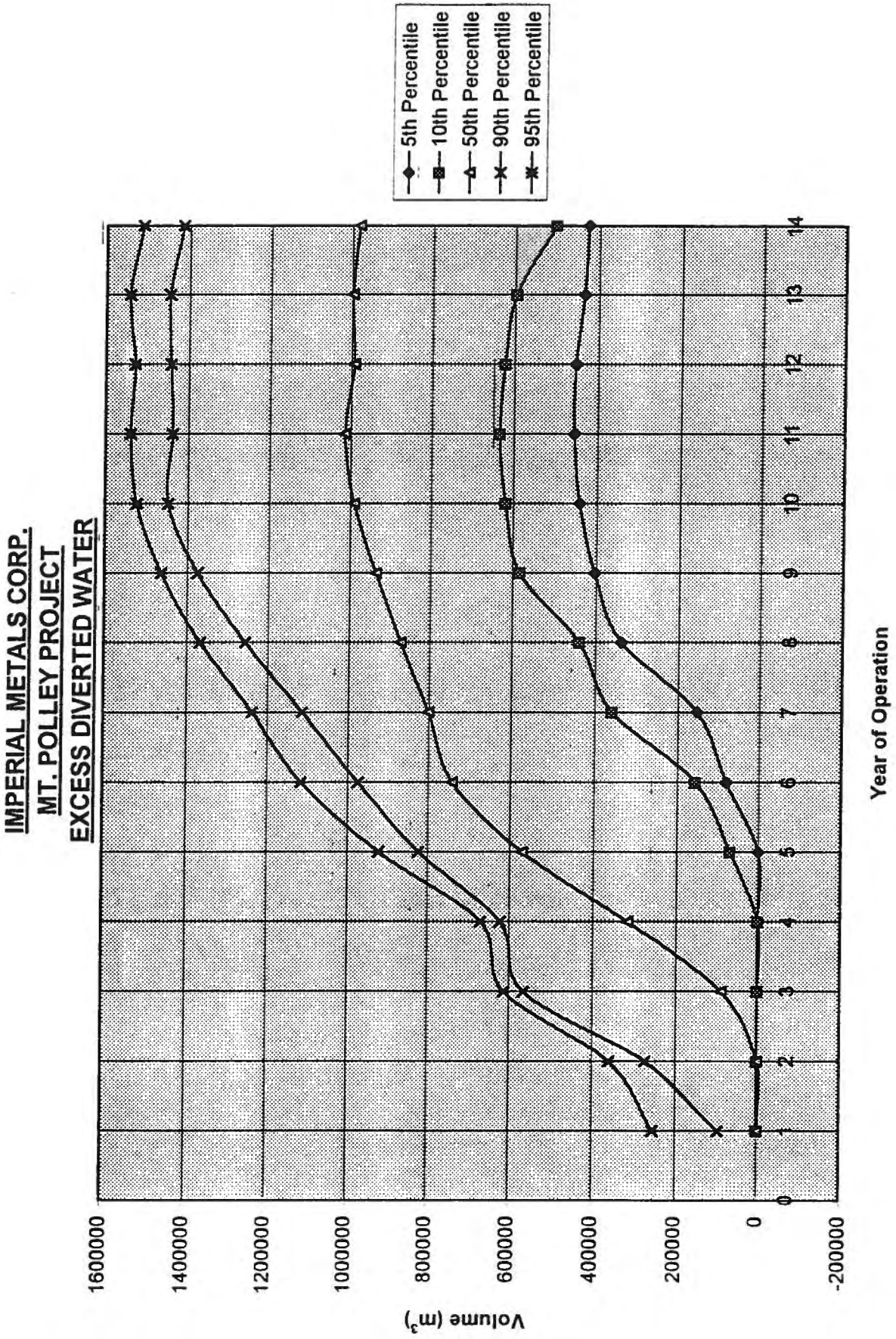

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FIGURE 4.5

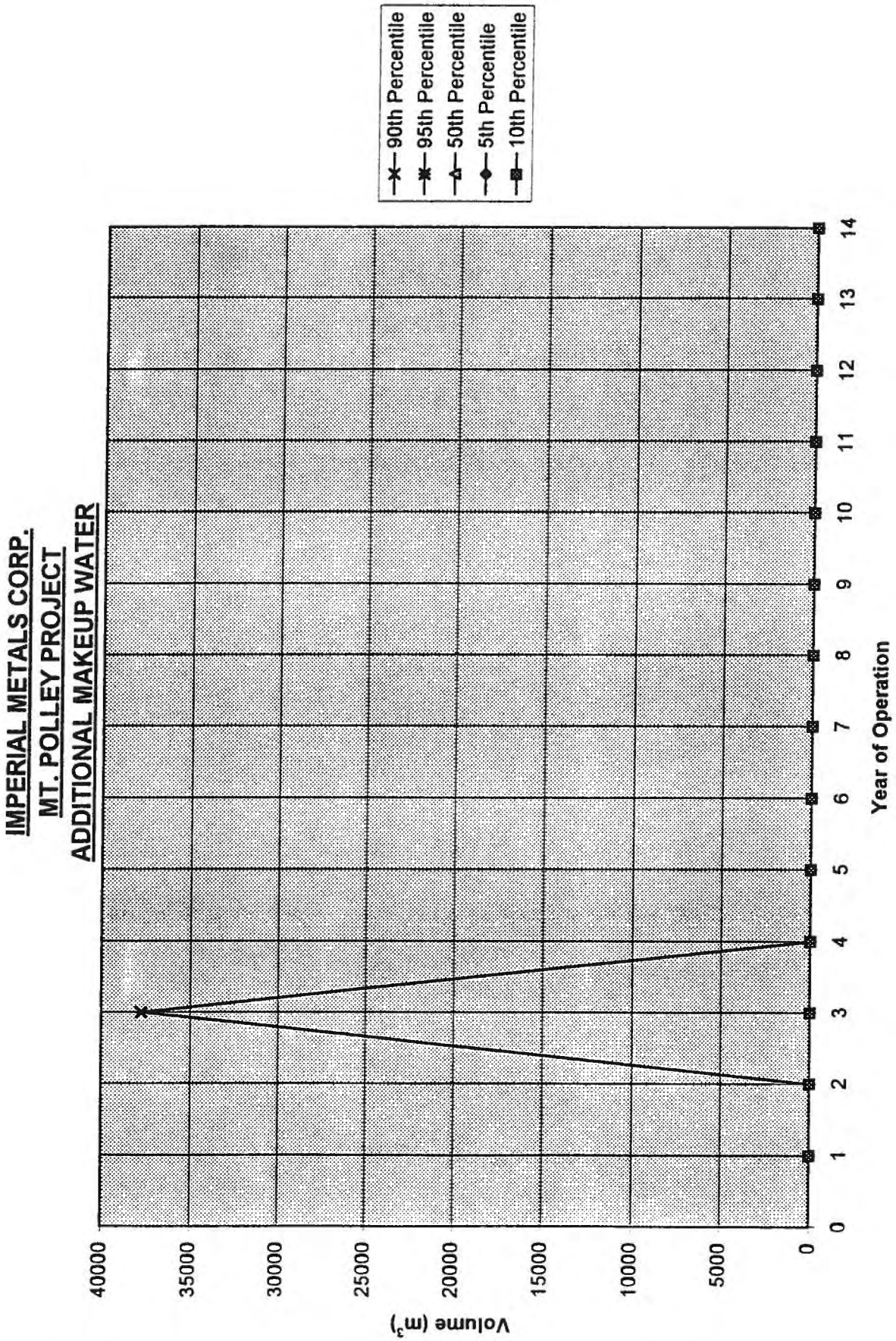

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FIGURE 4.6

APPENDIX A

TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCES
FOR AVERAGE PRECIPITATION

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TABLE A.1
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 1

assumptions:

daily ore throughput (tpd) =	13,425	min. fresh water makeup (%) =	2%	unprepared basin area (ha) =	96		dry	ave.	wet
tails % solids =	35%	initial dry density (t/m^3) =	0.9	prepared basin area (ha) =	64	unprep'd basin runoff coeff. =	20%	24%	29%
tails S.G. =	2.78	final dry density (t/m^3) =	1.1	beach area (ha) =	49	prep'd basin runoff coeff. =	90%	90%	90%
initial pond volume (m^3) =	1,500,000	total pit area (ha) =	18	pond area (ha) =	21	beach runoff coeff. =	90%	90%	90%
water content of ore =	4%	pit g/w infiltration (m^3/mo) =	39,818	beach evaporation factor =	0.80	pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	10,185	3,648	1,603	1,434	1,265	1,265	38,211	39,814	17,186	13,854	17,524	12,734	158,724
3	Beach runoff	21,244	7,609	3,343	2,991	2,639	2,639	79,700	83,044	35,847	28,897	36,550	26,561	331,063
4	Unprep'd basin runoff	11,122	3,984	1,750	1,566	1,382	1,382	41,724	43,475	18,766	15,128	19,135	13,905	173,317
5	Prep'd basin runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
6	Recovery from open pit: precipitation	4,557	1,632	717	642	566	566	17,097	17,815	7,690	6,199	7,841	5,698	71,020
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input	873,083	825,003	809,958	808,717	807,477	807,477	1,079,214	1,091,006	924,575	900,070	927,057	891,832	10,745,467
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	114,730	66,650	51,605	50,365	49,124	49,124	320,861	332,653	166,222	141,717	168,704	133,479	1,645,234
12	(-) Evaporation from pond	3,165	0	0	0	0	0	0	9,917	23,632	22,577	19,412	10,550	89,253
13	(-) Evaporation from beach	5,868	0	0	0	0	0	0	18,386	43,814	41,858	35,990	19,560	165,478
14	(+) Consolidation to final density	82,494	82,494	82,494	82,494	82,494	82,494	82,494	82,494	82,494	82,494	82,494	82,494	989,924
15	Sub-total (Water recovered as S/N)	581,614	542,567	527,523	526,282	525,041	525,041	796,779	780,267	574,693	553,199	589,219	579,287	7,101,512
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	224,335	224,335	224,335	224,335	224,335	224,335	224,335	224,335	224,335	224,335	224,335	224,335	2,692,024
20	Evaporation from beach and pond	9,033	0	0	0	0	0	0	28,303	67,446	64,435	55,402	30,110	254,731
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	239,208	230,175	230,175	230,175	230,175	230,175	230,175	258,479	297,622	294,611	285,578	260,285	3,016,835
23	>>> Total Water Output	873,083	825,003	809,958	808,717	807,477	807,477	1,079,214	1,091,006	924,575	900,070	927,057	891,832	10,745,467
24	Monthly water available (excluding stored water in TSF)	633,874	594,827	579,783	578,542	577,301	577,301	849,039	832,527	626,953	605,459	641,479	631,547	7,728,632
25	Available stored water in TSF at beginning of month	1,500,000	1,432,777	1,321,031	1,184,705	1,046,351	905,971	765,590	1,069,188	1,339,298	1,297,793	1,219,260	1,193,853	
26	*Total Monthly Water Available*	2,133,874	2,027,604	1,900,814	1,763,247	1,623,653	1,483,272	1,614,628	1,901,715	1,966,252	1,903,252	1,860,739	1,825,400	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-114,706	-128,753	-143,798	-145,039	-146,279	-146,279	125,458	83,946	-121,627	-143,122	-107,102	-117,034	-1,104,334
34	Annual cumulative precipitation surplus/deficit	-114,706	-243,459	-387,257	-532,296	-678,575	-824,854	-699,396	-615,450	-737,077	-880,199	-987,300	-1,104,334	
35	Total water in TSF at end of month (incl. mine site runoff)	1,432,777	1,321,031	1,184,705	1,046,351	905,971	765,590	1,069,188	1,339,298	1,297,793	1,219,260	1,193,853	1,136,187	
36	Excess runoff not diverted into tailings pond	0	0	0	0	0	0	0	0	0	0	0	0	0

Knight Piésold Ltd.
CONSULTING ENGINEERS

T/[illegible]A.2
IMPERIAL MET[illegible] CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 2

assumptions:

daily ore throughput (tpd) =	13,425	min. fresh water makeup (%) =	2%	unprepared basin area (ha) =	54		dry	ave.	wet
tails % solids =	35%	initial dry density (t/m^3) =	0.9	prepared basin area (ha) =	67	unprep'd basin runoff coeff. =	20%	24%	29%
tails S.G. =	2.78	final dry density (t/m^3) =	1.2	beach area (ha) =	82	prep'd basin runoff coeff. =	90%	90%	90%
initial pond volume (m^3) =	1,136,187	total pit area (ha) =	18	pond area (ha) =	27	beach runoff coeff. =	90%	90%	90%
water content of ore =	4%	pit g/w infiltration (m^3/mo) =	39,818	beach evaporation factor =	0.80	pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	13,081	4,685	2,058	1,842	1,625	1,625	49,077	51,136	22,073	17,794	22,507	16,355	203,859
3	Beach runoff	35,580	12,744	5,599	5,009	4,420	4,420	133,485	139,086	60,037	48,398	61,216	44,486	554,480
4	Unprep'd basin runoff	6,256	2,241	984	881	777	777	23,470	24,455	10,556	8,510	10,763	7,822	97,491
5	Prep'd basin runoff	29,107	10,426	4,580	4,098	3,616	3,616	109,200	113,782	49,115	39,593	50,079	36,392	453,604
6	Recovery from open pit: precipitation	4,557	1,632	717	642	566	566	17,097	17,815	7,690	6,199	7,841	5,698	71,020
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	> > > Total Water Input	886,753	829,899	812,109	810,642	809,175	809,175	1,130,500	1,144,443	947,642	918,665	950,576	908,924	10,958,503
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	128,400	71,546	53,756	52,289	50,822	50,822	372,147	386,091	189,289	160,312	192,224	150,571	1,858,270
12	(-) Evaporation from pond	4,065	0	0	0	0	0	0	12,737	30,352	28,997	24,932	13,550	114,633
13	(-) Evaporation from beach	9,828	0	0	0	0	0	0	30,794	73,382	70,106	60,278	32,760	277,150
14	(+) Consolidation to final density	113,429	113,429	113,429	113,429	113,429	113,429	113,429	113,429	113,429	113,429	113,429	113,429	1,361,146
15	Sub-total (Water recovered as S/N)	621,360	578,399	560,609	559,142	557,674	557,674	879,000	849,412	592,407	568,061	613,866	611,113	7,548,717
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	193,400	193,400	193,400	193,400	193,400	193,400	193,400	193,400	193,400	193,400	193,400	193,400	2,320,803
20	Evaporation from beach and pond	13,893	0	0	0	0	0	0	43,531	103,734	99,103	85,210	46,310	391,783
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	213,133	199,240	199,240	199,240	199,240	199,240	199,240	242,772	302,975	298,344	284,451	245,550	2,782,665
23	> > > Total Water Output	886,753	829,899	812,109	810,642	809,175	809,175	1,130,500	1,144,443	947,642	918,665	950,576	908,924	10,958,503
24	Monthly water available (excluding stored water in TSF)	673,620	630,659	612,869	611,402	609,934	609,934	931,260	901,672	644,667	620,321	666,126	663,373	8,175,837
25	Available stored water in TSF at beginning of month	1,136,187	1,109,579	1,033,977	930,874	825,502	717,863	610,223	999,307	1,341,963	1,319,640	1,257,153	1,257,890	
26	*Total Monthly Water Available*	1,809,807	1,740,238	1,646,846	1,542,275	1,435,437	1,327,797	1,541,483	1,900,978	1,986,630	1,939,961	1,923,279	1,921,263	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-74,961	-92,922	-110,712	-112,179	-113,646	-113,646	207,679	153,091	-103,913	-128,259	-82,455	-85,207	-657,129
34	Annual cumulative precipitation surplus/deficit	-74,961	-167,882	-278,594	-390,773	-504,419	-618,065	-410,386	-257,294	-361,208	-489,467	-571,922	-657,129	
35	Total water in TSF at end of month (incl. mine site runoff)	1,109,579	1,033,977	930,874	825,502	717,863	610,223	999,307	1,341,963	1,319,640	1,257,153	1,257,890	1,233,138	
36	Excess runoff not diverted into tailings pond	0	0	0	0	0	0	0	0	0	0	0	0	0

Knight Piésold Ltd.
CONSULTING ENGINEERS

TA[illegible].3
IMPERIAL META[illegible] CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 3

assumptions:

daily ore throughput (tpd) =	13,425	min. fresh water makeup (%) =	2%	unprepared basin area (ha) =	54		dry / ave. / wet
tails % solids =	35%	initial dry density (t/m^3) =	0.9	prepared basin area (ha) =	38	unprep'd basin runoff coeff. =	20% / 24% / 29%
tails S.G. =	2.78	final dry density (t/m^3) =	1.3	beach area (ha) =	105	prep'd basin runoff coeff. =	90% / 90% / 90%
initial pond volume (m^3) =	1,233,138	total pit area (ha) =	26	pond area (ha) =	33	beach runoff coeff. =	90% / 90% / 90%
water content of ore =	4%	pit g/w infiltration (m^3/mo) =	39,818	beach evaporation factor =	0.80	pit area runoff coeff. =	45% / 50% / 55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	16,026	5,740	2,522	2,256	1,991	1,991	60,124	62,646	27,042	21,799	27,573	20,037	249,746
3	Beach runoff	45,529	16,308	7,164	6,410	5,656	5,656	170,809	177,975	76,824	61,931	78,333	56,924	709,518
4	Unprep'd basin runoff	6,256	2,241	984	881	777	777	23,470	24,455	10,556	8,510	10,763	7,822	97,491
5	Prep'd basin runoff	16,509	5,913	2,598	2,324	2,051	2,051	61,934	64,533	27,856	22,456	28,403	20,640	257,268
6	Recovery from open pit: precipitation	6,603	2,365	1,039	930	820	820	24,772	25,811	11,142	8,982	11,360	8,255	102,898
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	> > > Total Water Input	889,093	830,737	812,477	810,971	809,465	809,465	1,139,279	1,153,591	951,590	921,848	954,602	911,849	10,994,970
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	130,740	72,384	54,125	52,619	51,113	51,113	380,926	395,238	193,238	163,495	196,250	153,497	1,894,737
12	(-) Evaporation from pond	4,980	0	0	0	0	0	0	15,604	37,184	35,524	30,544	16,600	140,436
13	(-) Evaporation from beach	12,576	0	0	0	0	0	0	39,405	93,901	89,709	77,133	41,920	354,643
14	(+) Consolidation to final density	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)	646,213	605,413	587,153	585,647	584,141	584,141	913,955	873,258	595,181	571,291	621,601	628,005	7,795,998
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond	17,556	0	0	0	0	0	0	55,009	131,085	125,233	107,677	58,520	495,079
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	190,620	173,064	173,064	173,064	173,064	173,064	173,064	228,073	304,149	298,297	280,741	231,584	2,571,851
23	> > > Total Water Output	889,093	830,737	812,477	810,971	809,465	809,465	1,139,279	1,153,591	951,590	921,848	954,602	911,849	10,994,970
24	Monthly water available (excluding stored water in TSF)	698,473	657,673	639,413	637,907	636,401	636,401	966,215	925,518	647,441	623,551	673,861	680,265	8,423,118
25	Available stored water in TSF at beginning of month	1,233,138	1,232,253	1,183,976	1,107,554	1,028,811	947,746	866,681	1,293,983	1,663,887	1,562,747	1,437,718	1,447,687	
26	*Total Monthly Water Available*	1,931,611	1,889,926	1,823,389	1,745,461	1,665,212	1,584,147	1,832,896	2,219,501	2,311,328	2,186,298	2,111,579	2,127,952	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-50,108	-65,908	-84,168	-85,673	-87,179	-87,179	242,634	176,937	-101,139	-125,030	-74,719	-68,315	-409,848
34	Annual cumulative precipitation surplus/deficit	-50,108	-116,016	-200,183	-285,857	-373,036	-460,215	-217,581	-40,644	-141,783	-266,813	-341,532	-409,848	
35	Total water in TSF at end of month (incl. mine site runoff)	1,232,253	1,183,976	1,107,554	1,028,811	947,746	866,681	1,293,983	1,663,887	1,562,747	1,437,718	1,447,687	1,440,914	
36	Excess runoff not diverted into tailings pond	0	0	0	0	0	0	0	0	83,058	66,956	0	0	150,014

Knight Piésold Ltd.
CONSULTING ENGINEERS

1[illegible] A.4
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 4

assumptions:

daily ore throughput (tpd) =	13,425	min. fresh water makeup (%) =	2%	unprepared basin area (ha) =	26		dry	ave.	wet
tails % solids =	35%	initial dry density (t/m^3) =	0.9	prepared basin area (ha) =	44	unprep'd basin runoff coeff. =	20%	24%	29%
tails S.G. =	2.78	final dry density (t/m^3) =	1.3	beach area (ha) =	121	prep'd basin runoff coeff. =	90%	90%	90%
initial pond volume (m^3) =	1,440,914	total pit area (ha) =	26	pond area (ha) =	39	beach runoff coeff. =	90%	90%	90%
water content of ore =	4%	pit g/w infiltration (m^3/mo) =	39,818	beach evaporation factor =	0.80	pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)		48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)		12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)		15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)														
1	With slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond		18,970	6,795	2,985	2,671	2,357	2,357	71,170	74,156	32,010	25,805	32,639	23,718	295,633
3	Beach runoff		52,437	18,782	8,251	7,382	6,514	6,514	196,723	204,977	88,480	71,327	90,217	65,561	817,165
4	Unprep'd basin runoff		3,012	1,079	474	424	374	374	11,300	11,774	5,083	4,097	5,182	3,766	46,940
5	Prep'd basin runoff		19,115	6,847	3,008	2,691	2,375	2,375	71,714	74,722	32,255	26,002	32,888	23,899	297,889
6	Recovery from open pit:	precipitation	6,603	2,365	1,039	930	820	820	24,772	25,811	11,142	8,982	11,360	8,255	102,898
7		g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input		898,308	834,038	813,927	812,269	810,610	810,610	1,173,850	1,189,612	967,139	934,382	970,457	923,371	11,138,573
	<WATER OUT> (m^3)														
	Supernatant Recovery														
9	(+) Recovery from tailings		451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff		139,955	75,685	55,575	53,916	52,257	52,257	415,497	431,260	208,787	176,030	212,104	165,018	2,038,341
12	(-) Evaporation from pond		5,895	0	0	0	0	0	0	18,471	44,016	42,051	36,156	19,650	166,239
13	(-) Evaporation from beach		14,484	0	0	0	0	0	0	45,383	108,147	103,319	88,835	48,280	408,449
14	(+) Consolidation to final density		139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)		652,605	608,713	588,603	586,944	585,286	585,286	948,526	900,434	589,652	563,688	620,141	630,116	7,859,993
	Underdrainage recovery														
16	(+) Underdrainage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)		52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water														
19	Water retained in tailings		167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond		20,379	0	0	0	0	0	0	63,854	152,163	145,370	124,991	67,930	574,688
21	Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)		193,443	173,064	173,064	173,064	173,064	173,064	173,064	236,919	325,228	318,435	298,056	240,994	2,651,460
23	>>> Total Water Output		898,308	834,038	813,927	812,269	810,610	810,610	1,173,850	1,189,612	967,139	934,382	970,457	923,371	11,138,573
24	Monthly water available (excluding stored water in TSF)		704,865	660,973	640,863	639,204	637,546	637,546	1,000,786	952,694	641,912	615,948	672,401	682,376	8,487,113
25	Available stored water in TSF at beginning of month		1,440,914	1,447,292	1,402,627	1,327,792	1,250,468	1,170,656	1,090,844	1,555,981	1,760,095	1,653,426	1,520,793	1,444,614	
26	*Total Monthly Water Available*		2,145,779	2,108,265	2,043,490	1,966,996	1,888,014	1,808,202	2,091,630	2,508,675	2,402,007	2,269,374	2,193,194	2,126,990	
27	Water included with slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill		18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore		16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads		25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*		748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required		0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit		-43,716	-62,607	-82,718	-84,376	-86,035	-86,035	277,205	204,113	-106,669	-132,633	-76,179	-66,204	-345,853
34	Annual cumulative precipitation surplus/deficit		-43,716	-106,323	-189,041	-273,417	-359,451	-445,486	-168,281	35,832	-70,836	-203,469	-279,648	-345,853	
35	Total water in TSF at end of month (incl. mine site runoff)		1,447,292	1,402,627	1,327,792	1,250,468	1,170,656	1,090,844	1,555,981	1,760,095	1,653,426	1,520,793	1,444,614	1,441,040	
36	Excess runoff not diverted into tailings pond		0	0	0	0	0	0	0	196,367	84,526	68,139	86,185	0	435,218

Knight Piésold Ltd.
CONSULTING ENGINEERS

T[illegible]A.5
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 5

assumptions:

daily ore throughput (tpd) =	13,425	min. fresh water makeup (%) =	2%	unprepared basin area (ha) =	26				dry	ave.	wet
tails % solids =	35%	initial dry density (t/m^3) =	0.9	prepared basin area (ha) =	19	unprep'd basin runoff coeff. =			20%	24%	29%
tails S.G. =	2.78	final dry density (t/m^3) =	1.3	beach area (ha) =	140	prep'd basin runoff coeff. =			90%	90%	90%
initial pond volume (m^3) =	1,441,040	total pit area (ha) =	40	pond area (ha) =	45	beach runoff coeff. =			90%	90%	90%
water content of ore =	4%	pit g/w infiltration (m^3/mo) =	39,818	beach evaporation factor =	0.80	pit area runoff coeff. =			45%	50%	55%

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	DESCRIPTION		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)		48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)		12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)		15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)														
1	With slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond		21,915	7,849	3,448	3,085	2,722	2,722	82,217	85,667	36,979	29,810	37,705	27,400	341,520
3	Beach runoff		60,648	21,723	9,543	8,538	7,534	7,534	227,528	237,074	102,335	82,496	104,344	75,827	945,122
4	Unprep'd basin runoff		3,012	1,079	474	424	374	374	11,300	11,774	5,083	4,097	5,182	3,766	46,940
5	Prep'd basin runoff		8,254	2,957	1,299	1,162	1,025	1,025	30,967	32,267	13,928	11,228	14,202	10,320	128,634
6	Recovery from open pit:	precipitation	10,461	3,747	1,646	1,473	1,300	1,300	39,246	40,893	17,652	14,230	17,998	13,079	163,023
7		g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input		902,461	835,525	814,581	812,853	811,126	811,126	1,189,429	1,205,845	974,146	940,031	977,601	928,563	11,203,287
	<WATER OUT> (m^3)														
	Supernatant Recovery														
9	(+) Recovery from tailings		451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff		144,108	77,172	56,228	54,501	52,773	52,773	431,076	447,492	215,794	181,678	219,249	170,210	2,103,055
12	(-) Evaporation from pond		6,810	0	0	0	0	0	0	21,338	50,848	48,578	41,768	22,700	192,042
13	(-) Evaporation from beach		16,752	0	0	0	0	0	0	52,490	125,082	119,498	102,746	55,840	472,406
14	(+) Consolidation to final density		139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)		653,574	610,201	589,256	587,529	585,802	585,802	964,105	906,693	572,893	546,631	607,763	624,698	7,834,947
	Underdrainage recovery														
16	(+) Underdrainage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)		52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water														
19	Water retained in tailings		167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond		23,562	0	0	0	0	0	0	73,828	175,930	168,076	144,514	78,540	664,448
21	Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)		196,626	173,064	173,064	173,064	173,064	173,064	173,064	246,892	348,994	341,140	317,578	251,604	2,741,220
23	>>> Total Water Output		902,461	835,525	814,581	812,853	811,126	811,126	1,189,429	1,205,845	974,146	940,031	977,601	928,563	11,203,287
24	Monthly water available (excluding stored water in TSF)		705,834	662,461	641,516	639,789	638,062	638,062	1,016,365	958,953	625,153	598,891	660,023	676,958	8,462,067
25	Available stored water in TSF at beginning of month		1,441,040	1,461,562	1,423,104	1,350,995	1,276,111	1,198,451	1,120,791	1,650,935	1,861,307	1,737,879	1,588,190	1,499,633	
26	*Total Monthly Water Available*		2,146,875	2,124,023	2,064,620	1,990,784	1,914,172	1,836,513	2,137,156	2,609,888	2,486,460	2,336,770	2,248,213	2,176,591	
27	Water included with slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill		18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore		16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads		25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*		748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required		0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit		-42,746	-61,120	-82,064	-83,792	-85,519	-85,519	292,784	210,373	-123,428	-149,690	-88,557	-71,622	-370,900
34	Annual cumulative precipitation surplus/deficit		-42,746	-103,866	-185,930	-269,722	-355,241	-440,760	-147,975	62,397	-61,031	-210,720	-299,277	-370,900	
35	Total water in TSF at end of month (incl. mine site runoff)		1,461,562	1,423,104	1,350,995	1,276,111	1,198,451	1,120,791	1,650,935	1,861,307	1,737,879	1,588,190	1,499,633	1,507,113	
36	Excess runoff not diverted into tailings pond		0	0	0	0	0	0	0	247,868	106,757	86,060	108,852	0	549,537

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE A.6
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 6

assumptions:

daily ore throughput (tpd) =	13,425	min. fresh water makeup (%) =	2%	unprepared basin area (ha) =	15		dry	ave.	wet
tails % solids =	35%	initial dry density (t/m^3) =	0.9	prepared basin area (ha) =	22	unprep'd basin runoff coeff. =	20%	24%	29%
tails S.G. =	2.78	final dry density (t/m^3) =	1.3	beach area (ha) =	142	prep'd basin runoff coeff. =	90%	90%	90%
initial pond volume (m^3) =	1,507,113	total pit area (ha) =	40	pond area (ha) =	51	beach runoff coeff. =	90%	90%	90%
water content of ore =	4%	pit g/w infiltration (m^3/mo) =	39,818	beach evaporation factor =	0.80	pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	24,811	8,887	3,904	3,493	3,082	3,082	93,083	96,988	41,866	33,749	42,688	31,021	386,654
3	Beach runoff	61,516	22,034	9,680	8,661	7,642	7,642	230,787	240,471	103,801	83,678	105,839	76,913	958,662
4	Unprep'd basin runoff	1,738	622	273	245	216	216	6,519	6,793	2,932	2,364	2,990	2,173	27,081
5	Prep'd basin runoff	9,558	3,423	1,504	1,346	1,187	1,187	35,857	37,361	16,127	13,001	16,444	11,950	148,945
6	Recovery from open pit: precipitation	10,461	3,747	1,646	1,473	1,300	1,300	39,246	40,893	17,652	14,230	17,998	13,079	163,023
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input	906,255	836,884	815,178	813,387	811,597	811,597	1,203,663	1,220,676	980,548	945,192	984,129	933,306	11,262,414
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	147,902	78,531	56,825	55,035	53,245	53,245	445,311	462,324	222,196	186,839	225,776	174,954	2,162,181
12	(-) Evaporation from pond	7,710	0	0	0	0	0	0	24,158	57,568	54,998	47,288	25,700	217,422
13	(-) Evaporation from beach	16,992	0	0	0	0	0	0	53,242	126,874	121,210	104,218	56,640	479,174
14	(+) Consolidation to final density	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)	656,228	611,560	589,853	588,063	586,273	586,273	978,339	917,953	570,783	543,660	607,299	625,642	7,861,925
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond	24,702	0	0	0	0	0	0	77,400	184,442	176,208	151,506	82,340	696,596
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	197,766	173,064	173,064	173,064	173,064	173,064	173,064	250,464	357,506	349,272	324,570	255,404	2,773,368
23	>>> Total Water Output	906,255	836,884	815,178	813,387	811,597	811,597	1,203,663	1,220,676	980,548	945,192	984,129	933,306	11,262,414
24	Monthly water available (excluding stored water in TSF)	708,488	663,820	642,113	640,323	638,533	638,533	1,030,599	970,213	623,043	595,920	659,559	677,902	8,489,045
25	Available stored water in TSF at beginning of month	1,507,113	1,467,021	1,432,504	1,362,126	1,288,791	1,212,498	1,136,205	1,707,627	1,929,259	1,803,721	1,651,061	1,562,039	
26	*Total Monthly Water Available*	2,215,602	2,130,841	2,074,617	2,002,449	1,927,324	1,851,031	2,166,804	2,677,840	2,552,302	2,399,641	2,310,620	2,239,941	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-40,092	-59,761	-81,467	-83,257	-85,048	-85,048	307,018	221,632	-125,538	-152,661	-89,022	-70,679	-343,921
34	Annual cumulative precipitation surplus/deficit	-40,092	-99,853	-181,320	-264,578	-349,625	-434,673	-127,654	93,978	-31,560	-184,221	-273,242	-343,921	
35	Total water in TSF at end of month (incl. mine site runoff)	1,467,021	1,432,504	1,362,126	1,288,791	1,212,498	1,136,205	1,707,627	1,929,259	1,803,721	1,651,061	1,562,039	1,491,361	
36	Excess runoff not diverted into tailings pond	70,477	0	0	0	0	0	0	276,047	118,921	95,866	121,255	88,116	770,682

Knight Piésold Ltd.
CONSULTING ENGINEERS

T[illegible]A.7
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 7

assumptions:

daily ore throughput (tpd) =	13,425	min. fresh water makeup (%) =	2%	unprepared basin area (ha) =	15				dry	ave.	wet
tails % solids =	35%	initial dry density (t/m^3) =	0.9	prepared basin area (ha) =	13	unprep'd basin runoff coeff. =	20%	24%	29%
tails S.G. =	2.78	final dry density (t/m^3) =	1.3	beach area (ha) =	145	prep'd basin runoff coeff. =	90%	90%	90%
initial pond volume (m^3) =	1,491,361	total pit area (ha) =	65	pond area (ha) =	58	beach runoff coeff. =	90%	90%	90%
water content of ore =	4%	pit g/w infiltration (m^3/mo) =	39,818	beach evaporation factor =	0.80	pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)		48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)		12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)		15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)														
1	With slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond		27,756	9,941	4,367	3,908	3,448	3,448	104,130	108,499	46,834	37,755	47,754	34,703	432,541
3	Beach runoff		62,776	22,485	9,878	8,838	7,798	7,798	235,514	245,395	105,927	85,391	108,006	78,488	978,296
4	Unprep'd basin runoff		1,738	622	273	245	216	216	6,519	6,793	2,932	2,364	2,990	2,173	27,081
5	Prep'd basin runoff		5,648	2,023	889	795	702	702	21,188	22,077	9,530	7,682	9,717	7,061	88,013
6	Recovery from open pit:	precipitation	16,753	6,001	2,636	2,359	2,081	2,081	62,852	65,489	28,269	22,789	28,824	20,946	261,080
7		g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input		912,841	839,243	816,214	814,315	812,415	812,415	1,228,374	1,246,424	991,663	954,151	995,461	941,541	11,365,058
	<WATER OUT> (m^3)														
	Supernatant Recovery														
9	(+) Recovery from tailings		451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff		154,489	80,891	57,861	55,962	54,063	54,063	470,021	488,071	233,310	195,799	237,108	183,189	2,264,826
12	(-) Evaporation from pond		8,625	0	0	0	0	0	0	27,025	64,400	61,525	52,900	28,750	243,225
13	(-) Evaporation from beach		17,340	0	0	0	0	0	0	54,332	129,472	123,692	106,352	57,800	488,988
14	(+) Consolidation to final density		139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)		661,552	613,919	590,890	588,990	587,091	587,091	1,003,049	939,743	572,466	543,610	610,885	629,667	7,928,953
	Underdrainage recovery														
16	(+) Underdrainage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)		52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water														
19	Water retained in tailings		167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond		25,965	0	0	0	0	0	0	81,357	193,872	185,217	159,252	86,550	732,213
21	Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)		199,029	173,064	173,064	173,064	173,064	173,064	173,064	254,421	366,936	358,281	332,316	259,614	2,808,985
23	>>> Total Water Output		912,841	839,243	816,214	814,315	812,415	812,415	1,228,374	1,246,424	991,663	954,151	995,461	941,541	11,365,058
24	Monthly water available (excluding stored water in TSF)		713,812	666,179	643,150	641,250	639,351	639,351	1,055,309	992,003	624,726	595,870	663,145	681,927	8,556,073
25	Available stored water in TSF at beginning of month		1,491,361	1,530,099	1,472,697	1,403,832	1,331,851	1,256,753	1,181,655	1,789,153	2,032,575	1,908,721	1,756,010	1,670,575	
26	*Total Monthly Water Available*		2,205,173	2,196,277	2,115,847	2,045,083	1,971,202	1,896,104	2,236,964	2,781,156	2,657,302	2,504,591	2,419,155	2,352,502	
27	Water included with slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill		18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore		16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads		25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*		748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required		0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit		-34,769	-57,402	-80,431	-82,330	-84,229	-84,229	331,729	243,422	-123,854	-152,711	-85,436	-66,653	-276,893
34	Annual cumulative precipitation surplus/deficit		-34,769	-92,170	-172,601	-254,931	-339,160	-423,390	-91,661	151,761	27,907	-124,804	-210,239	-276,893	
35	Total water in TSF at end of month (incl. mine site runoff)		1,530,099	1,472,697	1,403,832	1,331,851	1,256,753	1,181,655	1,789,153	2,032,575	1,908,721	1,756,010	1,670,575	1,603,921	
36	Excess runoff not diverted into tailings pond		0	26,328	0	0	0	0	0	287,890	124,033	99,987	126,468	91,904	756,609

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE A.8
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 8

assumptions:

daily ore throughput (tpd) =	13,425	min. fresh water makeup (%) =	2%	unprepared basin area (ha) =	6		dry	ave.	wet
tails % solids =	35%	initial dry density (t/m^3) =	0.9	prepared basin area (ha) =	18	unprep'd basin runoff coeff. =	20%	24%	29%
tails S.G. =	2.78	final dry density (t/m^3) =	1.3	beach area (ha) =	143	prep'd basin runoff coeff. =	90%	90%	90%
initial pond volume (m^3) =	1,603,921	total pit area (ha) =	65	pond area (ha) =	63	beach runoff coeff. =	90%	90%	90%
water content of ore =	4%	pit g/w infiltration (m^3/mo) =	39,818	beach evaporation factor =	0.80	pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	30,604	10,962	4,815	4,309	3,802	3,802	114,814	119,631	51,640	41,629	52,654	38,263	476,924
3	Beach runoff	61,951	22,189	9,748	8,722	7,696	7,696	232,417	242,169	104,534	84,269	106,586	77,456	965,432
4	Unprep'd basin runoff	695	249	109	98	86	86	2,608	2,717	1,173	946	1,196	869	10,832
5	Prep'd basin runoff	7,820	2,801	1,230	1,101	971	971	29,337	30,568	13,195	10,637	13,454	9,777	121,864
6	Recovery from open pit: precipitation	16,753	6,001	2,636	2,359	2,081	2,081	62,852	65,489	28,269	22,789	28,824	20,946	261,080
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input	915,993	840,372	816,710	814,759	812,807	812,807	1,240,199	1,258,746	996,981	958,439	1,000,884	945,482	11,414,180
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	157,641	82,020	58,357	56,406	54,454	54,454	481,847	500,393	238,629	200,086	242,532	187,130	2,313,948
12	(-) Evaporation from pond	9,510	0	0	0	0	0	0	29,798	71,008	67,838	58,328	31,700	268,182
13	(-) Evaporation from beach	17,112	0	0	0	0	0	0	53,618	127,770	122,066	104,954	57,040	482,558
14	(+) Consolidation to final density	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)	664,047	615,048	591,386	589,434	587,483	587,483	1,014,875	950,006	572,879	543,211	612,278	631,418	7,959,548
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond	26,622	0	0	0	0	0	0	83,416	198,778	189,904	163,282	88,740	750,740
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	199,686	173,064	173,064	173,064	173,064	173,064	173,064	256,480	371,842	362,968	336,346	261,804	2,827,512
23	>>> Total Water Output	915,993	840,372	816,710	814,759	812,807	812,807	1,240,199	1,258,746	996,981	958,439	1,000,884	945,482	11,414,180
24	Monthly water available (excluding stored water in TSF)	716,307	667,308	643,646	641,694	639,743	639,743	1,067,135	1,002,266	625,139	595,471	664,538	683,678	8,586,668
25	Available stored water in TSF at beginning of month	1,603,921	1,571,648	1,515,375	1,435,440	1,364,329	1,289,999	1,215,669	1,846,359	2,100,044	1,976,603	1,823,493	1,739,451	
26	*Total Monthly Water Available*	2,320,228	2,238,956	2,159,021	2,077,135	2,004,072	1,929,742	2,282,804	2,848,624	2,725,183	2,572,074	2,488,032	2,423,129	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-32,273	-56,273	-79,935	-81,886	-83,838	-83,838	343,554	253,685	-123,441	-153,110	-84,042	-64,902	-246,298
34	Annual cumulative precipitation surplus/deficit	-32,273	-88,546	-168,481	-250,367	-334,205	-418,043	-74,488	179,197	55,756	-97,354	-181,396	-246,298	
35	Total water in TSF at end of month (incl. mine site runoff)	1,571,648	1,515,375	1,435,440	1,364,329	1,289,999	1,215,669	1,846,359	2,100,044	1,976,603	1,823,493	1,739,451	1,674,549	
36	Excess runoff not diverted into tailings pond	76,536	27,413	12,043	0	0	0	0	299,733	129,145	104,108	131,680	95,692	876,349

Knight Piésold Ltd.
CONSULTING ENGINEERS

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IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 9

assumptions:

daily ore throughput (tpd) =	13,425	min. fresh water makeup (%) =	2%	unprepared basin area (ha) =	6			dry	ave.	wet
tails % solids =	35%	initial dry density (t/m^3) =	0.9	prepared basin area (ha) =	15	unprep'd basin runoff coeff. =		20%	24%	29%
tails S.G. =	2.78	final dry density (t/m^3) =	1.3	beach area (ha) =	139	prep'd basin runoff coeff. =		90%	90%	90%
initial pond volume (m^3) =	1,674,549	total pit area (ha) =	65	pond area (ha) =	70	beach runoff coeff. =		90%	90%	90%
water content of ore =	4%	pit g/w infiltration (m^3/mo) =	39,818	beach evaporation factor =	0.80	pit area runoff coeff. =		45%	50%	55%

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	DESCRIPTION		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)		48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)		12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)		15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)														
1	With slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond		33,597	12,034	5,286	4,730	4,173	4,173	126,042	131,330	56,690	45,700	57,803	42,005	523,563
3	Beach runoff		60,561	21,691	9,529	8,526	7,523	7,523	227,202	236,734	102,188	82,377	104,194	75,718	943,768
4	Unprep'd basin runoff		695	249	109	98	86	86	2,608	2,717	1,173	946	1,196	869	10,832
5	Prep'd basin runoff		6,517	2,334	1,025	917	810	810	24,448	25,474	10,996	8,864	11,212	8,148	101,553
6	Recovery from open pit:	precipitation	16,753	6,001	2,636	2,359	2,081	2,081	62,852	65,489	28,269	22,789	28,824	20,946	261,080
7		g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	> > > Total Water Input		916,293	840,479	816,757	814,801	812,844	812,844	1,241,322	1,259,915	997,486	958,846	1,001,399	945,857	11,418,844
	<WATER OUT> (m^3)														
	Supernatant Recovery														
9	(+) Recovery from tailings		451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff		157,940	82,127	58,404	56,448	54,492	54,492	482,969	501,563	239,134	200,493	243,047	187,504	2,318,612
12	(-) Evaporation from pond		10,440	0	0	0	0	0	0	32,712	77,952	74,472	64,032	34,800	294,408
13	(-) Evaporation from beach		16,728	0	0	0	0	0	0	52,414	124,902	119,326	102,598	55,760	471,730
14	(+) Consolidation to final density		139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)		663,800	615,155	591,433	589,476	587,520	587,520	1,015,998	949,465	569,308	539,723	609,445	629,972	7,948,814
	Underdrainage recovery														
16	(+) Underdrainage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)		52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water														
19	Water retained in tailings		167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond		27,168	0	0	0	0	0	0	85,126	202,854	193,798	166,630	90,560	766,138
21	Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)		200,232	173,064	173,064	173,064	173,064	173,064	173,064	258,191	375,919	366,863	339,695	263,624	2,842,910
23	> > > Total Water Output		916,293	840,479	816,757	814,801	812,844	812,844	1,241,322	1,259,915	997,486	958,846	1,001,399	945,857	11,418,844
24	Monthly water available (excluding stored water in TSF)		716,060	667,415	643,693	641,736	639,780	639,780	1,068,258	1,001,725	621,568	591,983	661,705	682,232	8,575,934
25	Available stored water in TSF at beginning of month		1,674,549	1,642,028	1,585,863	1,505,975	1,424,131	1,350,214	1,276,298	1,919,476	2,172,620	2,045,607	1,889,010	1,802,134	
26	*Total Monthly Water Available*		2,390,609	2,309,444	2,229,556	2,147,712	2,063,911	1,989,994	2,344,556	2,921,201	2,794,188	2,637,591	2,550,715	2,484,366	
27	Water included with slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill		18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore		16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads		25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*		748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required		0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit		-32,520	-56,165	-79,888	-81,844	-83,801	-83,801	344,677	253,144	-127,013	-156,597	-86,876	-66,348	-257,032
34	Annual cumulative precipitation surplus/deficit		-32,520	-88,686	-168,573	-250,417	-334,218	-418,019	-73,341	179,803	52,790	-103,808	-190,684	-257,032	
35	Total water in TSF at end of month (incl. mine site runoff)		1,642,028	1,585,863	1,505,975	1,424,131	1,350,214	1,276,298	1,919,476	2,172,620	2,045,607	1,889,010	1,802,134	1,735,786	
36	Excess runoff not diverted into tailings pond		79,566	28,499	12,520	11,202	0	0	0	311,575	134,256	108,229	136,892	99,479	922,218

Knight Piésold Ltd.
CONSULTING ENGINEERS

TA[illegible].10
IMPERIAL META[illegible] CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 10

assumptions:

daily ore throughput (tpd) =	13,425	min. fresh water makeup (%) =	2%	unprepared basin area (ha) =	0				dry	ave.	wet
tails % solids =	35%	initial dry density (t/m^3) =	0.9	prepared basin area (ha) =	17	unprep'd basin runoff coeff. =			20%	24%	29%
tails S.G. =	2.78	final dry density (t/m^3) =	1.3	beach area (ha) =	137	prep'd basin runoff coeff. =			90%	90%	90%
initial pond volume (m^3) =	1,735,786	total pit area (ha) =	65	pond area (ha) =	76	beach runoff coeff. =			90%	90%	90%
water content of ore =	4%	pit g/w infiltration (m^3/mo) =	39,818	beach evaporation factor =	0.80	pit area runoff coeff. =			45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	36,541	13,088	5,750	5,144	4,539	4,539	137,089	142,841	61,658	49,705	62,869	45,687	569,450
3	Beach runoff	59,648	21,365	9,386	8,398	7,410	7,410	223,779	233,168	100,649	81,137	102,625	74,577	929,550
4	Unprep'd basin runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Prep'd basin runoff	7,385	2,645	1,162	1,040	917	917	27,708	28,870	12,462	10,046	12,707	9,234	115,094
6	Recovery from open pit: precipitation	16,753	6,001	2,636	2,359	2,081	2,081	62,852	65,489	28,269	22,789	28,824	20,946	261,080
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input	918,499	841,270	817,104	815,111	813,118	813,118	1,249,598	1,268,539	1,001,209	961,847	1,005,195	948,615	11,453,222
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	160,146	82,917	58,752	56,759	54,766	54,766	491,245	510,186	242,856	203,494	246,842	190,262	2,352,990
12	(-) Evaporation from pond	11,355	0	0	0	0	0	0	35,579	84,784	80,999	69,644	37,850	320,211
13	(-) Evaporation from beach	16,476	0	0	0	0	0	0	51,625	123,021	117,529	101,053	54,920	464,623
14	(+) Consolidation to final density	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)	665,343	615,945	591,780	589,787	587,794	587,794	1,024,274	956,011	568,079	537,995	609,173	630,520	7,964,495
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond	27,831	0	0	0	0	0	0	87,204	207,805	198,528	170,697	92,770	784,834
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	200,895	173,064	173,064	173,064	173,064	173,064	173,064	260,268	380,869	371,592	343,761	265,834	2,861,606
23	>>> Total Water Output	918,499	841,270	817,104	815,111	813,118	813,118	1,249,598	1,268,539	1,001,209	961,847	1,005,195	948,615	11,453,222
24	Monthly water available (excluding stored water in TSF)	717,603	668,205	644,040	642,047	640,054	640,054	1,076,534	1,008,271	620,339	590,255	661,433	682,780	8,591,615
25	Available stored water in TSF at beginning of month	1,735,786	1,704,809	1,649,433	1,569,893	1,488,359	1,415,093	1,341,827	2,004,647	2,264,337	2,136,096	1,977,770	1,890,623	
26	*Total Monthly Water Available*	2,453,389	2,373,014	2,293,473	2,211,940	2,128,413	2,055,147	2,418,360	3,012,918	2,884,676	2,726,350	2,639,203	2,573,403	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-30,977	-55,375	-79,541	-81,534	-83,527	-83,527	352,953	259,690	-128,241	-158,326	-87,147	-65,800	-241,351
34	Annual cumulative precipitation surplus/deficit	-30,977	-86,352	-165,893	-247,427	-330,953	-414,480	-61,527	198,164	69,922	-88,404	-175,551	-241,351	
35	Total water in TSF at end of month (incl. mine site runoff)	1,704,809	1,649,433	1,569,893	1,488,359	1,415,093	1,341,827	2,004,647	2,264,337	2,136,096	1,977,770	1,890,623	1,824,823	
36	Excess runoff not diverted into tailings pond	82,595	29,584	12,996	11,628	0	0	0	323,418	139,368	112,350	142,105	103,267	957,312

Knight Piésold Ltd.
CONSULTING ENGINEERS

TA[illegible].11
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 11

Assumptions:

daily ore throughput (tpd) =	13,425	min. fresh water makeup (%) =	2%	unprepared basin area (ha) =	0		dry	ave.	wet
tails % solids =	35%	initial dry density (t/m^3) =	0.9	prepared basin area (ha) =	13	unprep'd basin runoff coeff. =	20%	24%	29%
tails S.G. =	2.78	final dry density (t/m^3) =	1.3	beach area (ha) =	135	prep'd basin runoff coeff. =	90%	90%	90%
initial pond volume (m^3) =	1,824,823	total pit area (ha) =	65	pond area (ha) =	82	beach runoff coeff. =	90%	90%	90%
water content of ore =	4%	pit g/w infiltration (m^3/mo) =	39,818	beach evaporation factor =	0.80	pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)		48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)		12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)		15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)														
1	With slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond		39,486	14,143	6,213	5,559	4,905	4,905	148,136	154,351	66,627	53,710	67,935	49,368	615,337
3	Beach runoff		58,736	21,038	9,242	8,269	7,296	7,296	220,356	229,602	99,109	79,896	101,055	73,437	915,333
4	Unprep'd basin runoff		0	0	0	0	0	0	0	0	0	0	0	0	0
5	Prep'd basin runoff		5,648	2,023	889	795	702	702	21,188	22,077	9,530	7,682	9,717	7,061	88,013
6	Recovery from open pit:	precipitation	16,753	6,001	2,636	2,359	2,081	2,081	62,852	65,489	28,269	22,789	28,824	20,946	261,080
7		g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	> > > Total Water Input		918,793	841,375	817,151	815,153	813,155	813,155	1,250,703	1,269,690	1,001,705	962,247	1,005,701	948,983	11,457,810
	<WATER OUT> (m^3)														
	Supernatant Recovery														
9	(+) Recovery from tailings		451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff		160,440	83,022	58,798	56,800	54,802	54,802	492,350	511,337	243,353	203,894	247,349	190,630	2,357,578
12	(-) Evaporation from pond		12,270	0	0	0	0	0	0	38,446	91,616	87,526	75,256	40,900	346,014
13	(-) Evaporation from beach		16,224	0	0	0	0	0	0	50,835	121,139	115,731	99,507	54,080	457,517
14	(+) Consolidation to final density		139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)		664,975	616,051	591,826	589,828	587,830	587,830	1,025,378	955,084	563,626	533,666	605,614	628,679	7,950,388
	Underdrainage recovery														
16	(+) Underdrainage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)		52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water														
19	Water retained in tailings		167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond		28,494	0	0	0	0	0	0	89,281	212,755	203,257	174,763	94,980	803,531
21	Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)		201,558	173,064	173,064	173,064	173,064	173,064	173,064	262,346	385,820	376,322	347,828	268,044	2,880,303
23	> > > Total Water Output		918,793	841,375	817,151	815,153	813,155	813,155	1,250,703	1,269,690	1,001,705	962,247	1,005,701	948,983	11,457,810
24	Monthly water available (excluding stored water in TSF)		717,235	668,311	644,086	642,088	640,090	640,090	1,077,638	1,007,344	615,886	585,926	657,874	680,939	8,577,508
25	Available stored water in TSF at beginning of month		1,824,823	1,793,477	1,738,207	1,658,713	1,577,221	1,493,731	1,420,501	2,084,426	2,343,190	2,210,495	2,047,840	1,957,133	
26	*Total Monthly Water Available*		2,542,058	2,461,788	2,382,293	2,300,801	2,217,311	2,133,821	2,498,140	3,091,770	2,959,076	2,796,421	2,705,714	2,638,072	
27	Water included with slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill		18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore		16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads		25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*		748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required		0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit		-31,346	-55,270	-79,494	-81,492	-83,490	-83,490	354,058	258,764	-132,695	-162,655	-90,707	-67,642	-255,459
34	Annual cumulative precipitation surplus/deficit		-31,346	-86,616	-166,110	-247,602	-331,092	-414,582	-60,524	198,240	65,545	-97,110	-187,817	-255,459	
35	Total water in TSF at end of month (incl. mine site runoff)		1,793,477	1,738,207	1,658,713	1,577,221	1,493,731	1,420,501	2,084,426	2,343,190	2,210,495	2,047,840	1,957,133	1,889,491	
36	Excess runoff not diverted into tailings pond		82,595	29,584	12,996	11,628	10,260	0	0	323,418	139,368	112,350	142,105	103,267	967,572

Knight Piésold Ltd.
CONSULTING ENGINEERS

TAI[illegible].12
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 12

assumptions:

daily ore throughput (tpd) =	13,425	min. fresh water makeup (%) =	2%	unprepared basin area (ha) =	0		dry	ave.	wet
tails % solids =	35%	initial dry density (t/m^3) =	0.9	prepared basin area (ha) =	10	unprep'd basin runoff coeff. =	20%	24%	29%
tails S.G. =	2.78	final dry density (t/m^3) =	1.3	beach area (ha) =	132	prep'd basin runoff coeff. =	90%	90%	90%
initial pond volume (m^3) =	1,889,491	total pit area (ha) =	65	pond area (ha) =	88	beach runoff coeff. =	90%	90%	90%
water content of ore =	4%	pit g/w infiltration (m^3/mo) =	39,818	beach evaporation factor =	0.80	pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	42,430	15,198	6,676	5,974	5,271	5,271	159,182	165,861	71,595	57,715	73,001	53,050	661,224
3	Beach runoff	57,389	20,556	9,030	8,080	7,129	7,129	215,304	224,337	96,837	78,064	98,738	71,753	894,345
4	Unprep'd basin runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Prep'd basin runoff	4,344	1,556	684	612	540	540	16,299	16,982	7,331	5,909	7,474	5,432	67,702
6	Recovery from open pit: precipitation	16,753	6,001	2,636	2,359	2,081	2,081	62,852	65,489	28,269	22,789	28,824	20,946	261,080
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	> > > Total Water Input	919,088	841,480	817,197	815,194	813,191	813,191	1,251,807	1,270,841	1,002,202	962,648	1,006,208	949,351	11,462,399
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	160,735	83,128	58,844	56,841	54,839	54,839	493,455	512,488	243,850	204,295	247,855	190,998	2,362,167
12	(-) Evaporation from pond	13,185	0	0	0	0	0	0	41,313	98,448	94,053	80,868	43,950	371,817
13	(-) Evaporation from beach	15,852	0	0	0	0	0	0	49,670	118,362	113,078	97,226	52,840	447,026
14	(+) Consolidation to final density	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)	664,726	616,156	591,873	589,870	587,867	587,867	1,026,483	954,534	560,068	530,193	602,790	627,237	7,939,664
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond	29,037	0	0	0	0	0	0	90,983	216,810	207,131	178,094	96,790	818,843
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	202,101	173,064	173,064	173,064	173,064	173,064	173,064	264,047	389,874	380,195	351,158	269,854	2,895,615
23	> > > Total Water Output	919,088	841,480	817,197	815,194	813,191	813,191	1,251,807	1,270,841	1,002,202	962,648	1,006,208	949,351	11,462,399
24	Monthly water available (excluding stored water in TSF)	716,986	668,416	644,133	642,130	640,127	640,127	1,078,743	1,006,794	612,328	582,453	655,050	679,497	8,566,784
25	Available stored water in TSF at beginning of month	1,889,491	1,857,897	1,802,733	1,723,285	1,641,834	1,558,381	1,474,927	2,139,957	2,398,170	2,261,918	2,095,790	2,002,260	
26	*Total Monthly Water Available*	2,606,478	2,526,313	2,446,865	2,365,415	2,281,961	2,198,508	2,553,671	3,146,751	3,010,499	2,844,371	2,750,840	2,681,757	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-31,594	-55,164	-79,448	-81,451	-83,453	-83,453	355,163	258,213	-136,252	-166,128	-93,531	-69,084	-266,183
34	Annual cumulative precipitation surplus/deficit	-31,594	-86,759	-166,207	-247,657	-331,111	-414,564	-59,401	198,812	62,560	-103,568	-197,099	-266,183	
35	Total water in TSF at end of month (incl. mine site runoff)	1,857,897	1,802,733	1,723,285	1,641,834	1,558,381	1,474,927	2,139,957	2,398,170	2,261,918	2,095,790	2,002,260	1,933,176	
36	Excess runoff not diverted into tailings pond	82,595	29,584	12,996	11,628	10,260	10,260	0	323,418	139,368	112,350	142,105	103,267	977,832

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE A.13
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 13

assumptions:

daily ore throughput (tpd) =	13,425	min. fresh water makeup (%) =	2%	unprepared basin area (ha) =	0		dry	ave.	wet
tails % solids =	35%	initial dry density (t/m^3) =	0.9	prepared basin area (ha) =	6	unprep'd basin runoff coeff. =	20%	24%	29%
tails S.G. =	2.78	final dry density (t/m^3) =	1.3	beach area (ha) =	130	prep'd basin runoff coeff. =	90%	90%	90%
initial pond volume (m^3) =	1,933,176	total pit area (ha) =	65	pond area (ha) =	94	beach runoff coeff. =	90%	90%	90%
water content of ore =	4%	pit g/w infiltration (m^3/mo) =	39,818	beach evaporation factor =	0.80	pit area runoff coeff. =	45%	50%	55%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)	12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)													
1	With slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond	45,326	16,235	7,132	6,381	5,631	5,631	170,048	177,183	76,482	61,655	77,984	56,671	706,359
3	Beach runoff	56,520	20,244	8,893	7,957	7,021	7,021	212,044	220,941	95,371	76,882	97,243	70,666	880,805
4	Unprep'd basin runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Prep'd basin runoff	2,607	934	410	367	324	324	9,779	10,189	4,398	3,546	4,485	3,259	40,621
6	Recovery from open pit: precipitation	16,753	6,001	2,636	2,359	2,081	2,081	62,852	65,489	28,269	22,789	28,824	20,946	261,080
7	g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input	919,377	841,584	817,243	815,235	813,227	813,227	1,252,894	1,271,973	1,002,691	963,042	1,006,706	949,713	11,466,913
	<WATER OUT> (m^3)													
	Supernatant Recovery													
9	(+) Recovery from tailings	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff	161,025	83,232	58,890	56,882	54,875	54,875	494,541	513,620	244,338	204,689	248,353	191,360	2,366,680
12	(-) Evaporation from pond	14,085	0	0	0	0	0	0	44,133	105,168	100,473	86,388	46,950	397,197
13	(-) Evaporation from beach	15,612	0	0	0	0	0	0	48,918	116,570	111,366	95,754	52,040	440,258
14	(+) Consolidation to final density	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)	664,356	616,260	591,918	589,911	587,903	587,903	1,027,570	953,598	555,629	525,879	599,240	625,399	7,925,565
	Underdrainage recovery													
16	(+) Underdrainage	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water													
19	Water retained in tailings	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond	29,697	0	0	0	0	0	0	93,051	221,738	211,839	182,142	98,990	837,455
21	Seepage losses	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)	202,761	173,064	173,064	173,064	173,064	173,064	173,064	266,115	394,802	384,903	355,206	272,054	2,914,227
23	>>> Total Water Output	919,377	841,584	817,243	815,235	813,227	813,227	1,252,894	1,271,973	1,002,691	963,042	1,006,706	949,713	11,466,913
24	Monthly water available (excluding stored water in TSF)	716,616	668,520	644,178	642,171	640,163	640,163	1,079,830	1,005,858	607,889	578,139	651,500	677,659	8,552,685
25	Available stored water in TSF at beginning of month	1,933,176	1,901,211	1,846,151	1,766,748	1,685,338	1,601,921	1,518,504	1,874,753	2,132,030	1,991,339	1,820,897	1,723,817	
26	*Total Monthly Water Available*	2,649,792	2,569,731	2,490,329	2,408,919	2,325,502	2,242,084	2,598,333	2,880,611	2,739,919	2,569,478	2,472,397	2,401,475	
27	Water included with slurry	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads	25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*	748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit	-31,965	-55,061	-79,402	-81,410	-83,417	-83,417	356,249	257,277	-140,691	-170,442	-97,080	-70,922	-280,281
34	Annual cumulative precipitation surplus/deficit	-31,965	-87,025	-166,428	-247,838	-331,255	-414,672	-58,423	198,854	58,163	-112,279	-209,359	-280,281	
35	Total water in TSF at end of month (incl. mine site runoff)	1,901,211	1,846,151	1,766,748	1,685,338	1,601,921	1,518,504	1,874,753	2,132,030	1,991,339	1,820,897	1,723,817	1,652,895	
36	Excess runoff not diverted into tailings pond	82,595	29,584	12,996	11,628	10,260	10,260	309,867	323,418	139,368	112,350	142,105	103,267	1,287,699

Knight Piésold Ltd.
CONSULTING ENGINEERS

TAB[illegible]14
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY
MONTHLY WATER BALANCE
YEAR 14

assumptions:

daily ore throughput (tpd) =	13,425	min. fresh water makeup (%) =	2%	unprepared basin area (ha) =	0				dry	ave.	wet
tails % solids =	35%	initial dry density (t/m^3) =	0.9	prepared basin area (ha) =	3	unprep'd basin runoff coeff. =			20%	24%	29%
tails S.G. =	2.78	final dry density (t/m^3) =	1.3	beach area (ha) =	127	prep'd basin runoff coeff. =			90%	90%	90%
initial pond volume (m^3) =	1,652,895	total pit area (ha) =	65	pond area (ha) =	100	beach runoff coeff. =			90%	90%	90%
water content of ore =	4%	pit g/w infiltration (m^3/mo) =	39,818	beach evaporation factor =	0.80	pit area runoff coeff. =			45%	50%	55%

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	DESCRIPTION		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)		48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	81.5	65.7	83.0	58.9	450.4
B	Snowfall (mm/month)		12.0	39.7	66.7	68.1	51.7	38.2	18.7	5.3	0.0	0.0	0.0	1.5	301.8
C	Evaporation (mm/month)		15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<WATER IN> (m^3)														
1	With slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
2	Precipitation onto pond		48,271	17,290	7,595	6,796	5,996	5,996	181,095	188,693	81,451	65,660	83,050	60,352	752,246
3	Beach runoff		55,174	19,762	8,682	7,768	6,854	6,854	206,992	215,676	93,098	75,050	94,926	68,983	859,817
4	Unprep'd basin runoff		0	0	0	0	0	0	0	0	0	0	0	0	0
5	Prep'd basin runoff		1,303	467	205	183	162	162	4,890	5,095	2,199	1,773	2,242	1,630	20,311
6	Recovery from open pit:	precipitation	16,753	6,001	2,636	2,359	2,081	2,081	62,852	65,489	28,269	22,789	28,824	20,946	261,080
7		g/w infiltration	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	39,818	477,816
8	>>> Total Water Input		919,672	841,690	817,289	815,276	813,264	813,264	1,253,999	1,273,124	1,003,188	963,442	1,007,213	950,081	11,471,501
	<WATER OUT> (m^3)														
	Supernatant Recovery														
9	(+) Recovery from tailings		451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	451,524	5,418,284
10	(-) Seepage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
11	(+) Total precipitation runoff		161,319	83,337	58,936	56,924	54,911	54,911	495,646	514,771	244,835	205,090	248,860	191,729	2,371,269
12	(-) Evaporation from pond		15,000	0	0	0	0	0	0	47,000	112,000	107,000	92,000	50,000	423,000
13	(-) Evaporation from beach		15,240	0	0	0	0	0	0	47,752	113,792	108,712	93,472	50,800	429,768
14	(+) Consolidation to final density		139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	139,605	1,675,256
15	Sub-total (Water recovered as S/N)		664,107	616,365	591,965	589,952	587,940	587,940	1,028,674	953,048	552,072	522,406	596,416	623,957	7,914,841
	Underdrainage recovery														
16	(+) Underdrainage		58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	58,100	697,200
17	(-) Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
18	Sub-total (Water recovered as U/D)		52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	52,260	627,120
	Unrecoverable Water														
19	Water retained in tailings		167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	167,224	2,006,692
20	Evaporation from beach and pond		30,240	0	0	0	0	0	0	94,752	225,792	215,712	185,472	100,800	852,768
21	Seepage losses		5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	5,840	70,080
22	Sub-total (Unrecoverable water)		203,304	173,064	173,064	173,064	173,064	173,064	173,064	267,816	398,856	388,776	358,536	273,864	2,929,540
23	>>> Total Water Output		919,672	841,690	817,289	815,276	813,264	813,264	1,253,999	1,273,124	1,003,188	963,442	1,007,213	950,081	11,471,501
24	Monthly water available (excluding stored water in TSF)		716,367	668,625	644,225	642,212	640,200	640,200	1,080,934	1,005,308	604,332	574,666	648,676	676,217	8,541,961
25	Available stored water in TSF at beginning of month		1,652,895	1,620,682	1,565,727	1,486,371	1,416,630	1,343,510	1,270,389	1,937,610	2,194,337	2,050,088	1,876,174	1,776,269	
26	*Total Monthly Water Available*		2,369,262	2,289,307	2,209,951	2,128,583	2,056,830	1,983,709	2,351,324	2,942,918	2,798,669	2,624,754	2,524,850	2,452,486	
27	Water included with slurry		758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	758,353	9,100,232
28	Fresh water input to mill		18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	18,200	218,406
29	Water in ore		16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	16,572	198,860
30	Water for dust control on roads		25,000	0	0	0	0	0	0	25,000	25,000	25,000	25,000	25,000	150,000
31	*Total Mill Water Required*		748,581	723,581	723,581	723,581	723,581	723,581	723,581	748,581	748,581	748,581	748,581	748,581	8,832,966
32	Additional makeup water required		0	0	0	0	0	0	0	0	0	0	0	0	0
33	Monthly precipitation water surplus/deficit		-32,213	-54,955	-79,356	-81,368	-83,381	-83,381	357,354	256,727	-144,249	-173,915	-99,904	-72,364	-291,005
34	Annual cumulative precipitation surplus/deficit		-32,213	-87,168	-166,524	-247,893	-331,274	-414,655	-57,301	199,426	55,177	-118,737	-218,641	-291,005	
35	Total water in TSF at end of month (incl. mine site runoff)		1,620,682	1,565,727	1,486,371	1,416,630	1,343,510	1,270,389	1,937,610	2,194,337	2,050,088	1,876,174	1,776,269	1,703,906	
36	Excess runoff not diverted into tailings pond		82,595	29,584	12,996	0	0	0	0	323,418	139,368	112,350	142,105	103,267	945,683

APPENDIX B

MINE SITE - MONTHLY WATER BALANCES FOR AVERAGE PRECIPITATION

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE B.1
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 1

catchment areas (ha):

	dist'bd	undist'bd
East dump:	10	70
West dump:	0	0
North dump:	0	0
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	3,107	1,113	489	437	386	386	11,657	12,146	5,243	4,227	5,346	3,885	48,423
2	Undisturbed catchment runoff	8,700	3,116	1,369	1,225	1,081	1,081	32,640	34,010	14,681	11,835	14,969	10,878	135,584
	West Waste Dump													
3	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	North Waste Dump													
5	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	11,808	4,229	1,858	1,662	1,467	1,467	44,298	46,156	19,924	16,061	20,315	14,763	184,007
10	North waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
11	West waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	19,679	7,049	3,097	2,771	2,445	2,445	73,829	77,477	33,206	26,769	33,858	24,605	307,228
15	Grand Total (including additional tails catchment)	47,483	17,007	7,471	6,685	5,899	5,899	178,140	186,164	80,122	64,589	81,695	59,367	740,521

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE B.2
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 2

catchment areas (ha):

	dist'bd	undist'bd
East dump:	15	65
West dump:	0	0
North dump:	0	0
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	4,557	1,632	717	642	566	566	17,097	17,815	7,690	6,199	7,841	5,698	71,020
2	Undisturbed catchment runoff	8,120	2,908	1,278	1,143	1,009	1,009	30,464	31,743	13,702	11,046	13,971	10,153	126,545
	West Waste Dump													
3	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	North Waste Dump													
5	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	12,678	4,541	1,995	1,785	1,575	1,575	47,562	49,557	21,392	17,245	21,812	15,851	197,565
10	North waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
11	West waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	20,549	7,360	3,233	2,893	2,553	2,553	77,093	80,878	34,674	27,952	35,355	25,692	320,786
15	Grand Total (including additional tails catchment)	48,353	17,319	7,608	6,807	6,007	6,007	181,404	189,565	81,590	65,772	83,192	60,455	754,080

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE B.3
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 3

catchment areas (ha):

	dist'bd	undist'bd
East dump:	19	61
West dump:	0	0
North dump:	0	0
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	6,007	2,152	945	846	746	746	22,537	23,483	10,137	8,171	10,336	7,511	93,617
2	Undisturbed catchment runoff	7,540	2,701	1,186	1,062	937	937	28,288	29,475	12,723	10,257	12,973	9,427	117,506
	West Waste Dump													
3	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	North Waste Dump													
5	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	13,548	4,852	2,132	1,907	1,683	1,683	50,826	52,958	22,860	18,428	23,309	16,938	211,123
10	North waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
11	West waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	21,419	7,672	3,370	3,016	2,661	2,661	80,357	84,279	36,142	29,136	36,852	26,780	334,345
15	Grand Total (including additional tails catchment)	49,223	17,631	7,745	6,930	6,115	6,115	184,668	192,966	83,058	66,956	84,688	61,543	767,638

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE B.4
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 4

catchment areas (ha):

	dist'bd	undist'bd
East dump:	24	56
West dump:	0	0
North dump:	0	0
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	7,457	2,671	1,173	1,050	926	926	27,977	29,151	12,583	10,144	12,830	9,324	116,215
2	Undisturbed catchment runoff	6,960	2,493	1,095	980	865	865	26,112	27,208	11,744	9,468	11,975	8,702	108,467
	West Waste Dump													
3	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	North Waste Dump													
5	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	14,418	5,164	2,269	2,030	1,791	1,791	54,090	56,359	24,328	19,612	24,805	18,026	224,682
10	North waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
11	West waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	22,289	7,984	3,507	3,138	2,769	2,769	83,621	87,680	37,610	30,319	38,349	27,868	347,903
15	Grand Total (including additional tails catchment)	50,093	17,942	7,882	7,052	6,223	6,223	187,932	196,367	84,526	68,139	86,185	62,631	781,197

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE B.5
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 5

catchment areas (ha):

	dist'bd	undist'bd
East dump:	29	51
West dump:	0	0
North dump:	9	76
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	8,907	3,190	1,402	1,254	1,107	1,107	33,417	34,820	15,030	12,116	15,325	11,137	138,812
2	Undisturbed catchment runoff	6,380	2,285	1,004	898	793	793	23,936	24,941	10,766	8,679	10,977	7,977	99,428
	West Waste Dump													
3	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Undisturbed catchment runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
	North Waste Dump													
5	Waste rock runoff	2,900	1,039	456	408	360	360	10,880	11,337	4,894	3,945	4,990	3,626	45,195
6	Undisturbed catchment runoff	9,405	3,369	1,480	1,324	1,168	1,168	35,283	36,763	15,869	12,793	16,181	11,758	146,560
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	15,288	5,476	2,406	2,152	1,899	1,899	57,354	59,760	25,796	20,795	26,302	19,114	238,240
10	North waste dump	12,305	4,407	1,936	1,732	1,529	1,529	46,163	48,100	20,763	16,737	21,170	15,384	191,754
11	West waste dump	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	35,464	12,702	5,580	4,993	4,405	4,405	133,048	139,180	59,841	48,240	61,016	44,340	553,216
15	Grand Total (including additional tails catchment)	63,268	22,661	9,955	8,907	7,859	7,859	237,359	247,868	106,757	86,060	108,852	79,103	986,509

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE B.6
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 6

catchment areas (ha):

	dist'bd	undist'bd
East dump:	33	47
West dump:	0	37
North dump:	19	66
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	10,357	3,710	1,630	1,458	1,287	1,287	38,858	40,488	17,477	14,089	17,820	12,950	161,409
2	Undisturbed catchment runoff	5,800	2,077	913	817	721	721	21,760	22,673	9,787	7,890	9,979	7,252	90,389
	West Waste Dump													
3	Waste rock runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Undisturbed catchment runoff	4,599	1,647	724	647	571	571	17,253	17,977	7,760	6,255	7,912	5,750	71,666
	North Waste Dump													
5	Waste rock runoff	5,800	2,077	913	817	721	721	21,760	22,673	9,787	7,890	9,979	7,252	90,389
6	Undisturbed catchment runoff	8,245	2,953	1,297	1,161	1,024	1,024	30,931	32,228	13,912	11,215	14,185	10,308	128,482
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	16,158	5,787	2,542	2,275	2,007	2,007	60,618	63,161	27,264	21,978	27,799	20,202	251,799
10	North waste dump	14,045	5,031	2,210	1,977	1,745	1,745	52,691	54,902	23,699	19,104	24,164	17,560	218,871
11	West waste dump	4,599	1,647	724	647	571	571	17,253	17,977	7,760	6,255	7,912	5,750	71,666
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	42,673	15,284	6,715	6,008	5,301	5,301	160,093	167,360	72,005	58,046	73,418	53,353	665,557
15	Grand Total (including additional tails catchment)	70,477	25,243	11,090	9,922	8,755	8,755	264,404	276,047	118,921	95,866	121,255	88,116	1,098,850

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE B.7
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 7

catchment areas (ha):

	dist'bd	undist'bd
East dump:	38	42
West dump:	2	35
North dump:	28	57
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	11,808	4,229	1,858	1,662	1,467	1,467	44,298	46,156	19,924	16,061	20,315	14,763	184,007
2	Undisturbed catchment runoff	5,220	1,870	821	735	648	648	19,584	20,406	8,808	7,101	8,981	6,527	81,350
	West Waste Dump													
3	Waste rock runoff	699	250	110	98	87	87	2,623	2,733	1,180	951	1,203	874	10,895
4	Undisturbed catchment runoff	4,319	1,547	680	608	537	537	16,204	16,883	7,288	5,875	7,431	5,400	67,308
	North Waste Dump													
5	Waste rock runoff	8,700	3,116	1,369	1,225	1,081	1,081	32,640	34,010	14,681	11,835	14,969	10,878	135,584
6	Undisturbed catchment runoff	7,085	2,538	1,115	997	880	880	26,579	27,694	11,954	9,637	12,189	8,858	110,404
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	17,028	6,099	2,679	2,397	2,115	2,115	63,882	66,562	28,732	23,162	29,296	21,289	265,357
10	North waste dump	15,785	5,654	2,484	2,222	1,961	1,961	59,219	61,704	26,635	21,471	27,158	19,735	245,988
11	West waste dump	5,018	1,797	790	706	623	623	18,826	19,616	8,468	6,826	8,634	6,274	78,203
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	45,702	16,370	7,191	6,434	5,677	5,677	171,459	179,203	77,117	62,167	78,631	57,141	712,769
15	Grand Total (including additional tails catchment)	73,506	26,328	11,566	10,349	9,131	9,131	275,770	287,890	124,033	99,987	126,468	91,904	1,146,062

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE B.8
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 8

catchment areas (ha):

	dist'bd	undist'bd
East dump:	43	37
West dump:	5	33
North dump:	37	48
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	13,258	4,749	2,086	1,866	1,647	1,647	49,738	51,824	22,370	18,034	22,810	16,576	206,604
2	Undisturbed catchment runoff	4,640	1,662	730	653	576	576	17,408	18,139	7,830	6,312	7,983	5,801	72,311
	West Waste Dump													
3	Waste rock runoff	1,398	501	220	197	174	174	5,246	5,466	2,359	1,902	2,406	1,748	21,790
4	Undisturbed catchment runoff	4,039	1,447	636	569	502	502	15,154	15,790	6,816	5,495	6,950	5,050	62,950
	North Waste Dump													
5	Waste rock runoff	11,600	4,155	1,825	1,633	1,441	1,441	43,520	45,346	19,574	15,779	19,958	14,504	180,779
6	Undisturbed catchment runoff	5,924	2,122	932	834	736	736	22,227	23,159	9,997	8,059	10,193	7,407	92,326
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	17,898	6,411	2,816	2,520	2,223	2,223	67,146	69,963	30,200	24,345	30,793	22,377	278,915
10	North waste dump	17,525	6,277	2,758	2,467	2,177	2,177	65,747	68,506	29,571	23,838	30,151	21,911	273,105
11	West waste dump	5,438	1,948	856	766	675	675	20,400	21,256	9,175	7,397	9,356	6,799	84,740
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	48,732	17,455	7,668	6,861	6,054	6,054	182,825	191,045	82,229	66,288	83,843	60,929	759,981
15	Grand Total (including additional tails catchment)	76,536	27,413	12,043	10,775	9,508	9,508	287,135	299,733	129,145	104,108	131,680	95,692	1,193,275

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE B.9
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 9

catchment areas (ha):

	dist'bd	undist'bd
East dump:	47	33
West dump:	7	30
North dump:	47	38
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	14,708	5,268	2,314	2,071	1,827	1,827	55,178	57,493	24,817	20,006	25,304	18,389	229,201
2	Undisturbed catchment runoff	4,060	1,454	639	572	504	504	15,232	15,871	6,851	5,523	6,985	5,076	63,272
	West Waste Dump													
3	Waste rock runoff	2,097	751	330	295	261	261	7,869	8,199	3,539	2,853	3,609	2,622	32,685
4	Undisturbed catchment runoff	3,760	1,347	592	529	467	467	14,105	14,697	6,344	5,114	6,469	4,701	58,592
	North Waste Dump													
5	Waste rock runoff	14,500	5,194	2,282	2,041	1,801	1,801	54,401	56,683	24,468	19,724	24,948	18,130	225,973
6	Undisturbed catchment runoff	4,764	1,707	750	671	592	592	17,874	18,624	8,039	6,481	8,197	5,957	74,248
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	18,768	6,722	2,953	2,642	2,331	2,331	70,410	73,364	31,668	25,529	32,290	23,465	292,474
10	North waste dump	19,265	6,900	3,031	2,712	2,393	2,393	72,275	75,307	32,507	26,205	33,145	24,087	300,221
11	West waste dump	5,857	2,098	922	825	728	728	21,974	22,896	9,883	7,967	10,077	7,323	91,277
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	51,761	18,540	8,145	7,287	6,430	6,430	194,191	202,888	87,341	70,408	89,055	64,717	807,193
15	Grand Total (including additional tails catchment)	79,566	28,499	12,520	11,202	9,884	9,884	298,501	311,575	134,256	108,229	136,892	99,479	1,240,487

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE B.10
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 10

catchment areas (ha):

	dist'bd	undist'bd
East dump:	52	28
West dump:	9	28
North dump:	56	29
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	16,158	5,787	2,542	2,275	2,007	2,007	60,618	63,161	27,264	21,978	27,799	20,202	251,799
2	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	West Waste Dump													
3	Waste rock runoff	2,797	1,002	440	394	347	347	10,492	10,932	4,719	3,804	4,811	3,496	43,581
4	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	North Waste Dump													
5	Waste rock runoff	17,401	6,232	2,738	2,450	2,162	2,162	65,281	68,020	29,361	23,669	29,938	21,756	271,168
6	Undisturbed catchment runoff	3,604	1,291	567	507	448	448	13,522	14,090	6,082	4,903	6,201	4,507	56,170
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	19,638	7,034	3,090	2,765	2,439	2,439	73,674	76,765	33,136	26,712	33,787	24,553	306,032
10	North waste dump	21,005	7,524	3,305	2,957	2,609	2,609	78,803	82,109	35,443	28,572	36,139	26,262	327,338
11	West waste dump	6,277	2,248	988	884	780	780	23,548	24,536	10,591	8,538	10,799	7,848	97,814
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	54,791	19,625	8,621	7,714	6,806	6,806	205,556	214,731	92,453	74,529	94,268	68,504	854,406
15	Grand Total (including additional tails catchment)	82,595	29,584	12,996	11,628	10,260	10,260	309,867	323,418	139,368	112,350	142,105	103,267	1,287,699

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE B.11
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 11

catchment areas (ha):

	dist'bd	undist'bd
East dump:	52	28
West dump:	9	28
North dump:	56	29
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	16,158	5,787	2,542	2,275	2,007	2,007	60,618	63,161	27,264	21,978	27,799	20,202	251,799
2	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	West Waste Dump													
3	Waste rock runoff	2,797	1,002	440	394	347	347	10,492	10,932	4,719	3,804	4,811	3,496	43,581
4	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	North Waste Dump													
5	Waste rock runoff	17,401	6,232	2,738	2,450	2,162	2,162	65,281	68,020	29,361	23,669	29,938	21,756	271,168
6	Undisturbed catchment runoff	3,604	1,291	567	507	448	448	13,522	14,090	6,082	4,903	6,201	4,507	56,170
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	19,638	7,034	3,090	2,765	2,439	2,439	73,674	76,765	33,136	26,712	33,787	24,553	306,032
10	North waste dump	21,005	7,524	3,305	2,957	2,609	2,609	78,803	82,109	35,443	28,572	36,139	26,262	327,338
11	West waste dump	6,277	2,248	988	884	780	780	23,548	24,536	10,591	8,538	10,799	7,848	97,814
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	54,791	19,625	8,621	7,714	6,806	6,806	205,556	214,731	92,453	74,529	94,268	68,504	854,406
15	Grand Total (including additional tails catchment)	82,595	29,584	12,996	11,628	10,260	10,260	309,867	323,418	139,368	112,350	142,105	103,267	1,287,699

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TABLE B.12
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 12

catchment areas (ha):

	dist'bd	undist'bd
East dump:	52	28
West dump:	9	28
North dump:	56	29
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	16,158	5,787	2,542	2,275	2,007	2,007	60,618	63,161	27,264	21,978	27,799	20,202	251,799
2	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	West Waste Dump													
3	Waste rock runoff	2,797	1,002	440	394	347	347	10,492	10,932	4,719	3,804	4,811	3,496	43,581
4	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	North Waste Dump													
5	Waste rock runoff	17,401	6,232	2,738	2,450	2,162	2,162	65,281	68,020	29,361	23,669	29,938	21,756	271,168
6	Undisturbed catchment runoff	3,604	1,291	567	507	448	448	13,522	14,090	6,082	4,903	6,201	4,507	56,170
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	19,638	7,034	3,090	2,765	2,439	2,439	73,674	76,765	33,136	26,712	33,787	24,553	306,032
10	North waste dump	21,005	7,524	3,305	2,957	2,609	2,609	78,803	82,109	35,443	28,572	36,139	26,262	327,338
11	West waste dump	6,277	2,248	988	884	780	780	23,548	24,536	10,591	8,538	10,799	7,848	97,814
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	54,791	19,625	8,621	7,714	6,806	6,806	205,556	214,731	92,453	74,529	94,268	68,504	854,406
15	Grand Total (including additional tails catchment)	82,595	29,584	12,996	11,628	10,260	10,260	309,867	323,418	139,368	112,350	142,105	103,267	1,287,699

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TABLE B.13
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 13

catchment areas (ha):

	dist'bd	undist'bd
East dump:	52	28
West dump:	9	28
North dump:	56	29
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	16,158	5,787	2,542	2,275	2,007	2,007	60,618	63,161	27,264	21,978	27,799	20,202	251,799
2	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	West Waste Dump													
3	Waste rock runoff	2,797	1,002	440	394	347	347	10,492	10,932	4,719	3,804	4,811	3,496	43,581
4	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	North Waste Dump													
5	Waste rock runoff	17,401	6,232	2,738	2,450	2,162	2,162	65,281	68,020	29,361	23,669	29,938	21,756	271,168
6	Undisturbed catchment runoff	3,604	1,291	567	507	448	448	13,522	14,090	6,082	4,903	6,201	4,507	56,170
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	19,638	7,034	3,090	2,765	2,439	2,439	73,674	76,765	33,136	26,712	33,787	24,553	306,032
10	North waste dump	21,005	7,524	3,305	2,957	2,609	2,609	78,803	82,109	35,443	28,572	36,139	26,262	327,338
11	West waste dump	6,277	2,248	988	884	780	780	23,548	24,536	10,591	8,538	10,799	7,848	97,814
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	54,791	19,625	8,621	7,714	6,806	6,806	205,556	214,731	92,453	74,529	94,268	68,504	854,406
15	Grand Total (including additional tails catchment)	82,595	29,584	12,996	11,628	10,260	10,260	309,867	323,418	139,368	112,350	142,105	103,267	1,287,699

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TABLE B.14
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
MINE SITE RUNOFF
MONTHLY WATER BALANCE
YEAR 14

catchment areas (ha):

	dist'bd	undist'bd
East dump:	52	28
West dump:	9	28
North dump:	56	29
Mill site:	20	5
Additional tailings area:	0	240

runoff coefficients:

	dry	ave.	wet
waste rock =	58%	60%	62%
undisturbed catchment =	20%	24%	29%
mill site =	65%	70%	75%

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	DESCRIPTION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
A	Rainfall (mm/month)	51.8	18.5	8.1	7.3	6.4	6.4	25.9	48.6	87.4	70.4	89.1	63.2	483.2
B	Snowfall (mm/month)	12.9	42.6	71.5	73.1	55.4	41.0	20.1	5.6	0.0	0.0	0.0	1.6	323.8
C	Evaporation (mm/month)	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	107.0	92.0	50.0	423.0
	<CATCHMENT RUNOFF> (m^3)													
	East Waste Dump													
1	Waste rock runoff	16,158	5,787	2,542	2,275	2,007	2,007	60,618	63,161	27,264	21,978	27,799	20,202	251,799
2	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	West Waste Dump													
3	Waste rock runoff	2,797	1,002	440	394	347	347	10,492	10,932	4,719	3,804	4,811	3,496	43,581
4	Undisturbed catchment runoff	3,480	1,246	548	490	432	432	13,056	13,604	5,872	4,734	5,988	4,351	54,234
	North Waste Dump													
5	Waste rock runoff	17,401	6,232	2,738	2,450	2,162	2,162	65,281	68,020	29,361	23,669	29,938	21,756	271,168
6	Undisturbed catchment runoff	3,604	1,291	567	507	448	448	13,522	14,090	6,082	4,903	6,201	4,507	56,170
	Mill Site													
7	Catchment runoff	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
	Additional Tailings Area Catchment													
8	Catchment runoff	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
	<TOTAL RUNOFF> (m^3)													
9	East waste dump	19,638	7,034	3,090	2,765	2,439	2,439	73,674	76,765	33,136	26,712	33,787	24,553	306,032
10	North waste dump	21,005	7,524	3,305	2,957	2,609	2,609	78,803	82,109	35,443	28,572	36,139	26,262	327,338
11	West waste dump	6,277	2,248	988	884	780	780	23,548	24,536	10,591	8,538	10,799	7,848	97,814
12	Mill site	7,872	2,819	1,239	1,108	978	978	29,532	31,321	13,282	10,707	13,543	9,842	123,221
13	Additional tailings area catchment	27,804	9,959	4,375	3,914	3,454	3,454	104,311	108,687	46,916	37,820	47,837	34,763	433,294
14	Total Waste Dumps and Mill Site	54,791	19,625	8,621	7,714	6,806	6,806	205,556	214,731	92,453	74,529	94,268	68,504	854,406
15	Grand Total (including additional tails catchment)	82,595	29,584	12,996	11,628	10,260	10,260	309,867	323,418	139,368	112,350	142,105	103,267	1,287,699

APPENDIX B

GEOTECHNICAL INVESTIGATION INFORMATION

B.1 REPORT ON 1995 GEOTECHNICAL INVESTIGATIONS FOR MILL SITE AND T.S.F. (REF. NO. 1623/1)

B.2 EXCERPTS FROM 1990 GEOTECHNICAL INVESTIGATION REPORT

Knight Piésold Ltd.
CONSULTING ENGINEERS

B.1 REPORT ON 1994 GEOTECHNICAL INVESTIGATIONS FOR MILL SITE AND T.S.F. (REF. NO. 1623/1)

Association of Consulting Engineers of Canada
Association des Ingénieurs-Conseils du Canada

Knight Piésold Ltd.
CONSULTING ENGINEERS

IMPERIAL METALS CORP.
MT. POLLEY PROJECT

REPORT ON 1995 GEOTECHNICAL INVESTIGATIONS FOR MILL SITE AND TAILINGS STORAGE FACILITY (REF. NO. 1623/1)

"THIS REPORT HAS BEEN PREPARED EXCLUSIVELY FOR IMPERIAL METALS CORP. NO THIRD PARTY SHALL BE ENTITLED TO RELY ON ANY OF THE INFORMATION, CONCLUSIONS, OPINIONS OR ANY OTHER MATTER CONTAINED IN THIS REPORT".

Association of Consulting Engineers of Canada
Association des Ingénieurs-Conseils du Canada

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT

REPORT ON
1995 GEOTECHNICAL INVESTIGATIONS
FOR MILL SITE AND TAILINGS STORAGE FACILITY
(REF. NO. 1623/1)

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Figure 3.3 Stress Path Plots from Single Stage Consolidated-Undrained Triaxial Tests on Glacial Till Samples
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Appendix A Test Pit Logs
Appendix B Detailed Laboratory Test Results

SECTION 1.0 - INTRODUCTION

1.1 PROJECT DESCRIPTION

The Mt. Polley project site is located in central British Columbia approximately 56 kilometres north-west of Williams Lake, as shown on Figure 1.1. The site is situated on a topographic ridge located between Polley Lake and Bootjack Lake.

The Mt. Polley project involves open pit mining of an estimated 48.8 million tonnes of copper and gold ore contained in three adjacent ore bodies. The ore will be hauled from the open pit to the primary and secondary crushers where it will be crushed and transported to the nearby concentrator for processing. The ore will be processed by select flotation to produce a copper-gold concentrate at a production rate of approximately 13,425 tonnes per day. An additional 26.2 million tonnes of low grade ore will be stockpiled during operations for processing in the later stages of the mine life.

After processing of the ore to produce the copper/gold concentrate, the tailings will be discharged as a slurry into the tailings storage facility which has been designed to provide environmentally secure storage of the solids waste. As the solids settle out of the slurry, the solution is collected and recycled back to the mill for re-use in the milling process. No surface discharge of any process solution from the tailings facility is required or anticipated.

1.2 SCOPE OF WORK

A geotechnical site investigation program was carried out by Knight Piésold Ltd. between January 11 and 17, 1995. The program comprised excavating a total of thirty-nine (39) test pits to investigate the geotechnical characteristics and foundation conditions at each of the proposed project component sites and to evaluate the geologic factors affecting the design of these components. The following project components were investigated:

- Mill site

- Main access road
- Tailings storage facility, including the tailings basin and embankment foundations, tailings/reclaim pipeline route, and potential borrow areas
- Polley Lake dam site (no longer included in mine plan)

The scope of work for the investigation program included the following:

- Pioneering of access trails with a Cat D5 dozer.
- Excavation of the test pits with a Hitachi X200 backhoe.
- Detailed geotechnical logging of each test pit, including photographs.
- Bulk sampling of the various strata.
- Backfilling and reclamation work for all of the disturbed areas.

The test pit locations and the overall site plan are shown on Drawing 1623.100. Geological logs of each test pit are included in Appendix A, and detailed laboratory test work results on select bulk test pit samples are included in Appendix B.

This report addresses the outstanding geotechnical issues from previous work carried out at the Mt. Polley project site. The results of the previous geotechnical program are presented in the following documents:

- 1989 tailings area test pits (also included in Appendix A)
- 1990 mill site test pits (also included in Appendix A)
- Knight Piésold Ltd. "Report on Geotechnical Investigations and Design of Open Pit, Waste Dumps and Tailings Storage Facility (Ref. No. 1621/1)", dated February 19, 1990.

Test pit logs from the 1989 and 1990 geotechnical investigation programs have been included in Appendix A. In addition, applicable laboratory test work results from the 1989 tailings storage facility investigation program have also been included.

SECTION 2.0 - GEOTECHNICAL RESULTS

2.1 GENERAL

A total of thirty-nine (39) test pits were excavated during the geotechnical site investigation program to evaluate the type and distribution of surficial materials and the near surface foundation conditions at the mill site, along access roads and pipeline routes, at potential borrow areas, within the tailings basin and at the Polley Lake dam site.

2.2 MILL SITE AND ACCESS ROADS

2.2.1 Mill Site

Eight test pits (TP95-1 to 8) were excavated in select locations at the proposed mill site to provide additional information from the February, 1990 test pit program (TPMS90-1 to 4). Dense, brown glacial till comprising silty sand with some gravel and clay was encountered overlying lapilli tuff bedrock throughout the mill site area. The bedrock was typically heavily fractured for approximately 0.5 to 1.0 meters depth before becoming more competent, which precluded excavation with the backhoe.

TP95-1, located at the fine ore stockpile site, encountered 5.5 metres of glacial till overlying bedrock. Similar ground conditions were encountered to the north and south in test pits TPMS90-1 to 3.

Test pits TP95-2,3,4,7 and 8 were located in the vicinity of the concentrator site and encountered a variable thickness (1.2 to 3.6 metres) of glacial till overlying bedrock. Bedrock was typically encountered at shallow depths except in test pit TP95-7 where bedrock was not encountered.

TP95-5, located at the crusher site, revealed a thin, 0.5 meter thick layer of glacial till overlying bedrock. Test pit TPMS90-4, located to the north, encountered a thick, 6.1+ metre layer of till at a higher elevation.

TP95-6 was located at the coarse ore stockpile site and encountered 5.0+ metres of glacial till. Although bedrock was not exposed during excavation, angular rock fragments were present at the bottom of the pit which typically indicate a close proximity to bedrock.

2.2.2 Bootjack Lake Road

Five test pits (TP95-9 to 13) were excavated along the side slope of an existing access road above the west shore of Bootjack Lake. Test pits TP95-9, 10 and 11 encountered coarser-grained, sand and gravel glacial till at lower elevations, which became more silty and less gravel with increasing elevation. The till encountered in TP95-12 and 13 was similar to the material identified at the mill site. TP95-9 also encountered softer till, due to a higher in-situ moisture content, at 2.5 metres depth. TP95-12 encountered a thin, 1.2 metre thick layer of till overlying bedrock.

2.2.3 Main access road

Two test pits (TP95-14 and 15) were excavated to examine the regional ground conditions along the existing Main access road and to identify potential sand and gravel deposits. Test pit TP95-14 encountered 4.1 metres of sandy silt glacial till adjacent to Morehead Creek at kilometre 7.1. Test pit TP95-15, located on top of a narrow ridge at kilometre 4.3, did not encounter sand and gravel deposits as anticipated, rather 4.5 metres of sandy, gravelly silt glacial till to depth.

2.3 TAILINGS STORAGE FACILITY

2.3.1 Tailings and Reclaim Pipeline Route

Four test pits (TP95-16 to 19) were located north of the proposed tailings storage facility and partially along the proposed tailings and reclaim pipeline route. All four test pits encountered glacial till comprising silty sand to

gravel and sand. TP95-17 encountered the water table at 3 metres depth. TP95-19, located along the steep hill slope, encountered angular rock fragments at the bottom of the pit (6.4 metres), indicating a close proximity to bedrock, and indicates that a thinner covering of till exists at higher elevations.

2.3.2 Borrow Areas

Three test pits (TP95-29 to 31) were located on the ridge east of the tailings facility to investigate potential borrow sources for future embankment construction. All three pits encountered glacial till comprising silty sandy gravel with trace clay to depths of 5.7, 5.5 and 5.8 metres, respectively. The till in TP95-29 was drier than typically encountered in the other two pits, and the water table was not encountered in any of the pits.

2.3.3 Embankment and Basin Foundations

Eleven test pits (TP95-26 to 29, 32 to 39) were excavated within the proposed tailings storage facility. Glacial till was typically encountered in the northern portion of the facility, whereas glaciofluvial/glaciolacustrine deposits of silt, sand and clay were encountered in the south.

Test pits TP95-26, 27, 28 and 32, located in the northern portion of the tailings basin and in the Perimeter Embankment footprint, encountered very stiff to hard, low permeability glacial till to depths of over 6.2 metres. TP95-28, excavated in a swamp, encountered dry till below 1.9 metres of soft, saturated organics and silt/clay layers. Only localized, very low flow seeps were encountered in TP95-27, and a perched water table was observed in the lacustrine deposits overlying the till in TP95-28.

Test pits TP95-33 to 39 were excavated in the southern portion of the tailings basin and in the Main Embankment footprint. TP95-33, 34 and 35 encountered a 3 to 4 metre thick layer of low permeability, sandy silt glacial till overlying layered silt and very fine-grained sand glaciofluvial/

glaciolacustrine deposits. Localized, very low flow seeps were visible at the contact between these deposits. TP95-33 also encountered 0.9 metres of soft organics and silt/clay deposits at surface due to the close proximity to a pond. A similar glacial till cap overlying very stiff to hard, low permeability silt deposits interbedded with fine-grained sand was identified in test pits TP95-36 and 38. A 0.6 metre thick layer of clean, saturated, coarse-grained sand was encountered between the glacial till and the interbedded silts and sands in TP95-36. TP95-39, located in close proximity to TP95-36 and 38, encountered a 2.2 meter thick cap of low permeability glacial till overlying a more permeable silt and fine-grained sand deposit to 7.5+ meters depth. The water table was encountered at the contact of these two deposits, and the silt and sand displayed very limited cohesion due to a high moisture content. TP95-37, located up slope from TP95-39, encountered 1.5 meters of glacial till overlying bedrock. Geological sections through the tailings basin and along the Main Embankment alignment are shown on Drawing No. 1623.103.

2.4 POLLEY LAKE DAM

Six test pits (TP95-20 to 25) were excavated along the south shore of Polley Lake to investigate the foundation conditions for a potential dam site. Typical materials encountered in these test pits were soft, saturated organics overlying lacustrine deposits of fine-grained sand, silt and clays. Fresh water shells were typically found in the silt layers. TP95-20 and 25, located at the east and west ends of the lake, encountered hard, low permeability silty, clayey glacial till at 2.5 and 5 metre depths, respectively. A geological section along the proposed Polley Lake Dam alignment is shown on Drawing No. 1623.103.

SECTION 3.0 - LABORATORY TEST WORK

3.1 GENERAL

Overburden materials comprising glacial till and glaciofluvial/glaciolacustrine deposits were sampled at the mill site, along access roads, along the tailings and reclaim pipeline route, in the tailings basin and borrow areas, and at the Polley Lake dam site. Index testing was performed to characterize these materials, followed by specialized testing to evaluate the various materials for suitability in specific end uses. All test work was carried out by Golder Associates' Testing Laboratory using ASTM standard procedures for routine tests and procedures specified by Knight Piésold Ltd.

A total of twelve (12) representative samples were selected from the various project areas and were submitted for the following Index test work:

- Natural Moisture Content
- Atterberg Limits
- Specific Gravity
- Grain Size Distribution

Of these samples, eight (8) were selected for additional effective strength, compaction and permeability test work as follows:

- C-U Triaxial Tests
- Modified Proctor Tests
- Falling Head Permeameter Tests

This section describes the test work performed and summarizes the results obtained. Index test results are summarized in Table 3.1, and effective strength parameters, compaction and permeability test results are summarized in Table 3.2. Detailed test results are included in Appendix B.

3.2 MILL SITE AND ACCESS ROADS

3.2.1 Mill Site

Two representative samples (TP95-1 and 7) of glacial till were selected from the mill site test pits for Index test work. The tills varied between a silty sand with some gravel and clay to a coarser silty, gravelly sand with trace clay. The moisture content ranged from 10.4 to 10.9 percent, and the specific gravity test on the fine fraction was 2.78.

Laboratory compaction tests performed on a sample of glacial till from TP95-7 yielded a Modified Proctor maximum dry density of 2192 kg/m^3 at an optimum moisture content of 8.9 percent. The Modified Proctor optimum moisture content is 2.5 percent below the natural moisture content of the till.

3.2.2 Bootjack Lake Road

One sample of glacial till (TP95-10) was selected from the Bootjack Lake access road test pit for Index test work. The till comprised sand and gravel with some silt and trace clay, and was representative of the coarser-grained tills encountered along the road alignment. A natural moisture content of 12.6 percent was measured, which is slightly greater than measured in the finer-grained tills encountered at higher elevations at the mill site.

3.2.3 Main access road

Due to the similarity of materials identified during the test pit program, no samples from the Main access road were selected for Index test work.

3.3 TAILINGS STORAGE FACILITY

3.3.1 Tailings and Reclaim Pipeline Route

One representative sample (TP95-18) of glacial till was selected from the tailings and reclaim pipeline route test pits for Index test work. The till comprised sand and gravel with some silt and trace clay, and was similar to the coarser-grained tills encountered at similar elevations along the Bootjack Lake road alignment. However, the natural moisture content of 13.8 percent was slightly greater.

Laboratory compaction tests performed on this sample yielded a Modified Proctor maximum dry density of 2130 kg/m^3 at an optimum moisture content of 10.1 percent. The optimum moisture content is approximately 3.7 percent below the natural moisture content of the till. The maximum dry density was the lowest of all the till samples tested from the various project areas.

3.3.2 Borrow Areas

One sample of glacial till (TP95-31) was selected from the potential borrow area on the ridge east of the tailings facility for Index test work. The till comprised silty, sandy gravel with trace clay, with a moisture content of 11.0 percent.

Laboratory compaction tests performed on this sample yielded a Modified Proctor maximum dry density of 2200 kg/m^3 at an optimum moisture content of 7.6 percent. The optimum moisture content is approximately 3.4 percent below the natural moisture content of the till. The overall compaction characteristics are very similar to the tills encountered in the Perimeter Embankment foundation (TP95-27) and at the mill site (TP95-7).

3.3.3 Embankment and Basin Foundations

(i) Glacial Till Samples

Two representative samples of glacial till (TP95-27 and 37) were selected from test pits located in the Perimeter Embankment foundation footprint and within the tailings basin for Index test work. The tills comprised sand and silt with some gravel and clay, with moisture contents ranging from 11.1 to 18.8 percent. The higher moisture content in TP95-37 may be attributed to the close proximity to fractured bedrock where seeps were identified. The moisture content of the till in TP95-27 is typical of the fine-grained tills encountered at the mill site and the potential borrow area. Specific gravity tests on the fine fraction of TP95-27 yielded 2.73.

Laboratory compaction tests performed on the till sample from TP95-27 yielded a Modified Proctor maximum dry density of 2200 kg/m^3 at an optimum moisture content of 8.0 percent. The optimum moisture content is approximately 3.1 percent below the natural moisture content of the till. The overall compaction characteristics are very similar to the till encountered in the potential borrow area (TP95-31).

Laboratory derived effective strength parameters were determined on glacial till samples from TP95-27 and 37 using consolidated-undrained (C-U) triaxial test work. The samples were compacted to a minimum 95 percent Modified Proctor maximum dry density at the natural moisture content, and confining pressures of 250 and 750 kPa for TP95-27 and 500 and 1000 kPa for TP95-37 were applied in stages until failure developed. The triaxial test was done on both samples and the results were combined to obtain a more representative result of the shear strength properties of the glacial till. The tests resulted in the following shear strength parameters:

- $\varnothing' = 35°$
- $c' = 0$ kPa

The effective strength parameters were determined from the maximum deviator stresses and principal stress ratios at failure, and are shown as p' vs. q plots on Figure 3.3.

A detailed summary of the consolidated-undrained triaxial test results is shown in Table 3.3.

Falling head permeameter test work was performed on sample TP95-27 and yielded a permeability of 4×10^{-8} cm/sec. The permeability was similar to the measured permeabilities on glacial till samples from test pits TP95-31 ($k=6 \times 10^{-8}$ cm/sec) and TPB-13, 14 and 16 ($k=2 \times 10^{-8}$ cm/sec).

(ii) Glaciofluvial/Glaciolacustrine Samples

Three representative samples of glaciofluvial/glaciolacustrine materials (TP95-35, 38 and 39) were selected from test pits located within the southern tailings basin for Index test work. The materials varied from interbedded sandy silt to very stiff silt with some clay to saturated silt and fine-grained sand. Moisture contents ranged from 16.5 percent for the interbedded sandy silt to 28.5 percent for the dense silt and the saturated silt and sand. Specific gravity ranged between 2.76 and 2.79.

Laboratory derived effective strength parameters were determined on the silt and fine-grained sand sample from TP95-39 using consolidated-undrained (C-U) triaxial test work.. The sample was compacted to a minimum 95 percent Modified Proctor maximum dry density at the natural moisture content, and confining pressures of 300, 600 and 1000 kPa were applied in stages until failure

developed. The tests resulted in the following shear strength parameters:

- $\varnothing' = 33°$
- $c' = 0$ kPa

The effective strength parameters are determined from the maximum deviator stresses and principal stress ratios at failure, and are shown as p' vs. q on Figure 3.4.

A detailed summary of the consolidated-undrained triaxial test results is shown in Table 3.4.

Falling head permeameter test work was performed on samples TP95-35, 38 and 39 and yielded permeabilities of 7×10^{-7}, 3×10^{-7} and 2×10^{-6} cm/sec, respectively.

3.4 POLLEY LAKE DAM

Two samples (TP95-20 and 25) were selected from test pits located at the south end of Polley Lake for Index test work. The dense glacial till sample from TP95-20 comprised silty, clayey sand with a trace to some gravel and a moisture content of 14.5 percent. This till sample has a higher clay content than typically encountered tills, and the higher moisture content is attributed to the close proximity to Polley Lake. TP95-25 encountered lacustrine layers comprising sand and silt with some clay and gravel, with a natural moisture content of 17.1 percent.

SECTION 4.0 - GEOLOGICAL FACTORS AFFECTING DESIGN

4.1 GENERAL

The results of the investigation program were used to evaluate the geotechnical factors which may affect the design of the various project components. A summary of results, conclusions and recommendations is provided below with respect to each project component.

4.2 MILL SITE AND ACCESS ROADS

4.2.1 Mill Site

Glacial till was encountered in all eight test pits (TP95-1 to 8) at the proposed mill site location. The glacial till ranges in thickness from 0.5 to 5.8+ metres and overlies lapilli tuff bedrock. The top 1 metre of bedrock is typically very fractured and weathered near surface, however, it becomes fresh and increasingly competent with depth.

An allowable bearing capacity pressure (q_a) of 250 kPa has been estimated for the basal till, based on an assumed Standard Penetration Test (SPT) value of $(N_1)_{60}$ = 25. The SPT value was estimated from excavation conditions in the dense to hard glacial till. Therefore, the glacial till will provide a suitable dense foundation material for footings supporting general buildings and less settlement sensitive components. However, heavy structures with dynamic loads should be founded on competent bedrock. The allowable bearing pressure for competent rock (RQD>25 or as approved by the Engineer) is 1500 kPa. For both cases, the allowable bearing pressure will result in less than 25 mm (1 inch) of settlement in the foundation, assuming the groundwater table is located below the base of the footings.

The foundation must be stripped and grubbed and all organic material removed prior to footing excavation. The exposed till surface must be

inspected to ensure the material is competent and will support the design loads. Any soft soils or saturated areas must be excavated to expose either competent till or bedrock.

Foundations for heavy and/or vibratory structures such as at the crusher and concentrator must be excavated to competent bedrock to support the loads. The investigation program revealed a thin, 0.5 metre thick layer of glacial till covering most of the proposed crusher site location, and a thicker, up to 3.6 metres thick, layer of till over the majority of the concentrator site. This till cover and the upper fractured bedrock must be removed to expose competent bedrock. Nearby drill holes indicate that competent bedrock is present below the upper fractured rock. Any anchor systems that are required for the mills or crusher can be designed to suit the projected dynamic loadings.

Foundations for the crusher and concentrator must include provisions to accommodate seasonal freeze/thaw while minimizing potential differential settlement. Based on meteorological data, the depth of freeze is estimated to be 1.25 metres (4 feet). Consequently, the foundations for all structures must be covered with a 1.25 metre thick layer of free-draining, non-frost susceptible (NFS) material such as clean gravel or coarse sand, as required, to enhance drainage and prevent frost heave from occurring. The NFS material required for frost protection will provide drainage around foundation footings thereby depressing the water table and greatly reducing the potential for the development of ice lenses which cause frost heaving. It is recommended that 100 mm diameter corrugated polyethylene tubing (CPT) be included to further enhance foundation drainage.

The crusher and concentrator sites must be well drained during construction and operations to prevent standing water from ponding in the vicinity of the foundations. The NFS drainage material and CPT pipework will provide post-construction drainage at the sites. Surface runoff from building roofs and access roads, etc. must also be diverted or directed well away from the foundations to minimize seepage and infiltration into the foundation soils.

Foundation conditions at the proposed coarse and fine ore stockpile locations encountered 5.0+ and 5.5 metres of till overlying bedrock, respectively. This till will provide competent foundation support for the stockpiles as the amount of allowable settlement will be much higher than for the crusher and concentrator.

4.2.2 Bootjack Lake Road

Glacial till was encountered in all five test pits (TP95-9 to 13) along the proposed Bootjack Lake access road alignment. The glacial till ranges in thickness from 1.2 to 6.3+ metres and overlies bedrock. Due to the high water encountered in TP95-9 and 11, the softer material encountered at 2.5 metres depth in TP95-9, and the shallow depth to bedrock in TP95-12, it is recommended that the road excavation does not exceed 1 metre, otherwise difficulties may be encountered during construction. The surficial, coarse-grained till will be suitable for both excavation and use as fill for widening the existing road.

4.2.3 Main Access Road

Glacial till was encountered in both test pits (TP95-14 and 15) along the existing Main access road. This material will be suitable for both excavation and use as fill for widening the existing road. The entire road alignment should be inspected to identify any problem areas such as exposed bedrock outcrops, seeps, etc. prior to construction.

4.3 TAILINGS STORAGE FACILITY

4.3.1 Tailings and Reclaim Pipeline Route

Glacial till was encountered in all four test pits (TP95-16 to 19) near and along the proposed tailings and reclaim pipeline route. The till will be suitable for use as fill in access roads and will provide a competent

foundation for the pipelines. Excavations at lower elevations should not exceed 3 metres depth due to the high water table near Bootjack Creek.

4.3.2 Borrow Areas

Laboratory test work on the glacial till sample from test pit TP95-31 confirmed that the till encountered along the ridge east of the tailings storage facility will be suitable for use as embankment fill. Delineation of the borrow area extents and calculation of the available quantities of material is required.

4.3.3 Embankment and Basin Foundations

A 5 metre minimum thick cover of dense, low permeability glacial till blankets the majority of the tailings basin and the Perimeter Embankment footprint as encountered in test pits TP95-26 to 28, 32 and in existing test pits. However, in the southern portion of the basin, the till becomes thinner (3 to 4 metres thick) and is non-existent over a portion of the Main Embankment footprint. A low permeability glacial till liner will be required in the tailings basin where the in-situ glacial till is less than approximately 3 metres thick. The till liner will act as a seepage barrier to prevent the migration of water out of the tailings facility and into the foundation. In addition, this liner will be thick enough to provide frost protection for the glacial till. The till liner will tie into the low permeability glacial till core of the Main Embankment, thereby providing a continuous seepage barrier for the facility.

4.4 POLLEY LAKE DAM

The foundation conditions at the south end of Polley Lake comprise saturated, soft organics and lacustrine deposits overlying low permeability, very stiff glacial till as encountered in test pits TP95-20 to 25. At the south-east and south-west ends of the lake, the soft organics and lacustrine deposits vary in thickness between 2.5 and 5 metres, respectively. In between these pits, the deposits increased to more than 6.5

metres thick. During the excavation of the test pits, significant seepage was observed from the organics and the sandy layers of the lacustrine deposits, due to the close proximity to Polley Lake.

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE 3.1

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT

SUMMARY OF LABORATORY TESTS
INDEX TEST RESULTS

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Feb 27 '95 10:28 am

Test Pit Sample No.	Location	Specific Gravity	Natural Moisture Content (%)	Atterberg Limits (%)				Grain Size Distribution				Soil Description
				LL	PL	PI	LI	+#4 % Gravel	#4 - #200 % Sand	#200 - 0.002mm % Silt	-0.002mm %Clay	
TP95-1	Mill Site	-	10.4	21	13	8	-0.3	21	46	27	6	Silty, gravelly SAND, trace clay
TP95-7	Mill Site	2.78	10.9	24	14	11	-0.2	16	39	35	10	Silty SAND, some gravel and clay
TP95-10	Bootjack Lake Road	-	12.6	25	17	9	-0.4	38	36	19	7	GRAVEL and SAND, some silt, trace clay
TP95-18	Tailings/Reclaim Pipeline Route	-	13.8	27	13	14	0.0	38	36	19	7	GRAVEL and SAND, some silt, trace clay
TP95-20	Polley Lake	-	14.5	26	13	13	0.1	10	39	25	26	Silty, clayey SAND, trace to some gravel
TP95-25	Polley Lake	-	17.1	24	12	13	0.4	15	37	33	15	SAND and SILT, some gravel and clay
TP95-27	Perimeter Embankment Foundation	2.73	11.1	22	14	9	-0.3	19	37	33	11	SAND and SILT, some gravel and clay
TP95-31	East Ridge Borrow Area	-	11.0	22	14	8	-0.4	41	27	25	7	Silty, sandy GRAVEL, trace clay
TP95-35	South Basin	2.78	16.5	21	14	7	0.4	2	22	65	11	Sandy SILT, some clay, trace gravel
TP95-37	South Basin	-	18.8	27	16	11	0.2	14	40	35	11	SAND and SILT, some gravel and clay
TP95-38	Main Embankment Foundation	2.79	28.4	33	19	14	0.7	3	6	73	18	SILT, some clay, trace sand and gravel
TP95-39	Main Embankment Foundation	2.76	28.5	-	-	-	-	0	40	46	14	SILT and fine SAND, some clay
TPB-1	Main Embankment Foundation	-	13.7	29	19	10	-0.5	3	14	67	16	SILT, some clay and sand, trace gravel
TPB-13,14,16	Embankment & Pond Foundations	2.76	25.1	30	16	14	0.6	1	17	61	21	Clayey SILT, some sand, trace gravel

Note: 1. Samples TPB-1 and TPB-13,14,16 were selected for laboratory testwork in 1989 and have been reported for comparison.

Knight Piésold Ltd.
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TABLE 3.2

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT

SUMMARY OF LABORATORY TESTS
EFFECTIVE STRENGTH PARAMETERS, COMPACTION AND PERMEABILITY TEST RESULTS

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Mar 13 '95 2:07 pm

Test Pit Sample No.	Location	EFFECTIVE STRENGTH PARAMETERS		COMPACTION			PERMEABILITY	Soil Description
		Friction Angle, Ø' (degrees)	Cohesion, c' (kPa)	Natural Moisture Content (%)	Optimum Moisture Content (%)	Maximum Dry Density (kg/m^3)	Permeameter Falling Head Test (cm/sec)	
TP95-7	Mill Site	-	-	10.9	8.4	2192	-	Silty SAND, some gravel and clay
TP95-18	Tailings/Reclaim Pipeline Route	-	-	13.8	10.1	2130	-	GRAVEL and SAND, some silt, trace clay
TP95-27	Perimeter Embankment Foundation	35	0	11.1	8.0	2200	4×10^{-8}	SAND and SILT, some gravel and clay
TP95-31	East Ridge Borrow Area	-	-	11.0	7.6	2200	6×10^{-8}	Silty, sandy GRAVEL, trace clay
TP95-35	South Basin	-	-	-	-	-	7×10^{-7}	Sandy SILT, some clay, trace gravel
TP95-37	South Basin	35	0	-	-	-	-	SAND and SILT, some gravel and clay
TP95-38	Main Embankment Foundation	-	-	-	-	-	3×10^{-7}	SILT, some clay, trace sand and gravel
TP95-39	Main Embankment Foundation	33	0	-	-	-	2×10^{-6}	SILT and fine SAND, some clay
TPB-13,14,16	Embankment & Pond Foundations	-	-	25.1	13.3	1935	2×10^{-8}	Clayey SILT, some sand, trace gravel

Notes:

1. Triaxial tests results from samples TP95-27 and 37 were combined to determine average strength pearameters for the glacial till material.
2. Compaction tests performed as per ASTM D1557 Modified Proctor tests.
3. Permeability tests carried out on samples compacted with standard proctor energy and at natural moisture content.
4. Sample TPB-13,14,16 was selected for laboratory testwork in 1989 and has been reported for comparison.

Knight Piésold Ltd.
CONSULTING ENGINEERS

TABLE 3.3

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY

RESULTS OF CONSOLIDATED-UNDRAINED TRIAXIAL TESTS ON GLACIAL TILL SAMPLES

Triaxial Testing Stages and Soil Parameters	Units	Sample No. TP95-27 (Test 1)	TP95-37 (Test 2)	TP95-27 (Test 3)	TP95-37 (Test 4)
Initial Parameters					
Sample diameter	(cm)	3.77	3.72	3.75	3.72
Sample length	(cm)	14.68	15.35	15.21	15.35
Moisture content, w	(%)	7.9	9.3	7.6	9.1
Dry density, γ_{dry}	(kg/m^3)	2168	2072	2079	2063
Bulk density, γ_{bulk}	(kg/m^3)	2339	2265	2237	2251
Void ratio, e		0.259	0.342	0.313	0.348
B-value		0.965	0.985	0.954	0.997
Consolidation Stage					
Cell pressure	(kPa)	772	979	1220	1374
Back Pressure	(kPa)	484	481	476	412
Final effective consolidation pressure, σ_{3c}'	(kPa)	287	498	745	962
Final moisture content, w	(%)	9.7	9.8	9.8	9.9
Final dry density, γ_{dry}	(kg/m^3)	2207	2183	2161	2180
Final bulk density, γ_{bulk}	(kg/m^3)	2421	2397	2373	2396
Final void ratio, e		0.237	0.274	0.264	0.275
Coefficient of consolidation, c_v	(cm^2/s)	2.7×10^{-2}	7.4×10^{-4}	2.3×10^{-2}	1.1×10^{-3}
Shearing Stage					
Effective consolidation pressure, σ_{3c}'	(kPa)	287	498	745	962
Principal stress ratio, P.S.R. $(\sigma_1'/\sigma_3')_{max}$		4.25	3.74	3.60	3.38
Strain at maximum P.S.R.	(%)	1.85	2.09	11.67	7.42
σ_1' at maximum P.S.R.	(kPa)	823	1202	1012	2216
σ_3' at maximum P.S.R.	(kPa)	194	321	282	657
ΔU at maximum P.S.R.	(kPa)	94	177	463	305
A_f at maximum P.S.R.		0.15	0.20	0.63	0.20
Maximum deviator stress, $(\sigma_d')_{max}$	(kPa)	1416	1268	812	1624
Strain at $(\sigma_d')_{max}$	(%)	17.66	21.14	21.04	20.02
σ_1' at $(\sigma_d')_{max}$	(kPa)	1946	1843	1135	2354
σ_3' at $(\sigma_d')_{max}$	(kPa)	531	575	323	730
ΔU at $(\sigma_d')_{max}$	(kPa)	-243	-77	422	232
A_f at $(\sigma_d')_{max}$		-0.17	-0.06	0.52	0.14

TABLE 3.4

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TAILINGS STORAGE FACILITY

RESULTS OF CONSOLIDATED-UNDRAINED TRIAXIAL TESTS ON SILT AND FINE-GRAINED SAND SAMPLES

Triaxial Testing Stages and Soil Parameters	Units	Sample No. TP95-39 (Test 1)	(Test 2)	(Test 3)
Initial Parameters				
Sample diameter	(cm)	3.75	3.72	3.69
Sample length	(cm)	14.81	14.94	14.86
Moisture content, w	(%)	16.3	16.6	16.7
Dry density, γ_{dry}	(kg/m^3)	1693	1639	1558
Bulk density, γ_{bulk}	(kg/m^3)	1969	1911	1818
Void ratio, e		0.630	0.684	0.772
B-value		0.955	0.953	0.963
Consolidation Stage				
Cell pressure	(kPa)	779	1077	1306
Back Pressure	(kPa)	483	482	415
Final effective consolidation pressure, σ_{3c}'	(kPa)	296	595	891
Final moisture content, w	(%)	19.2	18.6	19.9
Final dry density, γ_{dry}	(kg/m^3)	1803	1807	1756
Final bulk density, γ_{bulk}	(kg/m^3)	2149	2143	2105
Final void ratio, e		0.531	0.528	0.571
Coefficient of consolidation, c_v	(cm^2/s)	2.2×10^{-2}	5.9×10^{-2}	3.8×10^{-2}
Shearing Stage				
Effective consolidation pressure, σ_{3c}'	(kPa)	296	595	891
Principal stress ratio, P.S.R. $(\sigma_1'/\sigma_3')_{max}$		4.06	3.60	3.43
Strain at maximum P.S.R.	(%)	9.62	7.72	11.95
σ_1' at maximum P.S.R.	(kPa)	293	502	858
σ_3' at maximum P.S.R.	(kPa)	72	140	250
ΔU at maximum P.S.R.	(kPa)	224	455	641
A_f at maximum P.S.R.		1.01	1.25	1.06
Maximum deviator stress, $(\sigma_d')_{max}$	(kPa)	228	364	615
Strain at $(\sigma_d')_{max}$	(%)	6.63	12.10	3.96
σ_1' at $(\sigma_d')_{max}$	(kPa)	303	507	1008
σ_3' at $(\sigma_d')_{max}$	(kPa)	75	143	393
ΔU at $(\sigma_d')_{max}$	(kPa)	221	452	498
A_f at $(\sigma_d')_{max}$		0.97	1.24	0.81

APPENDIX B

DETAILED LABORATORY TEST WORK RESULTS

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

Consolidated Undrained Triaxial Compression Test on Cohesive Soils
ASTM D 4767 - 88

									Strength Results:			Density: (Kg/M³)	
PROJECT#	9421897-5040	L_c =	15.35	cm	DATE	27-Feb-95			Max. σ_o' =	1267.6	kPa	γ_t =	2072
Test Pit	TP95-37	A_c =	43.57	cm²	FILE :	3x-500.XLS			Strain @ =	21.14	%	γ_r =	2183
Sample		V_c =	569.0	cm³	TEST#	CU-3			Max. PSR =	3.74		E_s =	0.342
Depth									Strain @ =	2.09	%	E_v =	0.274
REMARKS :		Consolidation Pressure :			CALIBRATIONS :				Consolidation Results:			Water Contents:	
- Failure Mode Bulging		CP =	979.0	kPa	LOAD =	0.0423	kN/mV		δV_c =	35.9	cc	W_i =	9.3
- Minus 19.5 mm material		BP =	480.6	kPa	PORE =	0.6895	kPa/mV		T_{r90} =	40.3	min	W_f =	9.8
- Corrections applied for membrane		σ_{3c}' =	498.4	kPa	LVDT =	0.0285	mm/mV		C_v =	7.4E-04	cm²/s		
- Corrections applied for filter paper		B_{VALUE} =	0.985		Feed Rate =	0.024	mm/min						

δL (mV)	LOAD (mV)	δU (mV)	E (%)	LOAD (kN)	A_c (cm²)	σ_o' (kPa)	δU (kPa)	σ_3' (kPa)	σ_1' (kPa)	PSR	A	p' (kPa)	q (kPa)
-1225.0	11.2	-697.0	0.00	0.00	43.57	0.0	0.0	498.4	498.4	1.00		498.4	0.0
-1219.4	17.6	-713.6	0.10	0.27	43.62	62.2	11.4	487.0	549.2	1.13	0.18	518.1	31.1
-1210.5	22.4	-738.9	0.27	0.47	43.69	138.4	28.9	469.5	577.9	1.23	0.27	523.7	54.2
-1202.5	28.7	-768.9	0.42	0.74	43.76	159.2	49.6	448.8	618.1	1.38	0.29	533.5	84.6
-1194.8	46.6	-872.9	0.56	1.50	43.82	341.4	121.3	377.1	719.5	1.91	0.36	547.8	170.7
-1187.2	57.4	-930.5	0.70	1.95	43.88	445.0	161.0	337.4	782.4	2.32	0.36	559.9	222.5
-1179.2	66.2	-965.7	0.85	2.32	43.95	528.4	185.2	313.1	841.5	2.69	0.35	577.3	264.2
-1170.8	73.6	-980.6	1.01	2.64	44.02	598.8	195.5	302.9	901.7	2.98	0.33	602.3	299.4
-1162.5	79.8	-990.1	1.16	2.90	44.08	657.5	202.1	296.3	953.8	3.22	0.31	625.1	328.8
-1154.4	85.5	-987.9	1.31	3.14	44.15	710.5	200.6	297.8	1008.4	3.39	0.28	652.1	355.3
-1146.0	90.3	-986.2	1.47	3.35	44.22	756.0	199.4	299.0	1055.0	3.53	0.26	677.0	378.0
-1137.5	94.7	-977.2	1.62	3.52	44.29	796.4	193.2	305.2	1101.6	3.61	0.24	703.4	398.2
-1129.6	98.3	-971.7	1.77	3.68	44.36	829.7	189.4	309.0	1138.7	3.69	0.23	723.8	414.8
-1120.2	101.4	-960.6	1.95	3.81	44.44	857.0	181.3	316.6	1173.6	3.71	0.21	745.1	428.5
-1112.3	104.0	-953.8	2.09	3.92	44.50	880.5	177.1	321.3	1201.9	3.74	0.20	761.6	440.3
-1103.5	106.2	-942.3	2.26	4.02	44.58	899.6	169.1	329.3	1228.9	3.73	0.19	779.1	449.8
-1095.2	108.1	-935.5	2.41	4.10	44.65	916.2	164.4	334.0	1250.1	3.74	0.18	792.0	458.1
-1086.7	109.8	-923.9	2.57	4.17	44.72	931.0	156.4	342.0	1273.0	3.72	0.17	807.5	465.5
-1078.4	111.6	-917.7	2.72	4.24	44.79	946.1	152.2	346.2	1292.3	3.73	0.16	819.3	473.1
-1069.8	113.1	-906.9	2.88	4.31	44.87	959.1	144.7	353.7	1312.8	3.71	0.15	833.2	479.5
-1060.2	114.6	-900.9	3.06	4.37	44.95	971.2	140.6	357.8	1329.0	3.71	0.14	843.4	485.6
-1051.9	115.9	-890.8	3.21	4.43	45.02	982.2	133.5	364.3	1347.0	3.69	0.14	855.9	491.1
-1043.3	117.4	-884.8	3.37	4.49	45.09	994.0	129.5	368.9	1363.0	3.69	0.13	865.9	497.0
-1034.8	118.6	-875.9	3.53	4.54	45.17	1004.1	123.4	375.0	1379.1	3.68	0.12	877.1	502.0
-1026.2	119.9	-869.4	3.69	4.60	45.24	1014.1	118.9	379.5	1393.6	3.67	0.12	886.6	507.0
-1017.4	121.2	-862.0	3.85	4.65	45.32	1024.5	113.8	384.6	1409.1	3.66	0.11	896.9	512.3
-1008.6	122.4	-854.6	4.02	4.70	45.40	1034.0	108.7	389.7	1423.7	3.65	0.11	906.7	517.0
-1000.1	123.6	-849.1	4.17	4.75	45.47	1042.8	104.9	393.5	1436.3	3.65	0.10	914.9	521.4
-991.2	124.7	-841.4	4.34	4.80	45.55	1051.6	99.6	398.8	1450.4	3.64	0.09	924.6	525.8
-982.5	125.7	-836.6	4.50	4.84	45.63	1059.3	96.3	402.1	1461.4	3.63	0.09	931.8	529.6
-973.6	126.7	-829.2	4.67	4.88	45.71	1066.5	91.2	407.2	1473.8	3.62	0.09	940.5	533.3
-964.5	127.8	-824.8	4.84	4.93	45.79	1074.4	88.1	410.2	1484.7	3.62	0.08	947.5	537.2
-955.9	128.8	-817.6	4.99	4.97	45.86	1081.5	83.2	415.2	1496.8	3.60	0.08	956.0	540.8
-947.0	129.7	-813.7	5.16	5.01	45.94	1088.2	80.5	417.9	1506.2	3.60	0.07	962.1	544.1
-938.0	130.7	-806.7	5.33	5.05	46.02	1095.3	75.6	422.8	1518.5	3.59	0.07	970.6	547.9
-929.2	131.7	-803.0	5.49	5.09	46.10	1102.2	73.1	425.3	1527.6	3.59	0.07	976.5	551.2
-920.0	132.6	-796.2	5.66	5.13	46.19	1108.5	68.4	430.0	1538.5	3.58	0.06	984.2	554.2
-911.0	133.4	-792.7	5.83	5.17	46.27	1114.0	66.0	432.4	1546.4	3.58	0.06	989.4	557.0
-901.8	134.2	-785.8	6.00	5.20	46.35	1119.6	61.2	437.2	1556.8	3.56	0.05	997.0	559.8
-892.3	135.2	-783.1	6.18	5.24	46.44	1125.8	59.4	439.0	1564.8	3.56	0.05	1001.9	562.9
-883.7	135.9	-776.7	6.33	5.27	46.52	1130.6	55.0	443.4	1574.0	3.55	0.05	1008.7	565.3
-874.6	136.7	-774.0	6.50	5.31	46.60	1135.8	53.1	445.3	1581.1	3.55	0.05	1013.2	567.9
-865.3	137.4	-767.6	6.68	5.34	46.69	1140.1	48.7	449.7	1589.8	3.54	0.04	1019.8	570.0
-856.4	138.2	-764.1	6.84	5.37	46.77	1145.3	46.3	452.1	1597.4	3.53	0.04	1024.8	572.6
-847.7	139.0	-759.4	7.00	5.40	46.85	1149.7	43.0	455.4	1605.1	3.52	0.04	1030.2	574.9
-838.4	139.9	-754.3	7.18	5.44	46.94	1155.7	39.5	458.9	1614.6	3.52	0.03	1036.7	577.9
-829.4	140.5	-751.4	7.34	5.47	47.03	1159.0	37.5	460.9	1619.9	3.51	0.03	1040.4	579.5
-820.6	141.2	-746.2	7.51	5.50	47.11	1163.2	33.9	464.5	1627.7	3.50	0.03	1046.1	581.6
-811.8	141.9	-744.0	7.67	5.53	47.19	1167.6	32.4	466.0	1633.6	3.51	0.03	1049.8	583.8
-802.5	142.6	-738.6	7.84	5.56	47.28	1171.5	28.7	469.7	1641.2	3.49	0.02	1055.5	585.7
-793.8	143.4	-736.9	8.00	5.59	47.36	1176.1	27.5	470.9	1647.0	3.50	0.02	1059.0	588.1
-784.3	144.1	-731.7	8.18	5.62	47.45	1180.2	23.9	474.5	1654.7	3.49	0.02	1064.6	590.1
-775.8	144.7	-729.9	8.34	5.64	47.54	1183.4	22.7	475.7	1659.1	3.49	0.02	1067.4	591.7
-766.5	145.2	-724.6	8.51	5.66	47.63	1185.5	19.0	479.4	1664.9	3.47	0.02	1072.1	592.7
-757.8	146.0	-723.4	8.67	5.70	47.71	1190.7	18.2	480.2	1670.9	3.48	0.02	1075.5	595.3
-748.7	146.6	-718.5	8.84	5.72	47.80	1193.2	14.8	483.6	1676.8	3.47	0.01	1080.2	596.6
-739.3	147.2	-716.7	9.02	5.75	47.89	1196.7	13.6	484.8	1681.5	3.47	0.01	1083.2	598.4
-730.8	147.7	-712.4	9.17	5.77	47.97	1198.8	10.6	487.8	1686.6	3.46	0.01	1087.2	599.4
-721.7	148.3	-710.0	9.34	5.80	48.06	1201.8	9.0	489.4	1691.3	3.46	0.01	1090.4	600.9
-712.9	148.9	-706.6	9.51	5.82	48.15	1204.5	5.6	491.8	1696.3	3.45	0.01	1094.0	602.3
-703.9	149.4	-703.3	9.67	5.84	48.24	1207.2	4.3	494.1	1701.2	3.44	0.00	1097.7	603.6
-695.0	150.0	-700.8	9.84	5.87	48.33	1209.8	2.6	495.8	1705.6	3.44	0.00	1100.7	604.9
-686.1	150.6	-696.7	10.00	5.90	48.42	1213.0	-0.2	498.6	1711.6	3.43	0.00	1105.1	606.5
-677.1	151.2	-695.4	10.17	5.92	48.51	1215.8	-1.1	499.5	1715.3	3.43	0.00	1107.4	607.9
-668.5	151.8	-691.4	10.33	5.94	48.59	1218.5	-3.9	502.3	1720.8	3.43	0.00	1111.5	609.3
-659.0	152.4	-690.2	10.51	5.97	48.69	1221.7	-4.7	503.1	1724.8	3.43	0.00	1113.9	610.8
-650.2	153.0	-686.4	10.67	5.99	48.78	1224.0	-7.3	505.7	1729.8	3.42	-0.01	1117.7	612.0
-641.0	153.5	-685.3	10.84	6.02	48.87	1226.2	-8.1	506.5	1732.7	3.42	-0.01	1119.6	613.1
-631.8	153.9	-681.4	11.01	6.03	48.96	1227.0	-10.8	509.2	1736.1	3.41	-0.01	1122.6	613.5

δL	LOAD	δU	E	LOAD	A_c	σ_0'	δU	σ_3	σ_1'	PSR	A	p'	q
(mV)	(mV)	(mV)	(%)	(kN)	(cm^2)	(kPa)	(kPa)	(kPa)	(kPa)			(kPa)	(kPa)
-622.4	154.5	-680.5	11.19	6.06	49.05	1229.7	-11.4	509.3	1739.5	3.41	-0.01	1124.5	614.9
-613.5	155.0	-676.8	11.35	6.08	49.15	1231.7	-13.9	512.3	1744.1	3.40	-0.01	1128.2	615.9
-604.3	155.6	-675.9	11.52	6.10	49.25	1234.3	-14.5	512.9	1747.2	3.41	-0.01	1130.1	617.1
-595.2	156.0	-672.1	11.69	6.12	49.34	1235.8	-17.2	515.6	1751.3	3.40	-0.01	1133.4	617.9
-585.9	156.6	-671.2	11.86	6.15	49.44	1237.9	-17.8	516.2	1754.1	3.40	-0.01	1135.1	618.9
-576.5	157.1	-667.8	12.04	6.17	49.54	1239.2	-20.1	518.5	1758.3	3.39	-0.02	1138.4	619.9
-566.9	157.7	-666.0	12.22	6.19	49.64	1242.1	-21.4	519.8	1761.9	3.39	-0.02	1140.8	621.1
-557.6	158.2	-663.5	12.39	6.21	49.73	1243.7	-23.1	521.5	1765.2	3.38	-0.02	1143.4	621.9
-547.9	158.7	-661.0	12.57	6.24	49.84	1245.4	-24.3	523.2	1768.6	3.38	-0.02	1145.9	622.7
-538.4	159.2	-659.2	12.74	6.26	49.94	1247.1	-26.1	524.5	1771.6	3.38	-0.02	1148.0	623.6
-528.8	159.7	-656.1	12.92	6.28	50.04	1248.8	-28.2	526.6	1775.4	3.37	-0.02	1151.0	624.4
-519.0	160.1	-655.4	13.10	6.30	50.14	1249.6	-28.7	527.1	1776.6	3.37	-0.02	1151.9	624.8
-509.0	160.5	-652.2	13.29	6.31	50.25	1249.7	-30.9	529.3	1779.0	3.36	-0.02	1154.2	624.9
-499.2	160.8	-651.5	13.47	6.33	50.36	1249.9	-31.4	529.8	1779.6	3.36	-0.03	1154.7	624.9
-489.2	161.1	-648.3	13.66	6.34	50.47	1249.4	-33.6	532.0	1781.4	3.35	-0.03	1156.7	624.7
-479.2	161.5	-647.9	13.84	6.36	50.57	1250.6	-33.9	532.3	1782.8	3.35	-0.03	1157.5	625.3
-469.2	162.2	-644.7	14.03	6.38	50.68	1253.0	-36.1	534.5	1787.5	3.34	-0.03	1161.0	626.5
-458.8	162.9	-644.2	14.22	6.41	50.80	1256.1	-36.4	534.8	1790.9	3.35	-0.03	1162.9	628.1
-448.7	163.3	-641.3	14.41	6.43	50.91	1256.8	-38.4	536.8	1793.6	3.34	-0.03	1165.2	628.4
-438.6	163.8	-640.4	14.60	6.45	51.02	1257.6	-39.0	537.4	1795.1	3.34	-0.03	1166.2	628.8
-428.6	164.2	-637.6	14.78	6.47	51.13	1258.1	-41.0	539.4	1797.5	3.33	-0.03	1168.4	629.1
-417.8	164.6	-636.7	14.98	6.49	51.25	1258.6	-41.6	540.0	1798.6	3.33	-0.03	1169.3	629.3
-407.5	165.1	-634.3	15.17	6.51	51.37	1259.9	-43.2	541.6	1801.5	3.33	-0.03	1171.6	629.9
-397.0	165.5	-632.0	15.37	6.52	51.49	1259.8	-44.8	543.2	1803.0	3.32	-0.04	1173.1	629.9
-387.4	166.0	-631.0	15.55	6.54	51.59	1261.2	-45.5	543.9	1805.1	3.32	-0.04	1174.5	630.6
-376.0	166.3	-628.5	15.76	6.56	51.72	1261.0	-47.2	545.6	1806.6	3.31	-0.04	1176.1	630.5
-365.9	166.8	-627.9	15.95	6.58	51.84	1262.2	-47.6	546.0	1808.2	3.31	-0.04	1177.1	631.1
-355.0	167.2	-625.3	16.15	6.60	51.96	1261.8	-49.4	547.8	1809.6	3.30	-0.04	1178.7	630.9
-344.8	167.6	-625.1	16.34	6.61	52.08	1262.5	-49.6	548.0	1810.5	3.30	-0.04	1179.2	631.2
-334.3	168.0	-622.2	16.53	6.63	52.20	1262.4	-51.6	550.0	1812.4	3.30	-0.04	1181.2	631.2
-323.4	168.5	-621.9	16.73	6.65	52.33	1263.4	-51.8	550.2	1813.6	3.30	-0.04	1181.9	631.7
-313.5	168.9	-619.0	16.92	6.67	52.45	1263.2	-53.8	552.2	1815.4	3.29	-0.04	1183.8	631.6
-303.2	169.2	-618.5	17.11	6.68	52.57	1263.1	-54.1	552.5	1815.6	3.29	-0.04	1184.1	631.6
-293.0	169.8	-616.4	17.30	6.70	52.69	1264.6	-55.6	554.0	1818.6	3.28	-0.04	1186.3	632.3
-282.1	170.1	-614.9	17.50	6.72	52.82	1264.3	-56.6	555.0	1819.3	3.28	-0.04	1187.2	632.2
-272.0	170.6	-613.4	17.69	6.74	52.94	1264.9	-57.6	556.0	1821.0	3.27	-0.05	1188.5	632.5
-262.7	170.9	-610.7	17.86	6.75	53.05	1264.5	-59.5	557.9	1822.4	3.27	-0.05	1190.1	632.2
-252.0	171.4	-610.7	18.06	6.77	53.18	1265.6	-59.5	557.9	1823.5	3.27	-0.05	1190.7	632.8
-241.5	171.7	-607.8	18.26	6.79	53.30	1264.6	-61.5	559.9	1824.5	3.26	-0.05	1192.2	632.3
-231.7	172.3	-607.8	18.44	6.81	53.42	1266.5	-61.5	559.9	1826.4	3.26	-0.05	1193.2	633.3
-221.3	172.4	-605.2	18.63	6.82	53.55	1264.6	-63.3	561.7	1826.2	3.25	-0.05	1194.0	632.3
-211.8	173.0	-605.0	18.81	6.84	53.67	1265.8	-63.4	561.8	1827.6	3.25	-0.05	1194.7	632.9
-202.7	173.3	-602.3	18.98	6.85	53.78	1265.4	-65.3	563.7	1829.1	3.24	-0.05	1196.4	632.7
-191.4	173.8	-602.2	19.18	6.88	53.92	1266.5	-65.4	563.8	1830.3	3.25	-0.05	1197.0	633.3
-182.1	174.1	-599.5	19.36	6.89	54.03	1265.6	-67.2	565.6	1831.3	3.24	-0.05	1198.4	632.8
-171.2	174.6	-598.6	19.56	6.91	54.17	1266.7	-67.8	566.2	1833.0	3.24	-0.05	1199.6	633.4
-163.1	174.9	-596.8	19.71	6.92	54.27	1266.7	-69.1	567.5	1834.2	3.23	-0.05	1200.8	633.4
-151.5	175.3	-595.1	19.93	6.94	54.42	1265.9	-70.3	568.7	1834.6	3.23	-0.06	1201.6	633.0
-142.3	175.8	-594.2	20.10	6.96	54.53	1266.8	-70.9	569.3	1836.0	3.23	-0.06	1202.7	633.4
-132.8	176.0	-591.7	20.27	6.97	54.65	1266.0	-72.6	571.0	1837.0	3.22	-0.06	1204.0	633.0
-123.7	176.5	-591.3	20.44	6.99	54.77	1266.6	-72.9	571.3	1837.9	3.22	-0.06	1204.6	633.3
-113.5	176.9	-589.2	20.63	7.00	54.90	1266.4	-74.3	572.7	1839.1	3.21	-0.06	1205.9	633.2
-103.8	177.2	-589.0	20.81	7.02	55.02	1265.9	-74.5	572.9	1838.8	3.21	-0.06	1205.8	633.0
-93.8	177.5	-586.6	21.00	7.03	55.15	1265.6	-76.1	574.5	1840.1	3.20	-0.06	1207.3	632.8
-86.0	178.1	-585.9	21.14	7.06	55.25	1267.6	-76.6	575.0	1842.6	3.20	-0.06	1208.8	633.8
-74.6	178.2	-583.9	21.35	7.06	55.40	1265.0	-78.0	576.4	1841.4	3.19	-0.06	1208.9	632.5
-65.4	178.8	-583.0	21.52	7.09	55.52	1266.5	-78.6	577.0	1843.5	3.19	-0.06	1210.3	633.3
-55.1	179.0	-581.3	21.72	7.10	55.66	1264.8	-79.8	578.2	1842.9	3.19	-0.06	1210.6	632.4
-47.6	179.4	-579.9	21.86	7.11	55.76	1265.8	-80.7	579.1	1844.9	3.19	-0.06	1212.0	632.9
-36.4	179.9	-578.8	22.06	7.13	55.91	1265.4	-81.5	579.9	1845.3	3.18	-0.06	1212.6	632.7
-27.4	180.0	-576.3	22.23	7.14	56.03	1263.6	-83.2	581.6	1845.3	3.17	-0.07	1213.4	631.8
-17.1	180.5	-576.2	22.42	7.16	56.17	1264.0	-83.3	581.7	1845.7	3.17	-0.07	1213.7	632.0
-8.7	180.8	-573.7	22.58	7.17	56.28	1263.7	-85.0	583.4	1847.2	3.17	-0.07	1215.3	631.9
1.7	181.4	-573.8	22.77	7.20	56.42	1264.9	-84.9	583.3	1848.2	3.17	-0.07	1215.8	632.4
9.7	181.7	-571.2	22.92	7.21	56.53	1264.5	-86.7	585.1	1849.6	3.16	-0.07	1217.4	632.2
21.4	182.1	-571.2	23.14	7.22	56.69	1263.8	-86.7	585.1	1849.0	3.16	-0.07	1217.1	631.9
31.1	182.4	-569.1	23.32	7.24	56.82	1263.2	-88.2	586.6	1849.8	3.15	-0.07	1218.2	631.6
40.2	182.7	-568.5	23.48	7.25	56.95	1262.7	-88.6	587.0	1849.7	3.15	-0.07	1218.4	631.4
48.5	183.0	-566.2	23.64	7.26	57.06	1261.8	-90.2	588.6	1850.4	3.14	-0.07	1219.5	630.9

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

Consolidated Undrained Triaxial Compression Test on Cohesive Soils

ASTM D 4767 - 88

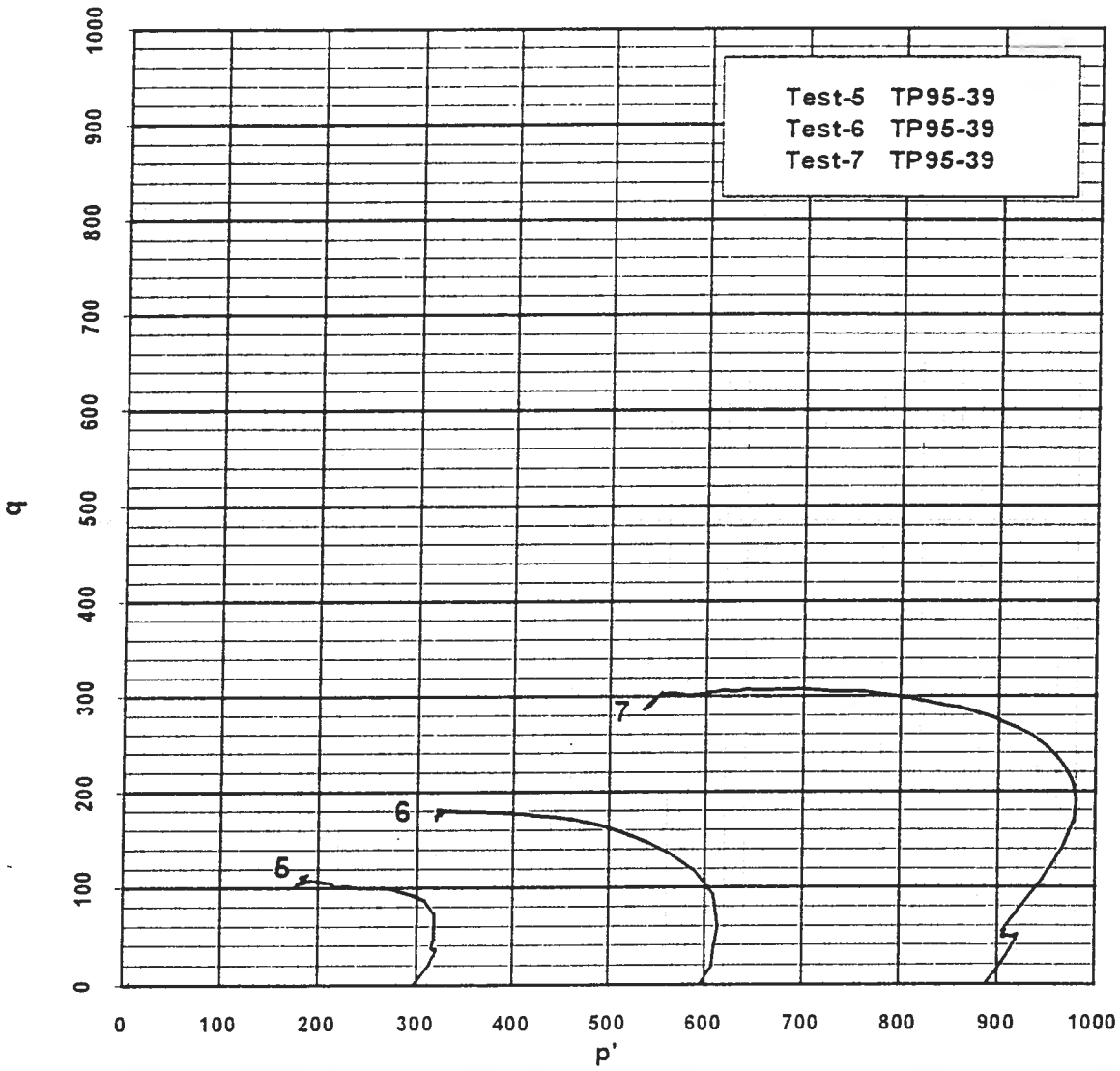
PROJECT#	9421897-5040	L_c =	15.35	cm	DATE	27-Feb-95		Strength Results:			Density: (Kg/M³)		
Test Pit	TP95-37	A_c =	43.46	cm²	FILE	3x-950.XLS		Max. σ_D' =	1624.3	kPa	γ_t =	2083	
Sample		V_c =	667.1	cm³	TEST#	CIU-4		Strain @ =	8.88	%	γ_d =	2180	
Depth								Max. PSR =	3.38		E_s =	0.348	
REMARKS:		Consolidation Pressure:			CALIBRATIONS:			Strain @ =	7.34	%	E_v =	0.275	
- Failure Mode : Bulging		CP =	1373.8	kPa	LOAD =	0.0423	kN/mV	Consolidation Results:			Water Contents:		
- Minus 19.5 mm material		BP =	412.2	kPa	PORE =	0.6895	kPa/mV	δV_c =	37.9	cc	W_i =	9.1	
- Corrections applied for membrane		σ_{3c}' =	961.6	kPa	LVDT =	0.0295	mm/mV	T_{100} =	27.0	min	W_f =	9.9	
- Corrections applied for filter paper		B_{VALUE} =	0.997		Feed Rate =	0.025	mm/min	C_v =	1.1E-03	cm²/s			

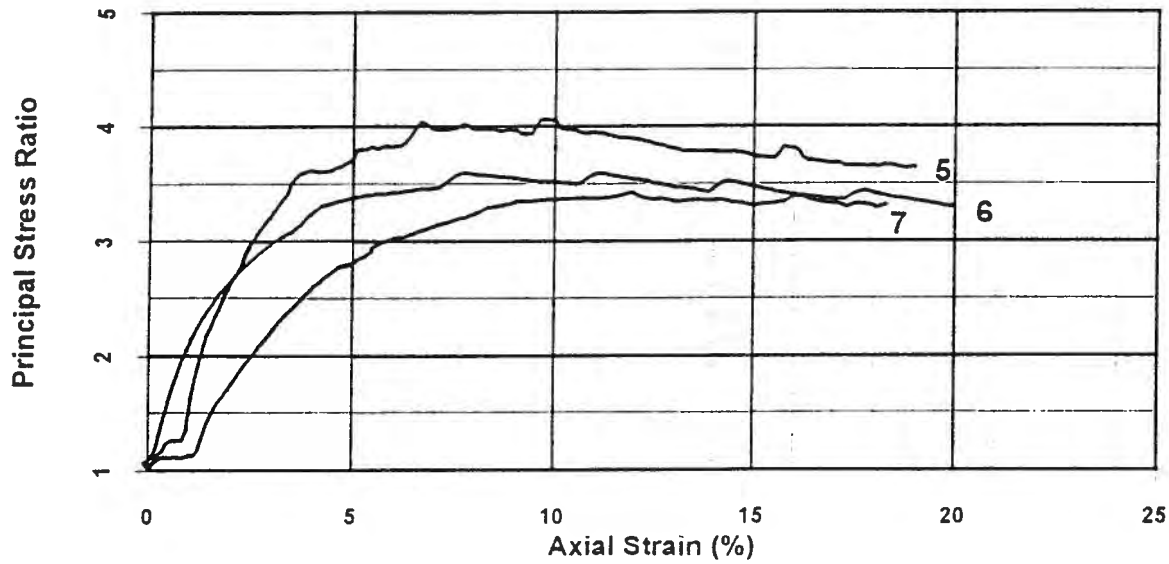
δL (mV)	LOAD (mV)	δU (mV)	E (%)	LOAD (kN)	A_c (cm²)	σ_D (kPa)	δU (kPa)	σ_3' (kPa)	σ_1' (kPa)	PSR	A	p' (kPa)	q (kPa)
510.0	16.3	-597.8	0.00	0.00	43.46	0.0	0.0	961.6	961.6	1.00		961.6	0.0
513.9	21.7	-601.4	0.07	0.23	43.49	52.2	2.5	959.1	1011.4	1.05	0.05	985.2	26.1
523.8	24.2	-605.3	0.26	0.33	43.57	75.8	5.2	956.4	1032.2	1.08	0.07	994.3	37.9
533.1	26.8	-611.7	0.43	0.44	43.65	101.6	9.5	952.0	1053.6	1.11	0.09	1002.8	50.8
540.1	59.6	-681.2	0.56	1.83	43.70	418.5	57.5	904.1	1322.6	1.46	0.14	1113.4	209.3
548.5	84.8	-794.0	0.71	2.89	43.77	660.7	135.3	826.3	1487.0	1.80	0.20	1156.6	330.3
557.3	103.7	-899.5	0.88	3.69	43.84	842.1	208.0	753.6	1595.7	2.12	0.25	1174.7	421.1
566.1	119.0	-971.6	1.04	4.34	43.92	987.4	257.7	703.9	1691.3	2.40	0.26	1197.6	493.7
574.9	131.5	-1022.6	1.21	4.87	43.99	1106.3	292.9	668.7	1775.0	2.65	0.26	1221.9	553.2
583.4	140.4	-1049.0	1.36	5.24	44.06	1189.6	311.1	650.5	1840.1	2.83	0.26	1245.3	594.8
593.2	146.8	-1066.2	1.54	5.51	44.14	1248.7	323.0	638.6	1887.3	2.96	0.26	1263.0	624.3
600.8	151.4	-1072.9	1.69	5.71	44.20	1290.9	327.6	634.0	1924.9	3.04	0.25	1279.5	645.4
610.4	154.9	-1076.6	1.86	5.86	44.29	1321.6	330.1	631.5	1953.1	3.09	0.25	1292.3	660.8
620.0	157.5	-1080.4	2.04	5.97	44.37	1344.0	332.8	628.8	1972.8	3.14	0.25	1300.8	672.0
629.3	159.8	-1075.8	2.22	6.07	44.44	1364.1	329.6	632.0	1996.1	3.16	0.24	1314.1	682.0
637.8	162.1	-1082.1	2.37	6.16	44.52	1383.4	333.9	627.7	2011.1	3.20	0.24	1319.4	691.7
647.3	164.1	-1079.4	2.55	6.25	44.60	1399.9	332.1	629.5	2029.5	3.22	0.24	1329.5	700.0
657.0	166.1	-1081.9	2.73	6.33	44.68	1415.5	333.8	627.8	2043.4	3.25	0.24	1335.6	707.8
666.3	167.4	-1079.8	2.90	6.39	44.76	1425.7	332.3	629.3	2055.0	3.27	0.23	1342.1	712.9
674.2	168.6	-1080.2	3.05	6.44	44.83	1434.4	332.6	629.0	2063.4	3.28	0.23	1346.2	717.2
684.2	169.5	-1079.3	3.23	6.48	44.91	1440.8	332.0	629.6	2070.4	3.29	0.23	1350.0	720.4
694.1	170.5	-1076.6	3.42	6.52	45.00	1447.2	330.1	631.5	2078.7	3.29	0.23	1355.1	723.6
702.1	171.7	-1077.3	3.57	6.57	45.07	1455.6	330.6	631.0	2086.6	3.31	0.23	1358.8	727.8
712.3	172.5	-1071.7	3.76	6.60	45.16	1460.9	326.8	634.8	2095.7	3.30	0.22	1365.3	730.4
721.9	173.5	-1074.9	3.93	6.64	45.24	1467.0	329.0	632.6	2099.6	3.32	0.22	1366.1	733.5
731.2	174.4	-1071.5	4.11	6.68	45.32	1472.5	326.6	635.0	2107.5	3.32	0.22	1371.2	736.2
740.0	175.3	-1072.3	4.27	6.72	45.40	1478.3	327.2	634.4	2112.7	3.33	0.22	1373.6	739.1
749.1	176.2	-1069.8	4.44	6.76	45.48	1484.2	325.4	636.2	2120.4	3.33	0.22	1378.3	742.1
758.6	177.2	-1068.8	4.62	6.80	45.56	1490.2	324.8	636.8	2127.1	3.34	0.22	1382.0	745.1
766.5	178.3	-1067.1	4.76	6.85	45.63	1498.5	323.6	638.0	2136.5	3.35	0.22	1387.3	749.3
776.2	179.2	-1063.1	4.94	6.89	45.72	1504.3	320.8	640.8	2145.1	3.35	0.21	1392.9	752.1
785.6	180.0	-1064.8	5.12	6.92	45.80	1508.4	322.0	639.6	2148.0	3.36	0.21	1393.8	754.2
794.2	180.6	-1058.9	5.28	6.95	45.88	1511.6	317.9	643.7	2155.3	3.35	0.21	1399.5	755.8
803.5	181.6	-1061.2	5.45	6.99	45.96	1517.7	319.5	642.1	2159.8	3.36	0.21	1400.9	758.9
812.6	182.0	-1057.6	5.62	7.00	46.05	1518.7	317.0	644.6	2163.3	3.36	0.21	1403.9	759.3
820.7	182.9	-1057.6	5.77	7.04	46.12	1524.2	317.0	644.6	2168.7	3.36	0.21	1406.7	762.1
829.8	183.8	-1055.0	5.94	7.08	46.20	1530.1	315.2	646.4	2176.5	3.37	0.21	1411.4	765.1
837.5	184.4	-1052.7	6.08	7.11	46.27	1532.9	313.7	647.9	2180.8	3.37	0.20	1414.4	766.4
847.1	185.3	-1051.7	6.26	7.14	46.36	1538.1	313.0	648.6	2186.7	3.37	0.20	1417.7	769.0
855.2	185.8	-1045.8	6.41	7.17	46.44	1540.5	308.9	652.7	2193.2	3.36	0.20	1422.9	770.2
864.4	186.5	-1048.1	6.58	7.20	46.52	1543.8	310.5	651.1	2195.0	3.37	0.20	1423.0	771.9
874.3	187.0	-1042.9	6.76	7.22	46.61	1544.9	306.9	654.7	2199.6	3.36	0.20	1427.1	772.4
886.1	188.0	-1044.3	6.98	7.26	46.72	1550.6	307.9	653.7	2204.4	3.37	0.20	1429.1	775.3
899.7	188.8	-1040.8	7.24	7.29	46.85	1553.2	305.4	656.2	2209.3	3.37	0.20	1432.7	776.6
909.4	189.9	-1040.3	7.42	7.34	46.94	1559.6	305.1	656.5	2216.1	3.38	0.20	1436.3	779.8
917.8	190.6	-1037.6	7.57	7.37	47.02	1563.7	303.2	658.4	2222.0	3.38	0.19	1440.2	781.8
927.2	191.3	-1035.9	7.75	7.40	47.11	1566.5	302.1	659.5	2226.1	3.38	0.19	1442.8	783.3
935.5	191.8	-1034.2	7.90	7.42	47.19	1568.9	300.9	660.7	2229.6	3.37	0.19	1445.1	784.4
945.3	192.5	-1030.2	8.08	7.45	47.28	1571.8	298.1	663.5	2235.2	3.37	0.19	1449.3	785.9
953.9	193.2	-1030.6	8.24	7.48	47.36	1574.7	298.4	663.2	2237.9	3.37	0.19	1450.6	787.4
963.4	193.7	-1025.4	8.42	7.50	47.45	1576.1	294.8	666.8	2242.9	3.36	0.19	1454.8	788.0
972.1	194.7	-1027.0	8.58	7.54	47.54	1582.6	295.9	665.7	2248.2	3.38	0.19	1456.9	791.3
980.9	195.2	-1022.9	8.74	7.56	47.62	1583.9	293.1	668.5	2252.4	3.37	0.19	1460.5	792.0
990.6	195.7	-1023.1	8.92	7.58	47.72	1585.3	293.2	668.4	2253.7	3.37	0.18	1461.0	792.7
998.9	196.3	-1019.8	9.08	7.61	47.80	1588.1	291.0	670.6	2258.7	3.37	0.18	1464.7	794.1
1008.6	197.2	-1018.7	9.26	7.65	47.89	1592.5	290.2	671.4	2263.9	3.37	0.18	1467.6	796.2
1016.6	198.0	-1016.6	9.41	7.68	47.97	1596.5	288.8	672.8	2269.3	3.37	0.18	1471.1	798.2
1026.1	198.7	-1012.6	9.58	7.71	48.07	1599.6	286.0	675.6	2275.2	3.37	0.18	1475.4	799.8
1036.0	199.2	-1013.4	9.77	7.73	48.16	1601.2	286.6	675.0	2276.2	3.37	0.18	1475.6	800.6
1045.6	199.6	-1008.5	9.94	7.75	48.26	1601.3	283.2	678.4	2279.7	3.36	0.18	1479.1	800.6
1054.9	200.5	-1009.8	10.12	7.79	48.35	1605.5	284.1	677.5	2283.1	3.37	0.18	1480.3	802.8
1063.8	200.9	-1006.0	10.28	7.80	48.44	1606.4	281.5	680.1	2286.5	3.36	0.18	1483.3	803.2
1073.5	201.5	-1005.8	10.46	7.83	48.54	1608.4	281.3	680.3	2288.7	3.36	0.17	1484.5	804.2
1083.8	202.2	-1003.1	10.65	7.86	48.64	1611.1	279.5	682.1	2293.2	3.36	0.17	1487.7	805.5
1106.0	202.8	-1001.3	11.07	7.88	48.87	1608.5	278.2	683.4	2291.8	3.35	0.17	1487.6	804.2
1152.6	203.5	-999.7	11.93	7.91	49.35	1598.2	277.1	684.5	2282.7	3.33	0.17	1483.6	799.1
1200.5	203.9	-994.6	12.82	7.93	49.85	1584.6	273.6	688.0	2272.6	3.30	0.17	1480.3	792.3
1225.0	204.6	-996.3	13.28	7.96	50.11	1582.2	274.8	686.8	2269.0	3.30	0.17	1477.9	791.1
1234.2	205.4	-992.6	13.45	8.00	50.21	1586.2	272.2	689.4	2275.5	3.30	0.17	1482.5	793.1

δL	LOAD	δU	E	LOAD	A_c	σ_0	δU	σ_3'	σ_1'	PSR	A	p'	q
(mV)	(mV)	(mV)	(%)	(kN)	(cm^2)	(kPa)	(kPa)	(kPa)	(kPa)			(kPa)	(kPa)
1244.7	206.1	-992.7	13.54	8.02	50.32	1588.3	272.3	689.3	2277.5	3.30	0.17	1483.5	794.1
1263.4	206.8	-990.1	13.99	8.05	50.53	1587.2	270.5	691.1	2278.3	3.30	0.17	1484.7	793.6
1272.7	207.7	-988.5	14.16	8.09	50.63	1591.3	269.4	692.2	2283.5	3.30	0.17	1487.9	795.5
1283.1	208.0	-987.0	14.35	8.10	50.74	1590.4	268.4	693.2	2283.6	3.29	0.17	1488.4	795.2
1292.8	208.5	-983.4	14.53	8.13	50.85	1591.4	265.9	695.7	2287.1	3.29	0.17	1491.4	795.7
1302.4	209.2	-983.6	14.71	8.16	50.96	1592.9	266.0	695.6	2289.5	3.29	0.17	1492.5	796.9
1311.7	209.7	-978.5	14.89	8.18	51.06	1594.3	262.5	699.1	2293.4	3.28	0.16	1496.3	797.1
1321.7	210.4	-980.4	15.07	8.21	51.17	1596.9	263.8	697.8	2294.7	3.29	0.17	1496.3	798.5
1332.5	210.9	-977.2	15.27	8.23	51.29	1597.0	261.6	700.0	2297.0	3.28	0.16	1498.5	798.5
1342.4	211.5	-976.0	15.46	8.25	51.40	1598.0	260.8	700.8	2298.9	3.28	0.16	1499.8	799.0
1352.6	212.0	-974.5	15.64	8.27	51.52	1598.8	259.7	701.9	2300.6	3.28	0.16	1501.3	799.4
1362.6	212.5	-971.7	15.83	8.30	51.63	1599.4	257.8	703.8	2303.2	3.27	0.16	1503.5	799.7
1372.8	213.5	-971.5	16.02	8.33	51.75	1602.2	257.7	703.9	2307.1	3.28	0.16	1505.5	801.6
1382.4	213.6	-966.8	16.20	8.34	51.86	1600.8	254.4	707.2	2308.0	3.26	0.16	1507.6	800.4
1393.5	212.7	-967.9	16.40	8.30	51.99	1589.1	255.2	706.4	2295.5	3.25	0.16	1501.0	794.6
1404.3	213.5	-964.9	16.60	8.34	52.11	1591.8	253.1	708.5	2300.3	3.25	0.16	1504.4	795.9
1414.4	212.6	-964.4	16.79	8.30	52.23	1581.4	252.8	708.8	2290.3	3.23	0.16	1499.5	790.7
1423.8	212.8	-962.1	16.97	8.31	52.34	1579.1	251.2	710.4	2289.5	3.22	0.16	1499.9	789.5
1433.7	213.0	-960.6	17.15	8.31	52.46	1577.0	250.2	711.4	2288.5	3.22	0.16	1500.0	788.5
1443.2	213.2	-959.1	17.33	8.33	52.57	1575.3	249.1	712.5	2288.3	3.21	0.16	1500.4	787.9
1452.1	213.9	-955.5	17.49	8.35	52.67	1578.0	246.6	715.0	2293.0	3.21	0.16	1504.0	789.0
1462.1	214.5	-956.3	17.68	8.38	52.79	1579.2	247.2	714.4	2293.7	3.21	0.16	1504.1	789.7
1471.7	215.3	-951.7	17.86	8.41	52.91	1582.2	244.0	717.6	2299.8	3.20	0.15	1508.7	791.1
1480.7	216.9	-952.8	18.02	8.48	53.01	1591.5	244.8	716.8	2308.3	3.22	0.15	1512.6	795.7
1490.8	219.0	-950.2	18.21	8.57	53.14	1604.1	243.0	718.6	2322.7	3.23	0.15	1520.6	802.0
1500.1	220.0	-949.2	18.38	8.61	53.25	1609.0	242.3	719.3	2328.3	3.24	0.15	1523.8	804.5
1510.3	220.5	-947.5	18.57	8.63	53.37	1608.6	241.1	720.5	2329.0	3.23	0.15	1524.8	804.3
1520.0	221.0	-944.2	18.75	8.65	53.49	1609.3	238.8	722.8	2332.1	3.23	0.15	1527.4	804.7
1530.0	221.7	-944.0	18.94	8.68	53.61	1610.8	238.7	722.9	2333.7	3.23	0.15	1528.3	805.4
1538.9	222.8	-939.5	19.10	8.73	53.72	1616.4	235.6	726.0	2342.4	3.23	0.15	1534.2	808.2
1549.3	222.4	-941.3	19.30	8.71	53.85	1608.9	236.8	724.8	2333.7	3.22	0.15	1529.2	804.5
1558.3	223.3	-937.8	19.46	8.75	53.96	1612.3	234.4	727.2	2339.5	3.22	0.15	1533.3	806.2
1568.4	224.3	-937.8	19.65	8.79	54.09	1616.7	234.4	727.2	2343.9	3.22	0.15	1535.5	808.4
1578.4	225.7	-935.3	19.84	8.85	54.21	1623.4	232.7	728.9	2352.3	3.23	0.14	1540.6	811.7
1588.0	226.3	-933.7	20.02	8.88	54.34	1624.3	231.6	730.0	2354.3	3.23	0.14	1542.1	812.2
1598.1	226.0	-932.5	20.20	8.87	54.46	1618.8	230.8	730.8	2349.6	3.21	0.14	1540.2	809.4
1607.6	226.1	-929.2	20.38	8.87	54.58	1615.7	228.5	733.1	2348.8	3.20	0.14	1540.9	807.8
1617.6	226.3	-929.2	20.57	8.88	54.71	1612.8	228.5	733.1	2345.9	3.20	0.14	1539.5	806.4
1627.1	226.6	-924.3	20.74	8.89	54.83	1612.2	225.1	736.5	2348.6	3.19	0.14	1542.6	806.1
1637.4	227.5	-926.0	20.93	8.93	54.97	1614.5	226.3	735.3	2349.8	3.20	0.14	1542.6	807.3
1646.7	228.2	-922.8	21.11	8.96	55.09	1616.8	224.1	737.5	2354.3	3.19	0.14	1545.9	808.4
1656.9	228.8	-922.3	21.30	8.99	55.22	1617.4	223.7	737.9	2355.3	3.19	0.14	1546.6	808.7
1666.2	229.6	-920.2	21.47	9.02	55.34	1619.7	222.3	739.3	2359.0	3.19	0.14	1549.1	809.8
1676.2	229.7	-918.8	21.65	9.02	55.47	1616.7	221.3	740.3	2357.0	3.18	0.14	1548.6	808.4
1686.0	229.4	-917.3	21.84	9.01	55.60	1610.3	220.3	741.3	2351.6	3.17	0.14	1546.4	805.1
1695.0	229.3	-913.6	22.00	9.01	55.72	1606.0	217.7	743.9	2349.9	3.16	0.14	1546.9	803.0
1705.1	229.9	-914.5	22.19	9.03	55.85	1606.2	218.4	743.2	2349.5	3.16	0.14	1546.4	803.1
1714.8	230.4	-910.2	22.37	9.05	55.98	1606.7	215.4	746.2	2352.9	3.15	0.13	1549.6	803.4
1724.4	231.3	-911.3	22.55	9.09	56.11	1609.7	216.2	745.4	2355.1	3.16	0.13	1550.3	804.9
1734.1	231.4	-908.3	22.73	9.09	56.24	1606.3	214.1	747.5	2353.8	3.15	0.13	1550.7	803.2
1743.6	232.4	-908.0	22.90	9.13	56.37	1609.8	213.9	747.7	2357.5	3.15	0.13	1552.6	804.9
1752.5	234.0	-905.7	23.07	9.20	56.49	1618.6	212.3	749.3	2367.9	3.16	0.13	1558.6	809.3
1762.3	234.9	-903.9	23.25	9.24	56.63	1621.2	211.1	750.5	2371.9	3.16	0.13	1561.2	810.6
1772.2	234.8	-902.9	23.44	9.24	56.76	1616.6	210.4	751.2	2367.8	3.15	0.13	1559.5	808.3
1780.7	236.1	-898.8	23.59	9.29	56.88	1622.6	207.5	754.1	2376.7	3.15	0.13	1565.4	811.3

Consolidated Undrained Triaxial Compression Test on Cohesive Soils
ASTM D 4767-88

Figure





PROJECT No 1018A DRAWN LL REVIEWED DATE 03/13/95

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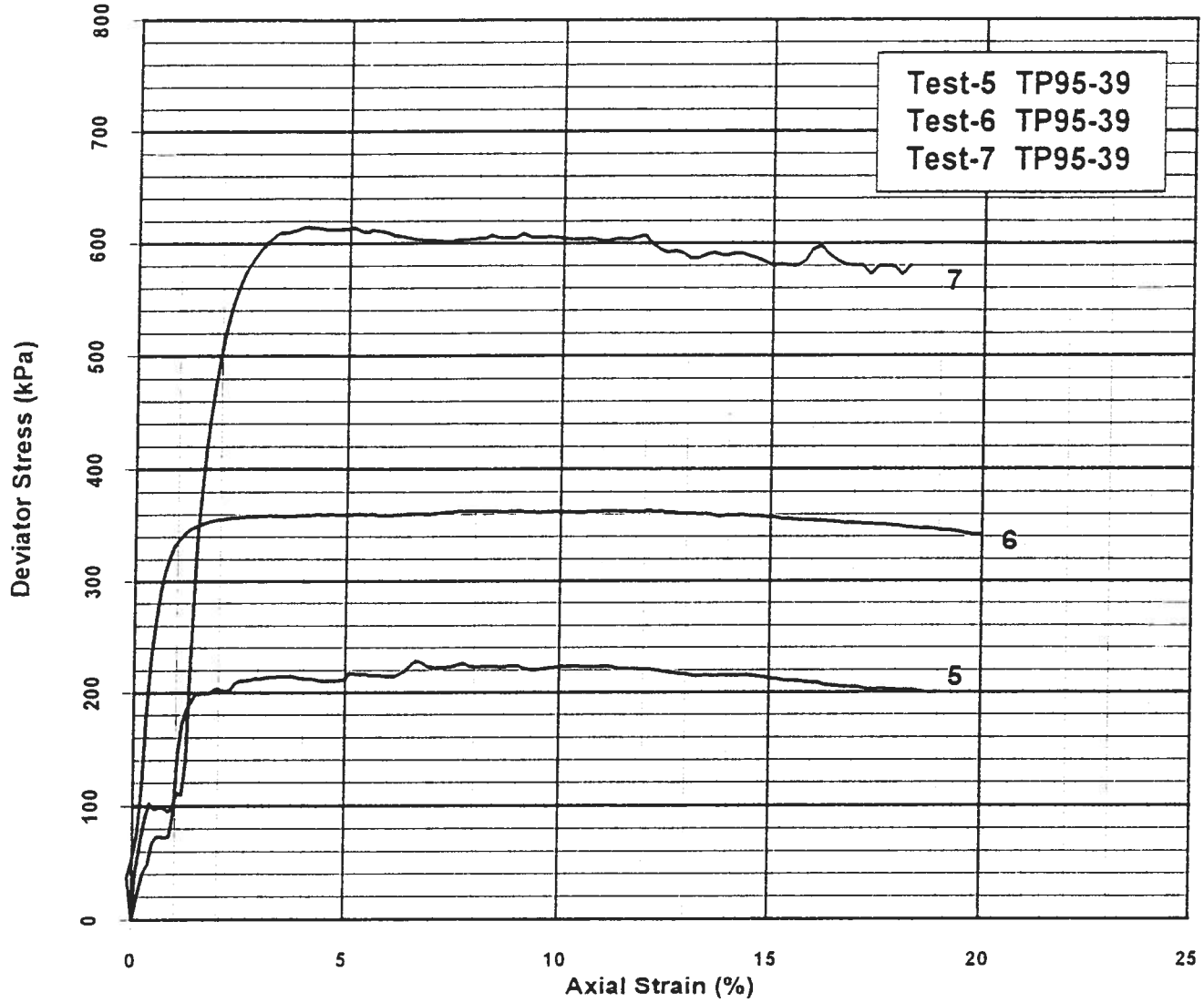
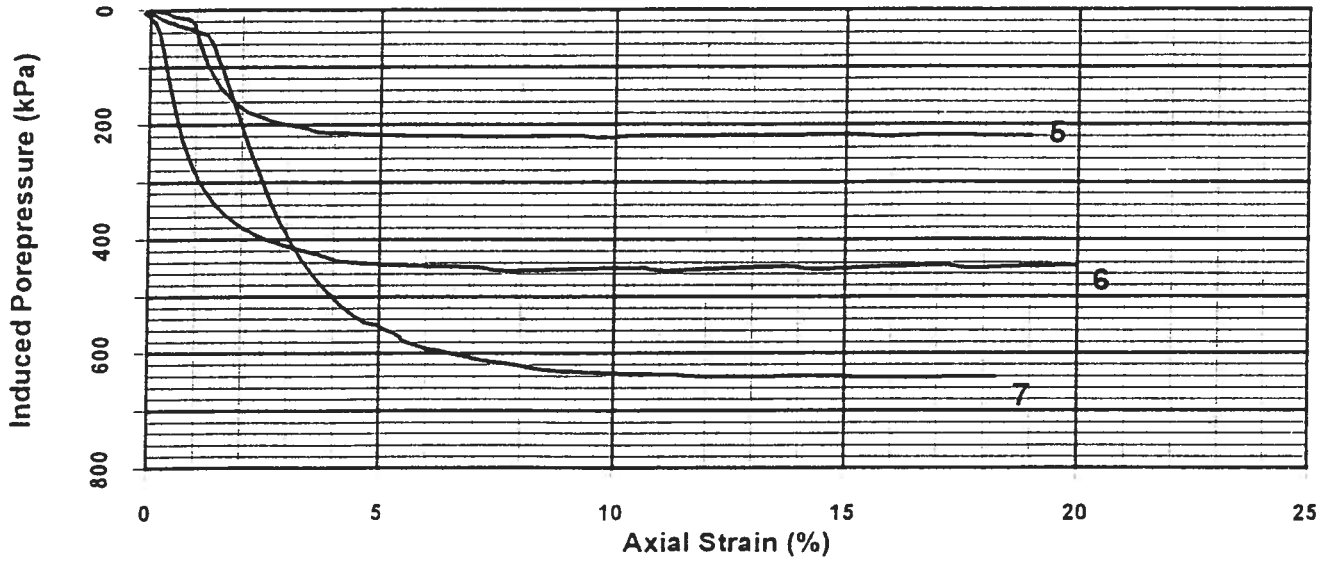
Consolidated Undrained Triaxial Compression Test on Cohesive Soils
ASTM D 4767-88

Figure





PROJECT No. 9...1018 DRAWN LL REVIEWED DATE 03/13/95

Golder Associates

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

Consolidated Undrained Triaxial Compression Test on Cohesive Soils

ASTM D 4767 - 88

PROJECT#	352-018		L_c =	14.81	cm	DATE	13-Mar-95		Strength Results			Density: (Kg/M³)	
Test Pit	TP95-29		A_c =	44.25	cm²	FILE	3x-200.xls		Max. σ_D' =	228.2	kPa	γ =	1693
Sample			V_c =	652.1	cm³	TEST#	210-5		Strain @ =	5.63	%	γ_d =	1503
Depth									Max. PSR =	4.06		E_s =	2.520
									Strain @ =	9.62	%	E_s =	2.531
REMARKS:		Consolidation Pressure				CALIBRATIONS			Consolidation Results:			Water Contents:	
- Failure Mode: Bulging			CP =	776.1	kPa	LOAD =	1.0036	kN/mV	δV_c =	42.2	cc	W =	19.2
- Minus 19.5 mm material			SP =	482.1	kPa	PORE =	0.5835	kPa/mV	T_{50} =	23.1	min	W_c =	18.2
- Corrections applied for membrane			σ_{3c}' =	295.9	kPa	LVDT =	0.0235	mm/mV	C_v =	2.2E-02	cm²/s		
			B_{value} =	0.955		Feed Rate =	0.300	mm/min					

δL (mV)	LOAD (mV)	δU (mV)	ε (%)	LOAD (kN)	A_c (cm²)	σ_D' (kPa)	δU (kPa)	σ_3' (kPa)	σ_1' (kPa)	PSR	A	p' (kPa)	q (kPa)
509.7	104.7	-700.8	0.00	0.00	44.09	0.0	0.0	295.9	295.9	1.00		295.9	0.0
513.3	117.2	-700.9	0.07	0.05	44.12	10.2	0.1	295.9	306.1	1.03	0.01	301.0	5.1
518.2	139.2	-703.6	0.16	0.12	44.18	28.1	1.9	294.0	322.1	1.10	0.07	308.1	14.0
523.3	156.2	-706.4	0.26	0.16	44.20	41.9	2.9	292.1	333.9	1.14	0.09	313.0	20.9
528.5	165.2	-709.1	0.36	0.22	44.25	49.1	5.7	290.2	339.3	1.17	0.12	314.8	24.6
533.5	188.4	-715.3	0.46	0.30	44.29	67.8	10.0	285.9	353.8	1.24	0.15	319.9	33.9
538.7	194.8	-718.6	0.56	0.32	44.34	72.9	12.3	283.7	356.6	1.26	0.17	320.1	36.5
544.1	194.9	-719.9	0.66	0.32	44.38	72.9	13.2	282.8	355.7	1.26	0.18	319.2	36.4
549.4	193.7	-722.4	0.76	0.32	44.43	71.8	14.9	281.0	352.8	1.26	0.21	316.9	35.9
554.6	195.7	-726.0	0.86	0.32	44.47	72.3	17.4	278.6	351.9	1.26	0.24	315.2	36.7
559.5	222.8	-738.3	0.96	0.43	44.51	95.1	25.9	270.1	365.1	1.35	0.27	317.6	47.5
564.2	283.4	-772.8	1.05	0.64	44.56	143.9	49.6	246.3	390.2	1.58	0.34	318.2	71.9
569.4	318.7	-807.9	1.15	0.77	44.60	172.2	73.8	222.1	394.3	1.78	0.43	308.2	86.1
574.5	334.5	-837.8	1.25	0.82	44.65	184.8	94.5	201.5	386.2	1.92	0.51	293.9	92.4
579.7	344.2	-863.0	1.35	0.85	44.69	192.3	111.8	184.1	376.4	2.04	0.58	280.3	96.2
585.1	352.1	-883.2	1.45	0.88	44.74	198.5	125.8	170.2	368.6	2.17	0.62	269.4	99.2
590.5	352.3	-900.2	1.55	0.88	44.78	198.4	137.5	158.5	356.8	2.25	0.69	257.6	99.2
595.8	354.4	-914.2	1.66	0.90	44.83	199.8	147.1	148.8	348.6	2.34	0.74	248.7	99.9
601.1	353.5	-926.1	1.76	0.90	44.88	198.8	155.3	140.6	339.4	2.41	0.78	240.0	99.4
606.5	357.8	-936.2	1.86	0.91	44.93	202.0	162.3	133.6	335.6	2.51	0.80	234.6	101.0
611.8	360.0	-945.0	1.96	0.92	44.97	203.5	168.4	127.6	331.1	2.60	0.83	229.3	101.8
616.9	358.7	-952.5	2.06	0.91	45.02	202.2	173.5	122.4	324.6	2.65	0.86	223.5	101.1
622.2	357.6	-959.2	2.16	0.91	45.06	201.1	178.2	117.8	318.9	2.71	0.89	218.3	100.5
627.7	359.6	-965.0	2.27	0.92	45.11	202.4	182.2	113.8	316.2	2.78	0.90	215.0	101.2
633.2	366.4	-970.1	2.38	0.94	45.16	207.6	185.7	110.3	317.8	2.88	0.89	214.0	103.8
638.4	369.4	-974.6	2.48	0.95	45.21	209.7	188.8	107.2	316.8	2.96	0.90	212.0	104.8
643.7	370.3	-978.6	2.58	0.96	45.26	210.1	191.5	104.4	314.5	3.01	0.91	209.5	105.1
649.2	371.7	-982.2	2.68	0.96	45.30	211.0	194.0	101.9	312.9	3.07	0.92	207.4	105.5
654.5	372.6	-985.6	2.79	0.96	45.35	211.4	196.4	99.6	311.0	3.12	0.93	205.3	105.7
659.7	374.4	-988.4	2.89	0.97	45.40	212.5	198.3	97.6	310.2	3.18	0.93	203.9	106.3
665.3	374.4	-991.3	2.99	0.97	45.45	212.3	200.3	95.6	307.9	3.22	0.94	201.8	106.1
670.7	375.7	-993.8	3.10	0.98	45.50	213.0	202.0	93.9	307.0	3.27	0.95	200.4	106.5
676.0	375.9	-996.4	3.20	0.98	45.55	212.7	203.8	92.1	305.8	3.32	0.95	199.0	106.9
681.4	377.3	-998.9	3.30	0.98	45.59	213.8	205.5	90.4	304.2	3.36	0.96	197.3	106.9
686.7	377.9	-1001.3	3.41	0.98	45.64	214.0	207.2	88.7	302.7	3.41	0.97	195.7	107.0
691.9	378.5	-1006.1	3.51	0.99	45.69	214.2	210.5	85.4	299.6	3.51	0.98	192.5	107.1
697.3	378.8	-1008.4	3.61	0.99	45.74	214.1	212.1	83.8	298.0	3.55	0.99	190.9	107.1
702.7	380.0	-1009.5	3.71	0.99	45.79	214.8	212.8	83.1	297.9	3.58	0.99	190.5	107.4
707.8	379.1	-1010.8	3.81	0.99	45.84	213.8	213.7	82.2	296.0	3.60	1.00	189.1	106.9
713.2	378.1	-1012.0	3.92	0.98	45.89	212.7	214.6	81.4	294.1	3.61	1.01	187.7	106.4
718.3	377.3	-1012.7	4.01	0.98	45.93	211.9	215.1	80.9	292.7	3.62	1.02	186.8	105.9
723.6	377.9	-1012.0	4.12	0.98	45.98	212.1	214.6	81.4	293.4	3.61	1.01	187.4	106.0
728.8	378.1	-1012.0	4.22	0.98	46.03	211.9	214.6	81.4	293.3	3.60	1.01	187.2	106.0
734.0	377.1	-1012.7	4.32	0.98	46.08	210.9	215.1	80.9	291.8	3.61	1.02	186.3	105.4
739.1	375.0	-1013.5	4.41	0.98	46.12	209.8	215.6	80.3	290.1	3.61	1.03	185.2	104.9
744.3	376.3	-1014.2	4.51	0.98	46.17	209.7	216.1	79.9	289.6	3.63	1.03	184.7	104.9
749.3	376.9	-1014.8	4.61	0.98	46.22	209.9	216.5	79.4	289.4	3.64	1.03	184.4	105.0
754.5	377.1	-1015.4	4.71	0.98	46.27	209.8	216.9	79.0	288.9	3.66	1.03	183.9	104.9
759.7	378.4	-1016.0	4.81	0.99	46.32	210.5	217.3	78.6	289.2	3.68	1.03	183.9	105.3
764.7	379.3	-1016.5	4.91	0.99	46.36	211.0	217.7	78.3	289.3	3.70	1.03	183.3	105.5
769.9	381.8	-1016.9	5.01	1.00	46.41	212.7	218.0	78.0	290.7	3.73	1.02	184.3	106.3
774.6	387.7	-1017.3	5.10	1.02	46.46	217.0	218.2	77.7	294.7	3.79	1.01	186.2	108.5
779.7	387.5	-1017.9	5.20	1.02	46.50	216.5	218.6	77.3	293.9	3.80	1.01	185.6	108.3
784.7	386.8	-1018.0	5.29	1.02	46.55	215.8	218.7	77.2	293.0	3.79	1.01	185.1	107.9
789.7	387.5	-1018.6	5.39	1.02	46.60	216.1	219.1	76.8	292.9	3.81	1.01	184.3	108.0
794.7	388.0	-1019.0	5.48	1.02	46.65	216.2	219.4	76.5	292.7	3.82	1.01	184.6	108.1
799.7	386.3	-1019.0	5.58	1.01	46.69	214.6	219.4	76.5	291.1	3.80	1.02	183.8	107.3
804.7	387.2	-1019.4	5.68	1.02	46.74	215.0	219.7	76.3	291.3	3.82	1.02	183.8	107.5
809.7	388.0	-1019.6	5.77	1.02	46.79	215.4	219.8	76.1	291.5	3.83	1.02	183.8	107.7
814.7	387.5	-1019.8	5.87	1.02	46.84	214.7	220.0	76.0	290.7	3.83	1.02	183.4	107.4
819.6	387.1	-1020.1	5.96	1.02	46.88	214.2	220.2	75.8	289.9	3.83	1.03	182.9	107.1
824.5	387.2	-1020.3	6.06	1.02	46.93	214.0	220.3	75.6	289.6	3.83	1.03	182.6	107.0
829.6	387.5	-1020.3	6.16	1.02	46.98	213.9	220.3	75.6	289.6	3.83	1.03	182.6	107.0
834.5	390.5	-1020.5	6.25	1.03	47.03	216.0	220.4	75.5	291.5	3.86	1.02	183.5	108.0
839.5	394.0	-1020.7	6.35	1.04	47.08	218.4	220.6	75.4	293.7	3.90	1.01	184.6	109.2
844.4	398.2	-1020.9	6.44	1.06	47.12	221.3	220.7	75.2	296.5	3.94	1.00	185.9	110.7
849.4	403.5	-1021.1	6.54	1.08	47.17	225.1	220.8	75.1	300.2	4.00	0.98	187.6	112.5
854.5	408.0	-1021.1	6.63	1.09	47.22	228.2	220.8	75.1	303.3	4.04	0.97	189.2	114.1
859.4	407.1	-1021.1	6.73	1.09	47.27	227.3	220.8	75.1	302.4	4.03	0.97	188.7	113.6

SL	LOAD	SU	E	LOAD	A_c	σ_0	SU	σ_3	σ_1	PSR	A	p'	q
(mV)	(mV)	(mV)	(%)	(kN)	(cm²)	(kPa)	(kPa)	(kPa)	(kPa)			(kPa)	(kPa)
364.4	404.8	-1021.3	6.82	1.08	47.32	225.2	221.0	75.2	300.2	4.01	0.98	187.6	112.6
369.3	402.3	-1021.3	6.82	1.07	47.37	223.1	221.0	75.2	298.0	3.98	0.99	186.5	111.5
374.2	401.3	-1021.5	7.02	1.07	47.41	222.2	221.1	74.8	296.8	3.97	1.00	185.8	111.0
379.4	401.4	-1021.8	7.11	1.07	47.46	221.8	221.1	74.8	296.6	3.96	1.00	185.7	110.9
384.2	401.7	-1021.5	7.21	1.07	47.51	221.9	221.1	74.8	296.6	3.96	1.00	185.7	110.9
389.2	402.6	-1021.5	7.30	1.07	47.56	222.2	221.1	74.8	297.0	3.97	1.00	185.9	111.1
394.4	403.8	-1021.5	7.40	1.08	47.61	222.8	221.1	74.8	297.6	3.98	0.99	186.2	111.4
399.2	404.5	-1021.2	7.49	1.08	47.66	222.7	221.0	75.0	298.0	3.98	0.99	186.5	111.5
404.0	405.7	-1021.5	7.59	1.09	47.71	224.9	221.1	74.8	299.9	4.00	0.99	187.0	112.2
408.9	408.5	-1021.5	7.68	1.09	47.76	225.6	221.1	75.0	300.4	4.01	0.98	187.6	112.8
413.9	408.9	-1021.3	7.78	1.10	47.81	225.6	221.0	75.0	300.6	4.01	0.98	187.7	112.8
918.8	406.4	-1021.2	7.87	1.09	47.86	223.4	221.0	75.0	298.4	3.98	0.99	186.7	111.7
923.8	406.0	-1021.3	7.97	1.08	47.91	222.8	221.0	75.0	297.8	3.97	0.99	186.4	111.4
928.7	406.1	-1021.2	8.06	1.09	47.95	222.6	221.0	75.0	297.6	3.97	0.99	186.3	111.3
933.5	407.0	-1021.1	8.15	1.09	48.00	223.0	220.8	75.1	298.1	3.97	0.99	186.6	111.5
938.5	407.9	-1021.1	8.25	1.09	48.05	223.4	220.8	75.1	298.5	3.98	0.99	186.8	111.7
943.6	407.7	-1020.9	8.35	1.09	48.10	222.9	220.7	75.2	298.2	3.96	0.99	186.7	111.5
948.6	408.8	-1021.1	8.44	1.09	48.15	223.5	220.8	75.1	298.6	3.98	0.99	186.9	111.8
953.7	408.3	-1020.9	8.54	1.09	48.21	222.9	220.7	75.2	298.1	3.96	0.99	186.7	111.4
958.8	408.2	-1020.9	8.64	1.09	48.26	222.5	220.7	75.2	297.7	3.96	0.99	186.5	111.2
963.9	409.1	-1020.9	8.74	1.10	48.31	222.9	220.7	75.2	298.1	3.96	0.99	186.7	111.4
968.8	410.8	-1020.7	8.83	1.10	48.36	223.9	220.6	75.4	299.2	3.97	0.99	187.3	111.9
973.9	410.8	-1020.5	8.93	1.10	48.41	223.6	220.4	75.5	299.1	3.96	0.99	187.3	111.8
979.0	411.4	-1020.5	9.02	1.10	48.46	223.7	220.4	75.5	299.2	3.96	0.99	187.4	111.9
984.2	409.4	-1020.5	9.13	1.10	48.52	222.0	220.4	75.5	297.5	3.94	0.99	186.5	111.0
989.3	408.2	-1020.7	9.23	1.09	48.57	220.8	220.6	75.4	296.1	3.92	1.00	185.8	110.4
994.4	407.7	-1021.1	9.22	1.09	48.62	220.1	220.8	75.1	295.2	3.93	1.00	185.2	110.1
999.6	407.6	-1021.5	9.43	1.09	48.68	219.8	221.1	74.8	294.6	3.94	1.01	184.7	109.9
1004.7	408.6	-1023.5	9.52	1.09	48.73	220.2	222.5	73.4	293.6	4.00	1.01	183.5	110.1
1009.8	410.2	-1025.2	9.62	1.10	48.78	221.1	223.7	72.3	293.4	4.06	1.01	182.8	110.5
1015.0	411.5	-1025.0	9.72	1.10	48.84	221.8	223.5	72.4	294.2	4.06	1.01	183.3	110.9
1020.1	412.3	-1024.8	9.82	1.11	48.89	222.1	223.4	72.5	294.6	4.06	1.01	183.6	111.0
1025.3	413.0	-1024.8	9.92	1.11	48.94	222.3	223.3	72.7	295.0	4.06	1.00	183.8	111.1
1030.7	414.5	-1023.8	10.02	1.12	49.00	223.1	222.7	73.2	296.3	4.05	1.00	184.3	111.5
1035.8	414.9	-1021.8	10.12	1.12	49.05	222.1	221.3	74.8	297.7	3.99	0.99	186.1	111.5
1041.1	415.1	-1021.3	10.22	1.12	49.11	222.9	221.0	75.0	297.9	3.97	0.99	186.4	111.5
1046.2	416.4	-1021.1	10.22	1.12	49.16	223.6	220.8	75.1	298.7	3.98	0.99	186.9	111.8
1051.5	416.7	-1020.7	10.42	1.12	49.22	223.5	220.6	75.4	298.9	3.97	0.99	187.1	111.7
1056.3	416.4	-1020.9	10.52	1.12	49.27	223.0	220.7	75.2	298.2	3.96	0.99	186.7	111.5
1061.8	416.2	-1020.5	10.62	1.12	49.33	222.5	220.4	75.5	298.0	3.95	0.99	186.8	111.3
1067.0	416.4	-1020.3	10.72	1.12	49.38	222.4	220.3	75.6	298.0	3.94	0.99	186.8	111.2
1072.2	416.7	-1020.5	10.82	1.12	49.44	222.3	220.4	75.5	297.8	3.94	0.99	186.6	111.1
1077.5	417.7	-1020.3	10.92	1.13	49.50	222.7	220.2	75.6	298.4	3.94	0.99	187.0	111.4
1082.7	418.6	-1020.3	11.02	1.13	49.55	223.1	220.2	75.6	298.7	3.95	0.99	187.2	111.5
1087.9	418.7	-1020.1	11.13	1.13	49.61	222.8	220.2	75.8	298.6	3.94	0.99	187.2	111.4
1093.2	419.0	-1020.1	11.23	1.13	49.66	222.7	220.2	75.8	298.5	3.94	0.99	187.2	111.4
1098.5	418.4	-1019.9	11.33	1.13	49.72	222.0	220.0	75.9	297.9	3.92	0.99	186.9	111.0
1103.7	418.0	-1019.9	11.43	1.13	49.78	221.4	220.0	75.9	297.3	3.92	0.99	186.6	110.7
1109.0	418.6	-1019.8	11.53	1.13	49.83	221.5	220.0	76.0	297.5	3.92	0.99	186.8	110.8
1114.4	417.8	-1019.6	11.63	1.13	49.89	220.6	219.8	76.1	296.8	3.90	1.00	186.4	110.3
1119.5	418.3	-1019.6	11.73	1.13	49.95	220.7	219.8	76.1	296.8	3.90	1.00	186.5	110.4
1124.7	419.0	-1019.4	11.83	1.13	50.01	220.9	219.7	76.3	297.2	3.90	0.99	186.7	110.5
1129.9	419.5	-1019.4	11.93	1.13	50.06	221.0	219.7	76.3	297.2	3.90	0.99	186.7	110.5
1135.2	419.2	-1019.2	12.04	1.13	50.12	220.4	219.5	76.4	296.8	3.89	1.00	186.6	110.2
1140.5	419.9	-1019.4	12.14	1.13	50.18	220.5	219.7	76.2	296.9	3.89	1.00	186.6	110.3
1145.7	418.9	-1019.0	12.24	1.13	50.24	219.6	219.4	76.5	296.2	3.87	1.00	186.3	109.8
1150.8	419.7	-1019.0	12.34	1.13	50.29	219.9	219.4	76.5	296.4	3.87	1.00	186.5	109.9
1156.2	418.4	-1019.0	12.44	1.13	50.35	218.6	219.4	76.5	295.2	3.86	1.00	185.9	109.3
1161.3	418.0	-1019.0	12.54	1.13	50.41	218.1	219.4	76.5	294.6	3.85	1.01	185.6	109.0
1166.6	417.7	-1018.8	12.64	1.13	50.47	217.8	219.3	76.7	294.2	3.84	1.01	185.5	108.8
1171.8	417.8	-1018.8	12.74	1.13	50.52	217.3	219.3	76.7	294.0	3.83	1.01	185.3	108.7
1177.1	417.0	-1018.6	12.84	1.12	50.58	216.4	219.1	76.8	293.3	3.82	1.01	185.0	108.2
1182.3	417.1	-1018.6	12.94	1.12	50.64	216.2	219.1	76.8	293.0	3.81	1.01	184.9	108.1
1187.6	417.4	-1018.4	13.04	1.13	50.70	216.1	219.0	77.0	293.1	3.81	1.01	185.0	108.1
1192.7	416.7	-1018.4	13.14	1.12	50.76	215.3	219.0	77.0	292.3	3.80	1.02	184.6	107.7
1198.0	415.8	-1018.2	13.24	1.12	50.82	214.4	218.8	77.1	291.5	3.78	1.02	184.2	107.2
1203.1	416.1	-1018.4	13.34	1.12	50.88	214.3	219.0	77.0	291.3	3.78	1.02	184.1	107.1
1208.4	417.7	-1018.0	13.44	1.13	50.94	215.1	218.7	77.2	292.4	3.79	1.02	184.8	107.6
1213.6	417.7	-1018.0	13.54	1.13	50.99	214.8	218.7	77.2	292.1	3.78	1.02	184.6	107.4
1218.7	418.0	-1018.0	13.64	1.13	51.05	214.7	218.7	77.2	292.0	3.78	1.02	184.6	107.4
1224.0	418.3	-1017.9	13.74	1.13	51.11	214.6	218.6	77.3	291.9	3.78	1.02	184.6	107.3
1229.2	419.3	-1017.9	13.84	1.13	51.17	215.0	218.6	77.3	292.3	3.78	1.02	184.8	107.5
1234.4	419.6	-1017.9	13.94	1.13	51.23	215.0	218.6	77.3	292.2	3.78	1.02	184.8	107.5
1239.6	419.7	-1017.9	14.04	1.13	51.29	214.7	218.6	77.3	292.0	3.78	1.02	184.7	107.4
1244.7	420.9	-1017.7	14.14	1.14	51.35	215.3	218.5	77.4	292.7	3.78	1.02	185.1	107.6
1249.9	420.5	-1017.7	14.24	1.14	51.41	214.7	218.5	77.4	292.1	3.77	1.02	184.8	107.3
1255.1	421.2	-1017.7	14.24	1.14	51.47	214.9	218.5	77.4	292.3	3.77	1.02	184.9	107.4
1260.2	422.2	-1017.7	14.44	1.14	51.53	215.3	218.5	77.4	292.7	3.78	1.02	185.1	107.6
1265.5	422.5	-1017.7	14.54	1.14	51.59	215.2	218.5	77.4	292.6	3.78	1.02	185.0	107.6
1270.6	422.4	-1017.5	14.64	1.14	51.65	214.3	218.4	77.6	292.4	3.77	1.02	185.0	107.4
1275.8	422.1	-1017.7	14.74	1.14	51.71	214.3	218.5	77.4	291.7	3.77	1.02	184.6	107.1
1280.9	421.8	-1017.7	14.84	1.14	51.77	213.8	218.5	77.4	291.2	3.76	1.02	184.3	106.9
1286.0	421.0	-1017.5	14.94	1.14	51.83	212.9	218.4	77.6	290.5	3.74	1.03	184.0	106.5
1291.2	420.2	-1017.5	15.04	1.14	51.89	212.1	218.4	77.6	289.6	3.73	1.03	183.6	106.0
1296.3	420.5	-1017.5	15.13	1.14	51.95	212.0	218.4	77.6	289.5	3.73	1.03	183.6	106.0
1301.4	420.2	-1017.5	15.23	1.14	52.01	211.5	218.4	77.6	289.0	3.73	1.03	183.3	105.7
1306.6	419.6	-1017.9	15.33	1.13	52.07	210.7	218.6	77.3	288.0	3.73	1.04	182.7	105.4
1311.7	419.0	-1018.2	15.43	1.13	52.13	210.0	218.8	77.1	287.1	3.72	1.04	182.1	105.0

δL	LOAD	δU	E	LOAD	A_c	σ_0'	δU	σ_3	σ_1'	PSR	A	p'	q
(mV)	(mV)	(mV)	(%)	(kN)	(cm^2)	(kPa)	(kPa)	(kPa)	(kPa)			(kPa)	(kPa)
1316.9	419.5	-1018.4	15.53	1.13	52.19	210.1	219.0	77.0	287.0	2.73	1.04	182.0	105.0
1322.1	419.6	-1019.9	15.63	1.13	52.26	209.8	220.0	75.9	285.3	3.76	1.05	180.8	104.9
1327.3	419.9	-1022.2	15.73	1.13	52.32	209.7	221.5	74.3	284.1	3.82	1.06	179.2	104.9
1332.4	418.9	-1022.6	15.83	1.13	52.38	208.8	221.9	74.1	282.9	3.82	1.06	178.4	104.4
1337.5	419.2	-1022.4	15.93	1.13	52.44	208.7	221.7	74.2	282.9	3.81	1.06	178.5	104.3
1342.5	419.0	-1022.4	16.02	1.13	52.50	208.2	221.7	74.2	282.4	3.81	1.06	178.2	104.1
1347.8	420.8	-1021.1	16.13	1.14	52.56	208.2	220.8	75.1	284.3	3.79	1.06	179.7	104.6
1352.9	419.0	-1019.6	16.22	1.13	52.63	207.6	219.8	75.1	283.8	3.73	1.06	179.9	103.8
1358.5	417.3	-1019.4	16.33	1.13	52.69	206.2	219.7	75.3	282.4	3.70	1.07	179.3	103.1
1363.6	418.0	-1019.4	16.43	1.13	52.76	206.3	219.7	75.3	282.6	3.71	1.06	179.4	103.2
1368.5	417.8	-1019.2	16.52	1.13	52.82	205.9	219.5	75.4	282.3	3.70	1.07	179.4	103.0
1373.8	418.0	-1019.2	16.63	1.13	52.88	205.7	219.5	76.4	282.1	3.69	1.07	179.3	102.9
1378.6	417.1	-1019.2	16.72	1.12	52.94	204.9	219.5	76.4	281.3	3.68	1.07	178.3	102.4
1383.8	418.1	-1019.2	16.82	1.13	53.00	205.2	219.5	76.4	281.6	3.69	1.07	179.0	102.6
1389.2	418.1	-1019.0	16.92	1.13	53.07	204.9	219.4	76.5	281.5	3.68	1.07	179.0	102.5
1395.2	418.7	-1019.2	17.04	1.13	53.14	205.0	219.5	76.4	281.4	3.68	1.07	178.9	102.5
1400.4	418.7	-1019.2	17.14	1.13	53.21	204.7	219.5	76.4	281.1	3.68	1.07	178.7	102.3
1405.1	417.3	-1019.0	17.23	1.13	53.26	203.5	219.4	76.5	280.0	3.66	1.08	178.3	101.7
1410.8	417.1	-1019.2	17.34	1.12	53.34	203.0	219.5	76.4	279.4	3.66	1.08	177.9	101.5
1416.2	417.3	-1019.2	17.44	1.13	53.40	202.8	219.5	76.4	279.2	3.65	1.08	177.8	101.4
1421.2	418.6	-1019.0	17.54	1.13	53.47	203.4	219.4	76.5	279.9	3.66	1.08	178.2	101.7
1425.8	418.9	-1019.2	17.63	1.13	53.52	203.3	219.5	76.4	279.7	3.66	1.08	178.1	101.7
1432.0	418.9	-1019.2	17.75	1.13	53.60	203.0	219.5	76.4	279.4	3.66	1.08	177.9	101.5
1437.3	418.7	-1019.2	17.85	1.13	53.67	202.5	219.5	76.4	278.9	3.65	1.08	177.7	101.3
1442.6	419.6	-1019.4	17.95	1.13	53.73	202.8	219.7	76.3	279.1	3.66	1.08	177.7	101.4
1448.0	418.7	-1019.6	18.05	1.13	53.30	201.9	219.8	76.1	278.0	3.65	1.09	177.1	101.0
1453.3	419.7	-1019.6	18.16	1.13	53.87	202.3	219.8	76.1	278.4	3.66	1.09	177.3	101.1
1458.5	420.5	-1019.8	18.26	1.14	53.93	202.5	220.0	76.0	278.5	3.66	1.09	177.2	101.2
1464.0	420.5	-1019.8	18.36	1.14	54.00	202.2	220.0	76.0	278.2	3.66	1.09	177.1	101.1
1469.3	420.5	-1019.9	18.46	1.14	54.07	201.9	220.0	75.9	277.8	3.66	1.09	176.9	100.9
1474.7	419.5	-1019.9	18.57	1.13	54.14	200.9	220.0	75.9	276.8	3.65	1.10	176.4	100.4
1480.0	419.7	-1019.9	18.67	1.13	54.21	200.7	220.0	75.9	276.6	3.64	1.10	176.3	100.4
1485.5	418.7	-1020.1	18.78	1.13	54.28	199.7	220.2	75.8	275.5	3.64	1.10	175.6	99.9
1490.7	419.9	-1020.1	18.88	1.13	54.35	200.2	220.2	75.8	276.0	3.64	1.10	175.9	100.1
1496.2	420.0	-1020.3	18.98	1.14	54.42	200.0	220.3	75.6	275.6	3.64	1.10	175.6	100.0

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

Consolidated Undrained Triaxial Compression Test on Cohesive Soils

ASTM D 4767 - 88

PROJECT#	9521018		L_c =	14.94	cm	DATE	7-Mar-95		Strength Results:			Density: (Kg/M³)	
Test Pit	TP95-39		A_c =	43.49	cm²	FILE	3x-600.XLS		Max.σ_D' =	363.5	kPa	γ_t =	1639
Sample			V_c =	649.6	cm³	TEST#	CIU-6		Strain @ =	12.10	%	γ_d =	1307
Depth									Max. PSR =	3.60		E_t =	0.384
									Strain @ =	7.72	%	E_d =	0.428
REMARKS:			Consolidation Pressure:			CALIBRATIONS:			Consolidation Results:			Water Contents:	
- Failure Mode Bulging			CP =	1076.7	kPa	LOAD =	0.0036	kN/mV	δV_c =	66.3	cc	W_i =	18.6
- Corrections applied for membrane			BP =	482.2	kPa	PORE =	0.5895	kPa/mV	T_{100} =	13.0	min	W_f =	18.5
			σ_{3c}' =	594.5	kPa	LVDT =	0.0295	mm/mV	C_v =	5.9E-02	cm²/s		
			B_{value} =	0.952		Feed Rate =	0.30	mm/min					

δL (mV)	LOAD (mV)	δU (mV)	E (%)	LOAD (kN)	A_c (cm²)	σ_D' (kPa)	δU (kPa)	σ_3' (kPa)	σ_1' (kPa)	PSR	A	p' (kPa)	q (kPa)
152.0	145.6	-699.9	0.00	0.00	43.49	0.0	0.0	594.5	594.5	1.00		594.5	0.0
157.0	190.4	-707.6	-0.12	0.18	43.44	37.1	5.3	589.2	626.3	1.06	0.14	607.8	18.5
162.9	210.5	-719.0	0.00	0.23	43.49	53.7	13.2	581.3	635.0	1.09	0.25	608.2	26.8
168.7	235.9	-732.3	0.11	0.32	43.54	74.6	22.3	572.2	646.8	1.13	0.30	609.5	37.3
174.2	288.2	-758.1	0.21	0.51	43.58	117.7	40.1	554.4	672.0	1.21	0.34	613.2	58.8
179.2	369.8	-812.7	0.31	0.81	43.62	184.8	77.8	516.7	701.6	1.36	0.42	609.1	92.4
184.6	429.1	-876.9	0.41	1.02	43.67	233.5	122.0	472.5	705.9	1.49	0.52	589.2	116.7
190.2	471.4	-936.6	0.52	1.17	43.72	268.0	162.2	431.3	699.3	1.62	0.61	565.3	134.0
195.6	501.8	-988.0	0.62	1.28	43.76	292.7	198.6	395.9	688.6	1.74	0.68	542.2	146.4
201.1	523.3	-1031.0	0.73	1.36	43.81	310.0	228.3	366.2	676.2	1.85	0.74	521.2	155.0
206.6	539.4	-1067.2	0.83	1.42	43.86	322.9	253.3	341.2	664.1	1.95	0.78	502.7	161.4
212.1	551.2	-1098.0	0.94	1.46	43.90	332.1	274.5	320.0	652.1	2.04	0.83	486.1	166.1
217.9	559.1	-1124.0	1.05	1.49	43.95	338.2	292.4	302.1	640.3	2.12	0.86	471.2	169.1
223.5	565.4	-1146.5	1.15	1.51	44.00	342.9	307.9	286.6	629.5	2.20	0.90	458.0	171.5
229.3	570.4	-1165.9	1.26	1.53	44.05	346.6	321.3	273.2	619.8	2.27	0.93	446.5	173.3
234.9	573.4	-1182.6	1.37	1.54	44.09	348.6	332.8	261.7	610.3	2.33	0.95	436.0	174.3
240.6	575.5	-1197.4	1.48	1.55	44.14	349.9	343.0	251.5	601.4	2.39	0.98	426.4	174.9
246.3	578.3	-1210.2	1.59	1.56	44.19	351.7	351.9	242.6	594.4	2.45	1.00	418.5	175.9
252.1	580.9	-1221.8	1.70	1.57	44.24	353.4	359.9	234.6	588.0	2.51	1.02	411.3	176.7
257.9	582.4	-1232.1	1.81	1.57	44.29	354.2	367.0	227.5	581.7	2.56	1.04	404.6	177.1
263.6	584.1	-1241.4	1.92	1.58	44.34	355.1	373.4	221.1	576.2	2.61	1.05	398.7	177.5
269.4	585.1	-1249.8	2.03	1.58	44.39	355.5	379.2	215.3	570.8	2.65	1.07	393.1	177.7
275.0	586.5	-1257.1	2.14	1.59	44.44	356.2	384.2	210.3	566.5	2.69	1.08	388.4	178.1
280.8	587.8	-1263.8	2.25	1.59	44.49	356.7	388.8	205.7	562.4	2.73	1.09	384.1	178.4
286.5	588.6	-1269.9	2.35	1.59	44.54	357.0	393.0	201.5	558.4	2.77	1.10	380.0	178.5
292.1	589.5	-1275.6	2.46	1.60	44.59	357.2	396.9	197.6	554.8	2.81	1.11	376.2	178.6
297.8	590.5	-1280.8	2.57	1.60	44.64	357.6	400.5	194.0	551.6	2.84	1.12	372.8	178.8
303.4	591.9	-1285.7	2.68	1.61	44.69	358.3	403.9	190.6	548.9	2.88	1.13	369.7	179.1
309.1	592.2	-1290.1	2.79	1.61	44.74	358.1	406.9	187.6	545.6	2.91	1.14	366.6	179.0
314.8	592.9	-1294.2	2.90	1.61	44.79	358.2	409.8	184.7	542.9	2.94	1.14	363.8	179.1
320.3	594.1	-1298.0	3.00	1.61	44.84	358.7	412.4	182.1	540.8	2.97	1.15	361.5	179.4
325.8	594.2	-1301.4	3.11	1.61	44.88	358.3	414.7	179.8	538.1	2.99	1.16	358.9	179.2
331.4	594.9	-1304.7	3.21	1.62	44.93	358.5	417.0	177.5	536.0	3.02	1.16	356.7	179.2
336.9	595.9	-1307.7	3.32	1.62	44.98	358.8	419.1	175.4	534.2	3.05	1.17	354.8	179.4
342.4	595.8	-1310.5	3.42	1.62	45.03	358.3	421.0	173.5	531.8	3.07	1.17	352.6	179.2
347.9	595.9	-1313.1	3.53	1.62	45.08	357.9	422.8	171.7	529.6	3.08	1.18	350.7	179.0
353.5	597.0	-1315.8	3.63	1.62	45.13	358.4	424.7	169.8	528.2	3.11	1.18	349.0	179.2
359.0	597.6	-1320.2	3.74	1.63	45.18	358.4	427.7	166.8	525.2	3.15	1.19	346.0	179.2
364.5	598.7	-1324.4	3.84	1.63	45.23	358.8	430.6	163.9	522.8	3.19	1.20	343.3	179.4
369.8	599.4	-1328.4	3.94	1.63	45.28	359.0	433.4	161.1	520.1	3.23	1.21	340.6	179.5
375.3	600.3	-1331.4	4.05	1.64	45.33	359.3	435.4	159.1	518.3	3.26	1.21	338.7	179.6
380.7	600.8	-1334.0	4.15	1.64	45.37	359.2	437.2	157.3	516.5	3.28	1.22	336.9	179.6
386.0	602.3	-1335.8	4.25	1.64	45.42	360.0	438.5	156.0	516.0	3.31	1.22	336.0	180.0
391.5	602.7	-1336.8	4.36	1.65	45.47	359.8	439.1	155.4	515.2	3.32	1.22	335.3	179.9
396.9	603.0	-1337.8	4.46	1.65	45.52	359.6	439.8	154.7	514.3	3.33	1.22	334.5	179.8
402.3	604.2	-1338.8	4.56	1.65	45.57	360.2	440.5	154.0	514.1	3.34	1.22	334.1	180.1
407.7	604.4	-1340.0	4.67	1.65	45.62	359.9	441.3	153.2	513.0	3.35	1.23	333.1	179.9
413.2	604.4	-1340.6	4.77	1.65	45.67	359.4	441.8	152.7	512.2	3.35	1.23	332.5	179.7
418.6	605.1	-1341.6	4.88	1.65	45.72	359.5	442.5	152.0	511.6	3.36	1.23	331.8	179.8
424.0	606.1	-1342.4	4.98	1.66	45.77	359.9	443.0	151.5	511.4	3.38	1.23	331.4	179.9
429.3	606.2	-1343.0	5.08	1.66	45.82	359.5	443.4	151.1	510.6	3.38	1.23	330.9	179.8
434.7	607.3	-1343.6	5.18	1.66	45.87	360.0	443.8	150.7	510.6	3.39	1.23	330.6	180.0
440.1	608.2	-1344.4	5.29	1.67	45.92	360.2	444.4	150.1	510.3	3.40	1.23	330.2	180.1
445.5	607.9	-1344.8	5.39	1.66	45.97	359.5	444.7	149.8	509.4	3.40	1.24	329.6	179.8
450.7	608.6	-1345.3	5.49	1.67	46.02	359.7	445.0	149.5	509.2	3.41	1.24	329.3	179.8
456.0	610.2	-1345.9	5.59	1.67	46.07	360.5	445.4	149.1	509.6	3.42	1.24	329.3	180.2
461.5	609.0	-1346.1	5.69	1.67	46.12	359.1	445.6	148.9	508.0	3.41	1.24	328.5	179.5
466.8	609.0	-1346.7	5.80	1.67	46.17	358.7	446.0	148.5	507.2	3.41	1.24	327.9	179.3
472.1	610.6	-1347.1	5.90	1.67	46.22	359.5	446.2	148.3	507.7	3.42	1.24	328.0	179.7
477.5	610.3	-1347.3	6.00	1.67	46.27	358.8	446.4	148.1	506.9	3.42	1.24	327.5	179.4
482.7	611.7	-1347.7	6.10	1.68	46.32	359.5	446.7	147.8	507.3	3.43	1.24	327.6	179.7
488.2	612.4	-1348.1	6.20	1.68	46.37	359.6	446.9	147.6	507.1	3.44	1.24	327.3	179.8
493.4	613.4	-1348.3	6.30	1.68	46.42	359.9	447.1	147.4	507.3	3.44	1.24	327.4	179.9
498.9	614.0	-1348.7	6.41	1.69	46.47	359.9	447.3	147.2	507.1	3.45	1.24	327.1	180.0
504.2	614.9	-1348.9	6.51	1.69	46.52	360.2	447.5	147.0	507.2	3.45	1.24	327.1	180.1
509.4	616.1	-1349.3	6.61	1.69	46.57	360.7	447.8	146.7	507.4	3.46	1.24	327.1	180.3
514.7	616.2	-1349.3	6.71	1.69	46.62	360.3	447.8	146.7	507.0	3.46	1.24	326.9	180.2
520.2	616.2	-1349.7	6.81	1.69	46.67	359.8	448.0	146.5	506.3	3.46	1.25	326.4	179.9
525.3	617.0	-1349.9	6.91	1.70	46.72	360.0	448.2	146.3	506.4	3.46	1.24	326.3	180.0

δL	LOAD	δU	E	LOAD	A_c	σ_0'	δU	σ_3	σ_1	PSR	A	p'	q
(mV)	(mV)	(mV)	(%)	(kN)	cm^2	(kPa)	(kPa)	(kPa)	(kPa)			(kPa)	(kPa)
530.6	618.3	-1349.9	7.01	1.70	46.77	360.6	448.2	146.3	506.9	3.46	1.24	326.6	180.3
536.1	619.6	-1350.3	7.12	1.71	46.82	361.1	448.5	146.0	507.2	3.47	1.24	326.6	180.6
541.4	620.7	-1352.1	7.22	1.71	46.87	361.5	449.7	144.8	506.3	3.50	1.24	325.6	180.8
546.5	621.1	-1354.5	7.32	1.71	46.92	361.4	451.3	143.2	504.6	3.52	1.25	323.9	180.7
551.9	622.1	-1356.5	7.42	1.72	46.98	361.7	452.7	141.8	503.5	3.55	1.25	322.6	180.9
557.2	623.8	-1357.9	7.52	1.72	47.03	362.6	453.7	140.8	503.4	3.58	1.25	322.1	181.3
562.5	624.2	-1358.9	7.62	1.72	47.08	362.4	454.4	140.1	502.6	3.59	1.25	321.3	181.2
567.8	625.0	-1359.7	7.72	1.73	47.13	362.6	454.9	139.6	502.2	3.60	1.25	320.9	181.3
573.1	625.5	-1359.3	7.82	1.73	47.18	362.5	454.7	139.8	502.4	3.59	1.25	321.1	181.3
578.5	626.3	-1358.7	7.93	1.73	47.23	362.7	454.2	140.2	503.0	3.59	1.25	321.6	181.3
582.8	626.9	-1358.5	8.03	1.73	47.29	362.7	454.1	140.4	503.1	3.58	1.25	321.7	181.4
589.1	627.3	-1358.1	8.13	1.73	47.34	362.6	453.8	140.7	503.2	3.58	1.25	322.0	181.3
594.5	627.9	-1357.9	8.23	1.74	47.39	362.6	453.7	140.9	503.4	3.57	1.25	322.1	181.3
599.7	628.3	-1357.5	8.33	1.74	47.44	362.4	453.4	141.1	503.5	3.57	1.25	322.3	181.2
605.1	629.8	-1357.3	8.43	1.74	47.50	363.1	453.3	141.2	504.3	3.57	1.25	322.8	181.5
610.4	629.7	-1356.9	8.54	1.74	47.55	362.6	453.0	141.5	504.1	3.56	1.25	322.8	181.3
615.9	629.8	-1356.7	8.64	1.74	47.60	362.2	452.9	141.6	503.8	3.56	1.25	322.7	181.1
621.2	630.8	-1356.5	8.74	1.75	47.66	362.5	452.7	141.8	504.2	3.56	1.25	323.0	181.2
626.6	631.9	-1356.1	8.84	1.75	47.71	362.9	452.4	142.1	504.9	3.55	1.25	323.5	181.4
631.9	632.4	-1355.9	8.95	1.75	47.76	362.8	452.3	142.2	505.0	3.55	1.25	323.6	181.4
637.1	633.1	-1355.5	9.04	1.75	47.82	362.9	452.0	142.5	505.3	3.55	1.25	323.9	181.4
642.5	632.9	-1355.3	9.15	1.75	47.87	362.2	451.9	142.6	504.8	3.54	1.25	323.7	181.1
647.9	633.2	-1355.1	9.25	1.76	47.92	362.0	451.8	142.7	504.7	3.54	1.25	323.7	181.0
653.2	634.3	-1354.7	9.35	1.76	47.98	362.4	451.5	143.0	505.4	3.53	1.25	324.2	181.2
658.5	634.0	-1354.3	9.45	1.76	48.03	361.7	451.2	143.3	505.0	3.52	1.25	324.1	180.8
663.9	635.0	-1354.3	9.56	1.76	48.09	362.0	451.2	143.3	505.3	3.53	1.25	324.3	181.0
669.2	635.7	-1353.9	9.66	1.76	48.14	362.0	450.9	143.6	505.6	3.52	1.25	324.6	181.0
674.5	635.9	-1353.9	9.76	1.76	48.19	361.7	450.9	143.6	505.3	3.52	1.25	324.4	180.9
679.6	637.4	-1353.7	9.86	1.77	48.25	362.4	450.8	143.7	506.1	3.52	1.24	324.9	181.2
684.8	638.0	-1353.5	9.95	1.77	48.30	362.4	450.7	143.8	506.3	3.52	1.24	325.1	181.2
690.1	638.3	-1353.1	10.06	1.77	48.35	362.2	450.4	144.1	506.3	3.51	1.24	325.2	181.1
695.3	639.0	-1353.1	10.16	1.78	48.41	362.3	450.4	144.1	506.4	3.51	1.24	325.2	181.1
700.5	639.0	-1352.7	10.25	1.78	48.46	361.8	450.1	144.4	506.2	3.51	1.24	325.3	180.9
705.6	640.2	-1352.5	10.35	1.78	48.51	362.3	450.0	144.5	506.8	3.51	1.24	325.7	181.1
710.8	640.1	-1352.5	10.45	1.78	48.57	361.7	450.0	144.5	506.3	3.50	1.24	325.4	180.9
716.1	640.6	-1352.1	10.55	1.78	48.62	361.6	449.7	144.8	506.4	3.50	1.24	325.6	180.8
721.2	642.3	-1352.3	10.65	1.79	48.67	362.5	449.8	144.7	507.1	3.51	1.24	325.9	181.2
726.4	643.2	-1354.5	10.75	1.79	48.73	362.7	451.3	143.2	505.8	3.53	1.24	324.5	181.3
731.5	643.4	-1356.3	10.85	1.79	48.78	362.4	452.6	141.9	504.3	3.55	1.25	323.1	181.2
736.6	644.1	-1357.9	10.94	1.79	48.83	362.4	453.7	140.8	503.2	3.57	1.25	322.0	181.2
741.8	645.2	-1358.9	11.04	1.80	48.89	362.8	454.4	140.1	502.9	3.59	1.25	321.5	181.4
746.9	645.4	-1359.5	11.14	1.80	48.94	362.5	454.8	139.7	502.2	3.59	1.25	321.0	181.2
752.1	646.5	-1359.3	11.24	1.80	49.00	362.8	454.7	139.8	502.7	3.59	1.25	321.3	181.4
757.0	646.5	-1358.7	11.33	1.80	49.05	362.4	454.2	140.3	502.7	3.58	1.25	321.5	181.2
762.0	647.2	-1358.1	11.43	1.81	49.10	362.5	453.8	140.7	503.2	3.58	1.25	321.9	181.2
767.1	648.3	-1357.5	11.53	1.81	49.16	362.8	453.4	141.1	503.9	3.57	1.25	322.5	181.4
772.3	648.2	-1357.1	11.62	1.81	49.21	362.3	453.1	141.4	503.7	3.56	1.25	322.5	181.2
777.2	648.5	-1356.3	11.72	1.81	49.26	362.1	452.6	141.9	504.0	3.55	1.25	323.0	181.0
782.2	649.6	-1356.1	11.81	1.81	49.32	362.5	452.4	142.1	504.5	3.55	1.25	323.3	181.2
787.1	649.7	-1355.7	11.91	1.81	49.37	362.1	452.2	142.3	504.4	3.54	1.25	323.4	181.1
792.2	650.7	-1354.9	12.00	1.82	49.42	362.4	451.6	142.9	505.3	3.54	1.25	324.1	181.2
797.1	652.8	-1354.7	12.10	1.83	49.48	363.5	451.5	143.0	506.5	3.54	1.24	324.8	181.7
802.2	652.5	-1354.3	12.19	1.82	49.53	362.8	451.2	143.3	506.1	3.53	1.24	324.7	181.4
807.0	652.2	-1353.9	12.29	1.82	49.58	362.2	450.9	143.6	505.7	3.52	1.25	324.6	181.1
812.2	654.2	-1353.5	12.39	1.83	49.64	363.1	450.7	143.8	507.0	3.52	1.24	325.4	181.6
816.9	653.3	-1352.9	12.48	1.83	49.69	362.1	450.2	144.3	506.3	3.51	1.24	325.3	181.0
822.0	653.3	-1352.5	12.57	1.83	49.74	361.6	450.0	144.5	506.2	3.50	1.24	325.3	180.8
826.9	654.7	-1352.1	12.67	1.83	49.80	362.2	449.7	144.8	507.0	3.50	1.24	325.9	181.1
831.9	653.9	-1351.7	12.76	1.83	49.85	361.2	449.4	145.1	506.3	3.49	1.24	325.7	180.6
836.9	653.9	-1351.5	12.86	1.83	49.91	360.7	449.3	145.2	506.0	3.48	1.25	325.6	180.4
841.8	654.6	-1351.1	12.95	1.83	49.96	360.8	449.0	145.5	506.3	3.48	1.24	325.9	180.4
846.7	655.0	-1350.7	13.04	1.83	50.01	360.7	448.7	145.8	506.4	3.47	1.24	326.1	180.3
851.8	655.1	-1350.5	13.14	1.83	50.07	360.3	448.6	145.9	506.2	3.47	1.25	326.0	180.1
856.6	656.3	-1350.1	13.23	1.84	50.12	360.7	448.3	146.2	506.9	3.47	1.24	326.5	180.4
861.5	656.1	-1349.9	13.33	1.84	50.18	360.1	448.2	146.3	506.4	3.46	1.24	326.4	180.1
866.3	657.4	-1349.7	13.42	1.84	50.23	360.6	448.0	146.5	507.1	3.46	1.24	326.8	180.3
871.3	657.7	-1349.5	13.51	1.84	50.29	360.4	447.9	146.6	507.0	3.46	1.24	326.8	180.2
876.3	657.0	-1349.1	13.61	1.84	50.34	359.4	447.6	146.9	506.3	3.45	1.25	326.6	179.7
881.2	656.3	-1349.1	13.70	1.84	50.40	358.5	447.5	146.9	505.4	3.44	1.25	326.1	179.3
886.2	656.1	-1348.7	13.80	1.84	50.45	357.9	447.3	147.2	505.1	3.43	1.25	326.1	179.0
891.2	657.1	-1348.5	13.89	1.84	50.51	358.2	447.2	147.3	505.5	3.43	1.25	326.4	179.1
895.9	659.6	-1350.5	13.98	1.85	50.56	359.5	448.6	145.9	505.4	3.46	1.25	325.7	179.8
900.9	659.7	-1352.3	14.08	1.85	50.62	359.2	449.8	144.7	503.8	3.48	1.25	324.2	179.6
906.0	660.2	-1354.1	14.18	1.85	50.67	359.1	451.1	143.4	502.5	3.50	1.26	323.0	179.5
911.0	661.5	-1355.1	14.27	1.86	50.73	359.5	451.8	142.7	502.3	3.52	1.26	322.5	179.8
915.9	662.0	-1355.7	14.36	1.86	50.79	359.4	452.2	142.3	501.8	3.53	1.26	322.0	179.7
921.0	661.8	-1355.7	14.46	1.86	50.84	358.8	452.2	142.3	501.2	3.52	1.26	321.7	179.4
926.0	662.1	-1355.1	14.56	1.86	50.90	358.6	451.8	142.7	501.3	3.51	1.26	322.0	179.3
931.0	662.5	-1354.5	14.65	1.86	50.96	358.4	451.3	143.2	501.6	3.50	1.26	322.4	179.2
936.0	663.3	-1353.9	14.75	1.86	51.01	358.5	450.9	143.6	502.1	3.50	1.26	322.8	179.3
941.0	662.7	-1353.5	14.84	1.86	51.07	357.7	450.7	143.8	501.5	3.49	1.26	322.7	178.8
946.1	662.9	-1352.9	14.94	1.86	51.13	357.3	450.2	144.3	501.6	3.48	1.26	322.9	178.7
951.1	663.9	-1352.5	15.04	1.87	51.19	357.6	450.0	144.5	502.1	3.47	1.26	323.3	178.8
956.2	663.9	-1352.1	15.13	1.87	51.25	357.1	449.7	144.8	501.9	3.47	1.26	323.4	178.6
961.3	663.3	-1351.7	15.23	1.86	51.30	356.3	449.4	145.1	501.3	3.46	1.26	323.2	178.1
966.5	663.1	-1351.1	15.33	1.86	51.36	355.6	449.0	145.5	501.1	3.44	1.26	323.3	177.8
971.5	664.6	-1350.9	15.42	1.87	51.42	356.2	448.9	145.6	501.9	3.45	1.26	323.8	178.1
976.5	663.9	-1350.5	15.52	1.87	51.48	355.3	448.6	145.9	501.2	3.44	1.26	323.6	177.6

δL	LOAD	δU	E	LOAD	A_c	σ_D	δU	σ_3'	σ_1'	PSR	A	p'	q
(mV)	(mV)	(mV)	(%)	(kN)	(cm^2)	(kPa)	(kPa)	(kPa)	(kPa)			(kPa)	(kPa)
981.7	664.3	-1349.9	15.62	1.87	51.54	355.1	448.2	146.3	501.4	3.43	1.26	323.9	177.6
986.7	664.6	-1349.7	15.71	1.87	51.60	354.9	448.0	146.5	501.3	3.42	1.26	323.9	177.4
991.8	665.3	-1349.3	15.81	1.87	51.66	354.9	447.9	146.7	501.6	3.42	1.26	324.2	177.4
997.0	665.6	-1348.9	15.91	1.87	51.72	354.6	447.5	147.0	501.6	3.41	1.26	324.3	177.3
1002.3	666.4	-1348.5	16.01	1.87	51.78	354.7	447.2	147.3	502.0	3.41	1.26	324.6	177.3
1007.3	666.1	-1348.1	16.11	1.87	51.84	354.0	446.9	147.6	501.6	3.40	1.26	324.6	177.0
1012.5	666.7	-1347.9	16.21	1.88	51.90	354.0	446.8	147.7	501.7	3.40	1.26	324.7	177.0
1017.8	667.7	-1347.7	16.31	1.88	51.97	354.2	446.7	147.8	502.0	3.40	1.26	324.9	177.1
1022.8	666.7	-1347.5	16.40	1.88	52.02	353.0	446.5	148.0	501.0	3.39	1.26	324.5	176.5
1028.0	667.5	-1347.1	16.50	1.88	52.09	353.1	446.2	148.3	501.4	3.38	1.26	324.8	176.6
1033.1	668.1	-1347.1	16.60	1.88	52.15	353.1	446.2	148.3	501.3	3.38	1.26	324.8	176.5
1038.3	668.0	-1346.7	16.70	1.88	52.21	352.5	446.0	148.5	501.1	3.37	1.27	324.8	176.3
1043.4	667.7	-1346.3	16.80	1.88	52.27	351.9	445.7	148.8	500.7	3.36	1.27	324.7	175.9
1048.5	669.3	-1346.5	16.89	1.89	52.33	352.5	445.8	148.7	501.2	3.37	1.26	324.9	176.2
1053.6	669.1	-1346.1	16.99	1.88	52.39	351.9	445.6	148.9	500.8	3.36	1.27	324.9	175.9
1058.7	670.0	-1345.9	17.09	1.89	52.45	352.0	445.4	149.1	501.1	3.36	1.27	325.1	176.0
1063.9	670.2	-1345.9	17.19	1.89	52.52	351.7	445.4	149.1	500.8	3.36	1.27	324.9	175.8
1069.0	669.9	-1346.9	17.29	1.89	52.58	351.0	446.1	148.4	499.4	3.37	1.27	323.9	175.5
1074.2	670.9	-1348.9	17.38	1.89	52.64	351.2	447.5	147.0	498.2	3.39	1.27	322.6	175.6
1079.4	671.2	-1350.9	17.48	1.89	52.71	351.0	448.9	145.6	496.6	3.41	1.28	321.1	175.5
1084.5	671.4	-1352.1	17.58	1.89	52.77	350.6	449.7	144.8	495.4	3.42	1.28	320.1	175.3
1089.8	672.0	-1353.1	17.68	1.89	52.83	350.6	450.4	144.1	494.7	3.43	1.28	319.4	175.3
1095.0	672.4	-1353.7	17.78	1.90	52.90	350.3	450.8	143.7	494.0	3.44	1.29	318.9	175.2
1100.1	672.5	-1353.1	17.88	1.90	52.96	349.9	450.4	144.1	494.1	3.43	1.29	319.1	175.0
1105.4	672.7	-1352.5	17.98	1.90	53.02	349.6	450.0	144.5	494.1	3.42	1.29	319.3	174.8
1110.6	673.0	-1352.1	18.08	1.90	53.09	349.3	449.7	144.8	494.1	3.41	1.29	319.5	174.7
1115.4	672.5	-1351.5	18.17	1.90	53.15	348.5	449.3	145.2	493.8	3.40	1.29	319.5	174.3
1120.8	672.5	-1351.1	18.27	1.90	53.21	348.0	449.0	145.5	493.5	3.39	1.29	319.5	174.0
1126.2	673.0	-1350.5	18.38	1.90	53.28	347.9	448.6	145.9	493.8	3.38	1.29	319.9	173.9
1131.4	673.1	-1350.1	18.48	1.90	53.35	347.5	448.3	146.2	493.7	3.38	1.29	319.9	173.7
1136.6	673.4	-1349.9	18.57	1.90	53.41	347.2	448.2	146.3	493.5	3.37	1.29	319.9	173.6
1141.8	674.4	-1349.5	18.67	1.90	53.48	347.4	447.9	146.6	494.0	3.37	1.29	320.3	173.7
1147.1	674.2	-1349.1	18.78	1.90	53.54	346.8	447.6	146.9	493.6	3.36	1.29	320.3	173.4
1152.3	675.2	-1348.9	18.87	1.91	53.61	347.0	447.5	147.0	494.0	3.36	1.29	320.5	173.5
1157.6	674.4	-1348.7	18.98	1.90	53.68	345.9	447.3	147.2	493.1	3.35	1.29	320.1	173.0
1162.8	674.4	-1348.5	19.07	1.90	53.74	345.5	447.2	147.3	492.7	3.35	1.29	320.0	172.7
1168.0	674.8	-1348.3	19.17	1.90	53.81	345.2	447.1	147.4	492.7	3.34	1.29	320.0	172.6
1173.3	675.6	-1348.1	19.27	1.91	53.88	345.3	446.9	147.6	492.8	3.34	1.29	320.2	172.6
1178.6	675.3	-1347.5	19.38	1.91	53.94	344.6	446.5	148.0	492.6	3.33	1.30	320.3	172.3
1183.8	675.3	-1347.3	19.48	1.91	54.01	344.1	446.4	148.1	492.2	3.32	1.30	320.2	172.1
1189.0	675.1	-1347.3	19.57	1.91	54.08	343.5	446.4	148.1	491.6	3.32	1.30	319.9	171.7
1194.3	674.4	-1346.9	19.68	1.90	54.14	342.5	446.1	148.4	490.9	3.31	1.30	319.7	171.3
1199.4	674.6	-1346.9	19.77	1.90	54.21	342.2	446.1	148.4	490.8	3.31	1.30	319.5	171.1
1204.7	674.4	-1346.7	19.87	1.90	54.28	341.6	446.0	148.5	490.1	3.30	1.31	319.3	170.8
1210.1	675.3	-1346.5	19.98	1.91	54.35	341.7	445.8	148.7	490.4	3.30	1.30	319.5	170.8

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

Consolidated Undrained Triaxial Compression Test on Cohesive Soils
ASTM D 4767 - 88

PROJECT#	9521018		L_c =	14.86	cm	DATE :	7-Mar-95		Strength Results :			Density: (Kg/M³)	
Test Pit	TP95-39		A_c =	42.86	cm²	FILE :	3x-300.XLS		Max. σ_D' =	314.5	kPa	γ_t =	1558
Sample			V_c =	537.1	cm³	TEST#	CIU-7		Strain @ =	3.96	%	γ_d =	1756
Depth									Max. PSR =	3.43		E, =	0.772
									Strain @ =	11.95	%	E_s =	0.571
REMARKS :			Consolidation Pressure :			CALIBRATIONS :			Consolidation Results:			Water Contents:	
- Failure Mode Bulging			CP =	1306.4	kPa	LOAD =	0.0036	kN/mV	δV_c =	51.2	cc	W_i =	16.7
- Corrections applied for membrane			BP =	414.9	kPa	PORE =	0.6895	kPa/mV	T_{100} =	20.3	min	W_f =	19.9
			σ_{3c}' =	891.5	kPa	LVDT =	0.0285	mm/mV	C_v =	3.8E-02	cm²/s		
			B_{value} =	0.963		Feed Rate =	0.20	mm/min					

δL (mV)	LOAD (mV)	δU (mV)	E (%)	LOAD (kN)	A_c (cm²)	σ_D (kPa)	δU (kPa)	σ_3' (kPa)	σ_1' (kPa)	PSR	A	p' (kPa)	q (kPa)
242.4	192.0	-602.3	0.00	0.00	42.86	0.0	0.0	891.5	891.5	1.00		891.5	0.0
242.5	196.8	-608.0	0.00	0.02	42.86	4.1	3.9	887.6	891.6	1.00	0.97	889.6	2.0
246.9	241.2	-614.4	0.09	0.18	42.90	41.3	8.3	883.2	924.4	1.05	0.20	903.8	20.6
252.3	274.8	-621.6	0.19	0.30	42.94	69.3	13.3	878.2	947.5	1.08	0.19	912.9	34.7
257.7	298.9	-628.0	0.29	0.38	42.99	89.4	17.7	873.8	963.2	1.10	0.20	918.5	44.7
263.1	314.6	-634.1	0.40	0.44	43.03	102.4	21.9	869.6	972.0	1.12	0.21	920.8	51.2
268.9	308.3	-638.6	0.51	0.42	43.08	96.9	25.0	866.5	963.4	1.11	0.26	914.9	48.5
274.4	310.4	-643.0	0.61	0.43	43.13	98.6	28.1	863.4	962.0	1.11	0.28	912.7	49.3
280.0	310.4	-646.8	0.72	0.43	43.17	98.4	30.7	860.9	959.2	1.11	0.31	910.0	49.2
285.5	305.9	-650.3	0.83	0.41	43.22	94.5	33.1	858.4	952.9	1.11	0.35	905.7	47.2
290.9	311.0	-653.9	0.93	0.43	43.26	98.6	35.6	855.9	954.5	1.12	0.36	905.2	49.3
296.3	326.6	-658.2	1.03	0.48	43.31	111.4	38.5	853.0	964.4	1.13	0.35	908.7	55.7
301.9	324.3	-661.4	1.14	0.48	43.36	109.3	40.7	850.8	960.1	1.13	0.37	905.4	54.7
307.0	361.4	-666.6	1.24	0.61	43.40	139.9	44.3	847.2	987.1	1.17	0.32	917.1	70.0
311.0	452.0	-679.9	1.32	0.94	43.43	214.9	53.5	838.0	1052.9	1.26	0.25	945.4	107.4
314.9	537.1	-699.1	1.39	1.24	43.47	285.2	56.7	824.8	1109.9	1.35	0.23	967.3	142.6
319.1	605.1	-722.9	1.47	1.49	43.50	341.2	63.2	808.3	1149.5	1.42	0.24	978.9	170.6
323.6	655.8	-750.1	1.56	1.67	43.54	382.8	101.9	789.6	1172.4	1.48	0.27	981.0	191.4
328.5	697.3	-779.8	1.65	1.82	43.58	416.6	122.4	769.1	1185.7	1.54	0.29	977.4	208.3
333.6	733.5	-811.0	1.75	1.95	43.63	446.0	143.9	747.6	1193.6	1.60	0.32	970.6	223.0
338.8	764.9	-843.7	1.85	2.06	43.67	471.4	166.4	725.1	1196.5	1.65	0.35	960.8	235.7
344.0	793.1	-876.5	1.95	2.16	43.71	494.1	189.1	702.4	1196.6	1.70	0.38	949.5	247.1
349.1	818.2	-909.8	2.05	2.25	43.76	514.2	212.0	679.5	1193.7	1.76	0.41	936.6	257.1
354.4	838.5	-942.4	2.15	2.33	43.80	530.3	234.5	657.0	1187.3	1.81	0.44	922.2	265.2
359.6	856.1	-974.6	2.25	2.39	43.85	544.2	256.7	634.8	1179.0	1.86	0.47	906.9	272.1
364.9	872.3	-1005.7	2.35	2.45	43.89	556.9	278.1	613.4	1170.2	1.91	0.50	891.8	278.4
370.3	885.5	-1035.6	2.45	2.50	43.94	567.1	298.8	592.7	1159.8	1.96	0.53	876.3	283.5
375.4	896.3	-1064.1	2.55	2.54	43.98	575.3	318.4	573.1	1148.4	2.00	0.55	860.7	287.6
380.7	904.0	-1091.2	2.65	2.56	44.03	580.9	337.1	554.4	1135.3	2.05	0.58	844.9	290.5
386.0	912.4	-1116.8	2.75	2.59	44.08	587.1	354.7	536.8	1123.9	2.09	0.60	830.3	293.6
391.2	919.7	-1140.9	2.85	2.62	44.12	592.4	371.4	520.1	1112.6	2.14	0.63	816.4	296.2
396.6	926.6	-1163.3	2.96	2.64	44.17	597.4	386.8	504.7	1102.1	2.18	0.65	803.4	298.7
402.0	932.7	-1184.5	3.06	2.67	44.22	601.7	401.4	490.1	1091.7	2.23	0.67	790.9	300.8
407.1	937.5	-1204.4	3.16	2.68	44.26	604.9	415.1	476.4	1081.3	2.27	0.69	778.8	302.5
412.4	942.2	-1223.0	3.26	2.70	44.31	608.0	428.0	463.5	1071.6	2.31	0.70	767.8	304.0
417.6	945.6	-1240.4	3.36	2.71	44.35	610.1	440.0	451.5	1061.7	2.35	0.72	756.6	305.1
422.7	946.0	-1256.5	3.46	2.71	44.40	609.8	451.1	440.4	1050.2	2.38	0.74	745.3	304.9
427.9	947.2	-1271.9	3.56	2.72	44.44	610.1	461.7	429.8	1039.9	2.42	0.76	734.9	305.0
433.2	949.3	-1286.1	3.66	2.73	44.49	611.1	471.5	420.0	1031.1	2.45	0.77	725.6	305.5
438.3	951.6	-1299.6	3.76	2.73	44.54	612.3	480.8	410.7	1023.0	2.49	0.79	716.9	306.1
443.6	954.2	-1312.3	3.86	2.74	44.58	613.7	489.5	402.0	1015.6	2.53	0.80	708.8	306.8
448.8	956.1	-1324.8	3.96	2.75	44.63	614.5	498.2	393.3	1007.9	2.56	0.81	700.6	307.3
454.0	956.5	-1337.0	4.06	2.75	44.67	614.2	506.6	284.9	999.1	2.60	0.82	692.0	307.1
459.3	956.6	-1348.1	4.16	2.75	44.72	613.5	514.2	377.3	990.8	2.63	0.84	684.0	306.8
464.7	957.5	-1358.7	4.26	2.76	44.77	613.6	521.5	370.0	983.5	2.66	0.85	676.7	306.3
470.0	957.6	-1368.6	4.36	2.76	44.82	612.9	528.4	363.1	976.1	2.69	0.86	669.6	306.5
475.3	957.4	-1377.6	4.47	2.76	44.87	612.1	534.6	356.9	969.0	2.71	0.87	663.0	306.0
480.7	958.5	-1385.8	4.57	2.76	44.91	612.3	540.2	351.3	963.5	2.74	0.88	657.4	306.1
486.2	959.4	-1393.7	4.67	2.76	44.96	612.2	545.7	345.8	958.1	2.77	0.89	652.0	306.1
502.2	963.0	-1400.7	4.98	2.78	45.11	613.0	550.5	341.0	954.0	2.80	0.90	647.5	306.5
507.4	965.3	-1407.4	5.08	2.78	45.16	614.1	555.1	336.4	950.5	2.83	0.90	643.5	307.1
512.7	964.6	-1414.1	5.18	2.78	45.21	612.9	559.7	331.8	944.6	2.85	0.91	638.2	306.4
517.9	962.3	-1419.9	5.28	2.77	45.25	610.4	563.7	327.8	938.1	2.86	0.92	632.9	305.2
522.6	962.7	-1425.6	5.37	2.77	45.30	610.1	567.7	323.8	933.9	2.88	0.93	628.9	305.0
527.6	964.3	-1430.9	5.47	2.78	45.34	610.7	571.3	320.2	930.8	2.91	0.94	625.5	305.3
526.8	964.9	-1436.0	5.45	2.78	45.33	611.2	574.8	316.7	927.9	2.93	0.94	622.3	305.6
530.2	966.6	-1440.9	5.52	2.79	45.37	612.1	578.2	313.3	925.4	2.95	0.94	619.4	306.1
535.5	966.9	-1445.3	5.62	2.79	45.41	611.7	581.2	310.3	921.9	2.97	0.95	616.1	305.8
540.8	967.2	-1449.6	5.72	2.79	45.46	611.2	584.2	307.3	918.5	2.99	0.96	612.9	305.6
546.7	966.5	-1453.6	5.83	2.79	45.52	609.9	587.0	304.5	914.4	3.00	0.96	609.5	304.9
551.6	965.9	-1457.5	5.93	2.79	45.56	608.7	589.7	301.8	910.6	3.02	0.97	606.2	304.4
555.6	965.0	-1460.9	6.01	2.78	45.60	607.5	592.0	299.5	907.0	3.03	0.97	603.2	303.7
568.7	965.3	-1464.4	6.26	2.78	45.72	606.0	594.4	297.1	903.0	3.04	0.98	600.1	303.0
573.8	965.4	-1467.7	6.35	2.78	45.77	605.4	596.7	294.8	900.2	3.05	0.99	597.5	302.7
578.9	964.8	-1470.6	6.45	2.78	45.82	604.2	598.7	292.8	897.0	3.06	0.99	594.9	302.1
583.8	965.0	-1473.7	6.55	2.78	45.86	603.7	600.8	290.7	894.4	3.08	1.00	592.5	301.9
588.9	965.6	-1476.5	6.64	2.78	45.91	603.5	602.8	288.7	892.2	3.09	1.00	590.5	301.8
593.8	965.9	-1479.0	6.74	2.79	45.96	603.1	604.5	287.0	890.1	3.10	1.00	588.6	301.5
606.2	967.4	-1484.9	6.98	2.79	46.08	602.6	608.6	282.9	885.6	3.13	1.01	584.3	301.3

δL	LOAD	δU	E	LOAD	A_c	σ_0'	δU	σ_3'	σ_1'	PSR	A	p'	q
(mV)	(mV)	(mV)	(%)	(kN)	(cm^2)	(kPa)	(kPa)	(kPa)	(kPa)			(kPa)	(kPa)
616.5	968.4	-1489.1	7.17	2.80	46.17	602.0	611.4	280.1	882.1	3.15	1.02	581.1	301.0
626.4	969.7	-1493.0	7.36	2.80	46.27	601.7	614.1	277.4	879.1	3.17	1.02	578.2	300.8
636.6	973.9	-1496.5	7.56	2.81	46.37	603.6	616.6	274.9	878.5	3.20	1.02	576.7	301.8
646.6	975.5	-1499.4	7.75	2.82	46.46	603.5	618.6	272.9	876.4	3.21	1.02	574.7	301.7
656.4	978.6	-1503.1	7.94	2.83	46.56	604.6	621.1	270.4	875.0	3.24	1.03	572.7	302.3
666.0	980.4	-1507.5	8.12	2.84	46.65	604.6	624.1	267.4	872.0	3.26	1.03	569.7	302.3
675.3	985.4	-1511.2	8.30	2.86	46.74	607.2	626.7	264.8	872.0	3.29	1.03	568.4	303.6
684.8	984.3	-1513.6	8.48	2.85	46.84	605.1	628.3	263.2	868.2	3.30	1.04	565.7	302.5
694.0	985.5	-1515.3	8.56	2.86	46.93	604.8	629.5	262.0	866.7	3.31	1.04	564.4	302.4
703.8	987.6	-1517.1	8.85	2.86	47.02	605.0	630.8	260.7	865.8	3.32	1.04	563.3	302.5
713.6	994.3	-1518.5	9.02	2.89	47.12	608.8	631.7	259.8	868.6	3.34	1.04	564.2	304.4
723.4	992.5	-1519.8	9.22	2.88	47.22	606.1	632.6	258.9	865.0	3.34	1.04	561.9	303.0
733.2	993.4	-1521.0	9.41	2.89	47.31	605.4	633.4	258.1	863.5	3.35	1.05	560.8	302.7
743.1	996.0	-1522.0	9.60	2.89	47.41	606.0	634.1	257.4	863.4	3.35	1.05	560.4	303.0
752.6	997.6	-1523.0	9.78	2.90	47.51	605.9	634.8	256.7	862.6	3.36	1.05	559.6	303.0
762.3	997.8	-1524.1	9.97	2.90	47.61	604.7	635.6	255.9	860.6	3.36	1.05	558.3	302.4
771.8	999.3	-1524.7	10.15	2.91	47.70	604.5	636.0	255.5	860.0	3.37	1.05	557.8	302.3
781.3	1000.0	-1525.5	10.33	2.91	47.80	603.7	636.5	255.0	858.7	3.37	1.05	556.8	301.9
790.8	1002.7	-1525.9	10.51	2.92	47.90	604.5	636.8	254.7	859.1	3.37	1.05	556.9	302.2
800.0	1003.9	-1526.3	10.69	2.92	47.99	604.1	637.1	254.4	858.5	3.37	1.05	556.4	302.0
809.5	1004.3	-1526.5	10.87	2.92	48.09	603.0	637.2	254.3	857.3	3.37	1.06	555.3	301.5
818.8	1005.2	-1526.9	11.05	2.93	48.19	602.4	637.5	254.0	856.4	3.37	1.06	555.2	301.2
828.0	1009.3	-1527.1	11.23	2.94	48.28	604.2	637.5	253.9	858.0	3.38	1.06	555.9	302.1
837.3	1011.0	-1527.8	11.41	2.95	48.38	604.1	638.1	253.4	857.5	3.38	1.06	555.4	302.1
846.7	1012.2	-1530.0	11.59	2.95	48.48	603.7	639.6	251.9	855.6	3.40	1.06	553.7	301.9
855.9	1016.5	-1531.5	11.76	2.97	48.58	605.6	640.7	250.8	856.4	3.41	1.06	553.6	302.8
865.4	1021.2	-1532.3	11.95	2.99	48.68	607.7	641.2	250.3	858.0	3.43	1.06	554.1	303.9
874.6	1011.4	-1532.1	12.12	2.95	48.77	599.2	641.1	250.4	849.6	3.39	1.07	550.0	299.6
884.0	1006.7	-1532.1	12.30	2.93	48.87	594.4	641.1	250.4	844.8	3.37	1.08	547.6	297.2
893.4	1004.7	-1532.1	12.48	2.93	48.98	591.6	641.1	250.4	842.0	3.36	1.08	546.2	295.8
902.7	1008.8	-1532.3	12.66	2.94	49.08	593.3	641.2	250.3	843.6	3.37	1.08	546.9	296.7
912.1	1008.0	-1532.3	12.84	2.94	49.18	591.4	641.2	250.3	841.7	3.36	1.08	546.0	295.7
921.6	1003.4	-1532.1	13.02	2.92	49.28	586.7	641.1	250.4	837.1	3.34	1.09	543.8	293.4
930.9	1004.7	-1532.1	13.20	2.93	49.38	586.4	641.1	250.4	836.8	3.34	1.09	543.6	293.2
940.5	1010.9	-1531.9	13.39	2.95	49.49	589.5	641.0	250.5	840.1	3.35	1.09	545.3	294.8
950.5	1016.3	-1531.7	13.58	2.97	49.60	592.1	640.9	250.7	842.7	3.36	1.08	546.7	296.0
964.3	1014.6	-1531.5	13.34	2.96	49.75	588.9	640.7	250.8	839.7	3.35	1.09	545.3	294.4
974.5	1019.5	-1531.5	14.04	2.98	49.86	591.0	640.7	250.8	841.8	3.36	1.08	546.3	295.5
985.1	1022.2	-1531.0	14.24	2.99	49.98	591.4	640.3	251.2	842.6	3.35	1.08	546.9	295.7
995.2	1020.1	-1530.6	14.43	2.98	50.09	588.5	640.1	251.4	839.9	3.34	1.09	545.7	294.2
1005.0	1019.2	-1530.6	14.62	2.98	50.20	586.4	640.1	251.4	837.9	3.33	1.09	544.6	293.2
1015.0	1016.9	-1530.4	14.81	2.97	50.32	583.4	639.9	251.6	834.9	3.32	1.10	543.3	291.7
1025.2	1014.2	-1530.2	15.01	2.96	50.43	580.0	639.8	251.7	831.7	3.30	1.10	541.7	290.0
1035.0	1018.0	-1532.1	15.20	2.97	50.54	581.3	641.1	250.4	831.7	3.32	1.10	541.1	290.7
1045.2	1017.8	-1533.3	15.39	2.97	50.66	579.7	641.9	249.6	829.3	3.32	1.11	539.4	289.9
1055.3	1020.8	-1534.3	15.59	2.98	50.78	580.4	642.6	248.9	829.3	3.33	1.11	539.1	290.2
1065.1	1028.4	-1533.9	15.77	3.01	50.89	584.4	642.3	249.2	833.6	3.35	1.10	541.4	292.2
1075.0	1045.1	-1533.7	15.96	3.07	51.00	594.8	642.2	249.3	844.1	3.39	1.08	546.7	297.4
1085.0	1051.0	-1533.7	16.16	3.09	51.12	597.4	642.2	249.3	846.7	3.40	1.07	548.0	298.7
1095.4	1042.1	-1533.5	16.36	3.06	51.24	589.7	642.1	249.4	839.1	3.36	1.09	544.3	294.8
1105.5	1037.0	-1533.5	16.55	3.04	51.36	584.6	642.1	249.4	834.1	3.34	1.10	541.7	292.3
1115.8	1033.5	-1533.3	16.75	3.03	51.48	580.7	641.9	249.6	830.3	3.33	1.11	539.9	290.3
1125.9	1034.7	-1533.3	16.94	3.03	51.60	580.1	641.9	249.6	829.6	3.32	1.11	539.6	290.0
1136.1	1036.9	-1533.1	17.14	3.04	51.73	580.1	641.8	249.7	829.8	3.32	1.11	539.8	290.1
1146.0	1027.1	-1533.1	17.33	3.01	51.84	571.9	641.8	249.7	821.6	3.29	1.12	535.7	285.9
1155.6	1040.1	-1532.9	17.51	3.05	51.96	579.5	641.6	249.9	829.4	3.32	1.11	539.6	289.8
1165.1	1042.0	-1532.9	17.69	3.06	52.08	579.4	641.6	249.9	829.3	3.32	1.11	539.6	289.7
1175.0	1044.2	-1532.7	17.88	3.07	52.20	579.5	641.5	250.0	829.5	3.32	1.11	539.7	289.8
1185.1	1035.3	-1532.5	18.08	3.04	52.32	571.9	641.4	250.1	822.0	3.29	1.12	536.1	286.0
1195.0	1048.1	-1532.5	18.26	3.08	52.44	579.3	641.4	250.1	829.4	3.32	1.11	539.8	289.6

← max PSR

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D 5084-90)

Project#	9521018A	Test No.	CIU-250	Date	2/20/95
Client	Knight Piesold Ltd.	Test Pit	TP95-27	System #	2
Project	Job# 1623/1	Sample		Method	B
Location	Burnaby	Depth		Falling Head Test	

INITIAL :			Do	7.62	cm		Cell Pressure	771.8	kPa
Wet Wt	1564.6	g	Lo	14.69	cm		Back Pressure	484.4	kPa
Dry Wt	1449.9	g	Ao	45.56	cm^2		Confining Pressure	287.4	kPa
W initial	7.9	%	Vo	669.0	cm^3		B - Value	0.965	
Dry Density	2167	Kg/M^3	Vf	657.1	cm^3				
Mod. Proctor	98.5	%					Burette Area :		
FINAL :			Gs	2.73			a (in) 1.037	cm^2	
Wet Wt	1590.1	g	Eo	0.260			a (out) 0.877	cm^2	
Dry Wt	1449.9	g	Ef	0.237					
W final	9.7	%	So	83.2	%	Remarks :			
Dry Density	2207	Kg/M^3				Compacted Sample : Minus 19.5 mm material			
Mod. Proctor	100.3	%							

Read #	Date	Time	Elapsed Time	Head Loss h1	Head Loss h2	Volumes of Flow Vin	Volumes of Flow Vout	Temperature	Temp. Corr. Rt	Permeability k
	m/d/y	h:mm	min	cm	cm	cc	cc	C		cm/s
1	2/14/95	9:35	0	131.4		0.00	0.00	19.1	1.0002	
2	2/14/95	13:15	220	131.4	131.1	0.10	0.15	19.7	1.0001	5.2E-08
3	2/14/95	16:50	435	131.4	130.8	0.10	0.20	20.0	1.0000	5.8E-08
4	2/15/95	9:00	1405	131.4	129.8	0.50	0.45	19.5	1.0169	4.9E-08
5	2/15/95	16:10	1835	131.4	129.4	0.20	0.25	20.4	0.9999	4.8E-08
6	2/16/95	8:55	2840	131.4	128.4	0.50	0.40	19.5	1.0001	4.5E-08
7	2/16/95	17:10	3335	131.4	128.0	0.20	0.20	20.1	1.0000	4.4E-08
8	2/17/95	9:30	4315	131.4	127.0	0.50	0.45	19.4	1.0001	4.4E-08
					Total Flow =	2.10	2.10			

DATE: MAR-06-95

PROJECT: 9521018

IDENTIFICATION:

SAMPLE NUMBER: TP95-31 GLACIAL TILL

TARE PLUS DRY SOIL, g		
TARE, g		
DRY SOIL, g	W_s	1118.2
DIAMETER OF SPECIMEN, cm	D	10.247
AREA OF SPECIMEN, sq. cm	A	82.4676
INITIAL HEIGHT OF SPECIMEN, cm	L	6.3005
INITIAL VOL. OF SPEC., CC = AL	V	519.59
INITIAL VOID RATIO = (V - Vs) / Vs	e	0.292
SPECIFIC GRAVITY	Gs	2.78 (assumed)
VOL. OF SOLIDS, CC = Ws / Gs	Vs	402.2
AREA OF STANDPIPE, sq. cm	a	0.291

TEST NO.		1a	1b	1c	1d	1e	1f
HEIGHT OF SPECIMEN, cm	L	6.2795	6.2795	6.2795	6.2795	6.2795	6.2795
VOID RATIO = (AL - Vs) / Vs	e	0.292	0.292	0.292	0.292	0.292	0.292
INITIAL TIME	t_o	0	0	0	0	0	0
FINAL TIME	t_f	50	130	185	265	330	425
ELAPSED TIME, sec = tf - to	t	3000	7800	11,100	15,000	19,800	25,500
INITIAL HEAD, cm	h_o	474.4	474.4	474.4	474.4	474.4	474.4
FINAL HEAD, cm	h_f	469.2	465.1	460.65	455.0	450.45	444.0
Log (ho / hf)		0.004787	0.008598	0.012774	0.018133	0.022498	0.028762
WATER TEMPERATURE °C	T	21.3	21.1	21.0	21.0	21.0	21.2
VISCOSITY CORRECTION FACTOR (1)	R_T	.9997	.9998	.9998	.9998	.9998	.9998
COEFFICIENT OF PERMEABILITY (2) cm / sec	k_{20}	8.14×10^{-8}	5.61×10^{-8}	5.87×10^{-8}	6.16×10^{-8}	5.80×10^{-8}	5.75×10^{-8}
	Avg.	6.2×10^{-8} cm/s					

(1) CORRECTION FACTOR FOR VISCOSITY OF WATER AT 20 °C

(2) $k_{20} = 2.303\ (aL) / (At) \log h_o / h_f * R_T$

REMARKS:

TECHNICIAN: LL COMPUTED BY: CHECKED BY:

GOLDER ASSOCIATES LTD.

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd.	Test Pit :	TP95-25
Date :	02/09/95	Project :	Job No. 1623/1	Sample :	
Lab Work:	LL	Location:	Burnaby	Depth :	

	1ST SIEVING		Hydrometer (Minus #10)		Residual #200	0.1	
	Total Weight	2733.1	Before Wash	75.0	Total -200	45.4	
			After Wash	29.7	Gs	2.78	
Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	66.5	2.4			2.4	25.4	97.6
3/4"	46.3	1.7			1.7	19.1	95.9
1/2"	66.4	2.4			2.4	12.7	93.4
3/8"	74.6	2.7			2.7	9.52	90.7
#4	151.9	5.6			5.6	4.76	85.2
#10	152.9	5.6			5.6	2.00	79.6
#20			5.7	7.6	6.0	0.840	73.5
#40			5.5	7.3	5.8	0.420	67.7
#60			5.0	6.7	5.3	0.250	62.4
#100			5.1	6.8	5.4	0.149	57.0
#200			8.3	11.1	8.8	0.074	48.2
Pan			45.4	60.5	48.2		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	47.0	20.1		-3.76	43.2	0.0645	44.6
1	42.0	20.1		-3.76	38.2	0.0478	39.4
2	38.0	20.1		-3.76	34.2	0.0350	35.3
4	36.0	20.1		-3.76	32.2	0.0251	33.3
8	34.0	20.1		-3.76	30.2	0.0181	31.2
15	32.0	20.0		-3.77	28.2	0.0134	29.1
30	30.0	20.0		-3.77	26.2	0.0096	27.1
60	26.0	20.0		-3.77	22.2	0.0070	22.9
120	23.5	20.0		-3.77	19.7	0.0050	20.3
240	21.5	20.0		-3.77	17.7	0.0036	18.3
360	20.0	20.0		-3.77	16.2	0.0030	16.7
1440	18.0	19.9		-3.77	14.2	0.0015	14.7

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PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd.	Test Pit :	TP95-31
Date :	02/09/95	Project :	Job No. 1623/1	Sample :	
Lab Work:	LL	Location:	Burnaby	Depth :	

	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.5	
	Total Weight	2916.2	Before Wash	75.0	Total -200	42.9	
			After Wash	32.6	Gs	2.78	
Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	505.7	17.3			17.3	38.1	82.7
1"	284.0	9.7			9.7	25.4	72.9
3/4"	31.2	1.1			1.1	19.1	71.9
1/2"	148.2	5.1			5.1	12.7	66.8
3/8"	79.5	2.7			2.7	9.52	64.0
#4	158.8	5.4			5.4	4.76	58.6
#10	105.9	3.6			3.6	2.00	55.0
#20			6.1	8.1	4.5	0.840	50.5
#40			5.3	7.1	3.9	0.420	46.6
#60			5.0	6.7	3.7	0.250	42.9
#100			6.3	8.4	4.6	0.149	38.3
#200			9.2	12.3	6.7	0.074	31.6
Pan			42.9	57.2	31.4		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	44.0	20.1		-3.76	40.2	0.0664	28.7
1	39.0	20.1		-3.76	35.2	0.0491	25.1
2	35.0	20.1		-3.76	31.2	0.0359	22.3
4	31.0	20.1		-3.76	27.2	0.0261	19.4
8	28.0	20.1		-3.76	24.2	0.0189	17.3
15	26.0	20.0		-3.77	22.2	0.0140	15.8
30	24.0	20.0		-3.77	20.2	0.0100	14.4
60	20.0	20.0		-3.77	16.2	0.0073	11.6
120	18.0	20.0		-3.77	14.2	0.0052	10.1
240	16.0	20.0		-3.77	12.2	0.0037	8.7
360	15.0	20.0		-3.77	11.2	0.0031	8.0
1440	13.0	19.9		-3.77	9.2	0.0015	6.6

GOLDER ASSOCIATES Ltd.

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PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd.	Test Pit :	TP95-35
Date :	02/09/95	Project :	Job No. 1623/1	Sample :	
Lab Work:	LL	Location:	Burnaby	Depth :	

	1ST SIEVING		Hydrometer (Minus #10)		Residual #200	0.5	
	Total Weight	2546.3	Before Wash	75.0	Total -200	59.3	
			After Wash	16.2	Gs	2.78	
Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	0.0					25.4	100.0
3/4"	0.0					19.1	100.0
1/2"	12.9	0.5			0.5	12.7	99.5
3/8"	13.2	0.5			0.5	9.52	99.0
#4	22.7	0.9			0.9	4.76	98.1
#10	19.2	0.8			0.8	2.00	97.3
#20			0.7	0.9	0.9	0.840	96.4
#40			1.0	1.3	1.3	0.420	95.1
#60			1.4	1.9	1.8	0.250	93.3
#100			3.4	4.5	4.4	0.149	88.9
#200			9.6	12.8	12.5	0.074	76.4
Pan			59.3	79.1	77.0		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	55.0	20.1		-3.76	51.2	0.0593	64.7
1	49.5	20.1		-3.76	45.7	0.0445	57.7
2	45.0	20.1		-3.76	41.2	0.0329	52.0
4	41.5	20.1		-3.76	37.7	0.0240	47.6
8	37.5	20.1		-3.76	33.7	0.0176	42.6
15	34.0	20.0		-3.77	30.2	0.0132	38.1
30	30.0	20.0		-3.77	26.2	0.0096	33.1
60	24.0	20.0		-3.77	20.2	0.0071	25.5
120	20.0	20.0		-3.77	16.2	0.0051	20.5
240	16.0	20.0		-3.77	12.2	0.0037	15.4
360	14.0	20.0		-3.77	10.2	0.0031	12.9
1440	12.0	19.9		-3.77	8.2	0.0015	10.4

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd.	Test Pit :	TP95-37
Date :	02/09/95	Project :	Job No. 1623/1	Sample :	
Lab Work:	LL	Location:	Burnaby	Depth :	

	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.2	
	Total Weight	1926.0	Before Wash	75.0	Total -200	41.9	
			After Wash	33.3	Gs	2.78	
Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	65.0	3.4			3.4	25.4	96.6
3/4"	35.1	1.8			1.8	19.1	94.8
1/2"	34.7	1.8			1.8	12.7	93.0
3/8"	43.1	2.2			2.2	9.52	90.8
#4	86.5	4.5			4.5	4.76	86.3
#10	63.2	3.3			3.3	2.00	83.0
#20			7.9	10.5	8.7	0.840	74.2
#40			6.4	8.5	7.1	0.420	67.2
#60			5.3	7.1	5.9	0.250	61.3
#100			5.2	6.9	5.8	0.149	55.5
#200			8.3	11.1	9.2	0.074	46.4
Pan			41.9	55.9	46.4		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	42.5	20.1		-3.76	38.7	0.0673	41.7
1	38.0	20.1		-3.76	34.2	0.0495	36.8
2	35.0	20.1		-3.76	31.2	0.0359	33.6
4	32.0	20.1		-3.76	28.2	0.0259	30.4
8	30.0	20.1		-3.76	26.2	0.0186	28.2
15	28.5	20.0		-3.77	24.7	0.0137	26.6
30	26.0	20.0		-3.77	22.2	0.0099	23.9
60	22.0	20.0		-3.77	18.2	0.0072	19.6
120	20.0	20.0		-3.77	16.2	0.0051	17.5
240	17.0	20.0		-3.77	13.2	0.0037	14.2
360	16.0	20.0		-3.77	12.2	0.0030	13.2
1440	13.0	19.9		-3.77	9.2	0.0015	9.9

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd	Test Pit :	TP95-38
Date :	02/09/95	Project :	Job No. 1623/1	Sample :	
Lab Work:	LL	Location:	Burnaby	Depth :	

	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.1	
	Total Weight	2160.0	Before Wash	75.0	Total -200	70.3	
			After Wash	4.8	Gs	2.79	
Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	32.3	1.5			1.5	25.4	98.5
3/4"	11.4	0.5			0.5	19.1	98.0
1/2"	0.0					12.7	98.0
3/8"	7.4	0.3			0.3	9.52	97.6
#4	9.4	0.4			0.4	4.76	97.2
#10	11.0	0.5			0.5	2.00	96.7
#20			0.7	0.9	0.9	0.840	95.8
#40			0.6	0.8	0.8	0.420	95.0
#60			0.6	0.8	0.8	0.250	94.2
#100			0.8	1.1	1.0	0.149	93.2
#200			1.9	2.5	2.4	0.074	90.8
Pan			70.3	93.7	90.6		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	66.0	20.1		-3.76	62.2	0.0511	77.9
1	63.0	20.1		-3.76	59.2	0.0377	74.1
2	59.0	20.1		-3.76	55.2	0.0282	69.1
4	55.0	20.1		-3.76	51.2	0.0209	64.1
8	50.0	20.1		-3.76	46.2	0.0156	57.9
15	46.5	20.0		-3.77	42.7	0.0118	53.5
30	41.0	20.0		-3.77	37.2	0.0088	46.6
60	35.0	20.0		-3.77	31.2	0.0065	39.1
120	30.0	20.0		-3.77	26.2	0.0048	32.8
240	25.0	20.0		-3.77	21.2	0.0035	26.6
360	22.0	20.0		-3.77	18.2	0.0029	22.8
1440	15.0	19.9		-3.77	11.2	0.0015	14.0

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd.	Test Pit :	TP95-39
Date :	02/09/95	Project :	Job No. 1623/1	Sample :	
Lab Work:	LL	Location:	Burnaby	Depth :	

	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.7	
	Total Weight	1001.4	Before Wash	75.0	Total -200	44.3	
			After Wash	31.4	Gs	2.79	

Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	0.0					25.4	100.0
3/4"	0.0					19.1	100.0
1/2"	0.0					12.7	100.0
3/8"	0.0					9.52	100.0
#4	0.0					4.76	100.0
#10	0.0					2.00	100.0
#20			0.1	0.1	0.1	0.840	99.9
#40			0.3	0.4	0.4	0.420	99.5
#60			0.7	0.9	0.9	0.250	98.5
#100			9.3	12.4	12.4	0.149	86.1
#200			19.8	26.4	26.4	0.074	59.7
Pan			44.3	59.1	59.1		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	44.0	20.1		-3.76	40.2	0.0662	52.1
1	40.0	20.1		-3.76	36.2	0.0485	46.9
2	38.0	20.1		-3.76	34.2	0.0349	44.3
4	36.5	20.1		-3.76	32.7	0.0250	42.4
8	35.0	20.1		-3.76	31.2	0.0179	40.4
15	34.0	20.0		-3.77	30.2	0.0132	39.1
30	33.0	20.0		-3.77	29.2	0.0094	37.8
60	29.0	20.0		-3.77	25.2	0.0068	32.6
120	26.0	20.0		-3.77	22.2	0.0049	28.8
240	21.0	20.0		-3.77	17.2	0.0036	22.3
360	18.0	20.0		-3.77	14.2	0.0030	18.4
1440	12.5	19.9		-3.77	8.7	0.0015	11.3

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

Project No. 9521018
Date : 2/9/95

SPECIFIC GRAVITY OF SOILS
ASTM D 854-92

DETERMINATION NUMBER		1	2	3	4
BOTTLE NUMBER		1	3		
AIR REMOVAL METHOD		Vacuum	Vacuum		
WEIGHT OF BOTTLE , gm.		179.54	173.97		
INITIAL WEIGHT OF BOTTLE + SOIL, gm.		279.54	273.94		
INITIAL WEIGHT OF SOIL, gm		100.00	99.97		
WEIGHT OF BOTTLE + SOIL + WATER, gm.	W_1	741.29	735.22		
TEMPERATURE, °C	T	19.6	19.5		
WEIGHT OF BOTTLE + WATER. gm.	W_2	678.08	672.43		
EVAPORATING DISH NUMBER		7	17		
WEIGHT OF DISH + DRY SOIL, gm.		468.58	457.71		
WEIGHT OF DISH, gm.		370.20	359.46		
WEIGHT OF SOIL, gm.	W_S	98.38	98.25		
SPECIFIC GRAVITY OF WATER	G_T	0.9994	0.9994		
$G_T W_S$		98.32	98.19		
$W_1 - W_2$		63.21	62.80		
$W_S-(W_1-W_2)$		35.17	35.45		
SPECIFIC GRAVITY OF SOIL	G_S	**2.796**	**2.769**		

$$G_S = (G_T \cdot W_S)/((W_S-(W_1-W_2)) = \underline{2.78} \text{ (average value)}$$

REMARKS :
(1) Method A - Oven Dried Procedure
(2) Passing the #10 sieve (2.00 mm)

Test Pit: 95-7
Sample :
Depth :

Tested By : LL
Calculated By : LL
Checked By : LL

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

Project No. 9521018
Date : 2/14/95

SPECIFIC GRAVITY OF SOILS
ASTM D 854-92

DETERMINATION NUMBER		1	2	3	4
BOTTLE NUMBER		1	3		
AIR REMOVAL METHOD		Vacuum	Vacuum		
WEIGHT OF BOTTLE , gm.		179.54	173.97		
INITIAL WEIGHT OF BOTTLE + SOIL, gm.		279.54	273.97		
INITIAL WEIGHT OF SOIL, gm		100.00	100.00		
WEIGHT OF BOTTLE + SOIL + WATER, gm.	W_1	741.35	735.58		
TEMPERATURE, °C	T	19.9	19.4		
WEIGHT OF BOTTLE + WATER, gm.	W_2	678.06	672.43		
EVAPORATING DISH NUMBER		9	38		
WEIGHT OF DISH + DRY SOIL, gm.		470.84	457.10		
WEIGHT OF DISH, gm.		371.13	357.40		
WEIGHT OF SOIL, gm.	W_S	99.71	99.70		
SPECIFIC GRAVITY OF WATER	G_T	0.99825	0.99835		
$G_T W_S$		99.54	99.54		
$W_1 - W_2$		63.29	63.16		
$W_S-(W_1-W_2)$		36.42	36.55		
SPECIFIC GRAVITY OF SOIL	G_S	2.733	2.724		

$$G_S = (G_T \cdot W_S)/((W_S-(W_1-W_2)) = \underline{2.73} \text{ (average value)}$$

REMARKS :
(1) Method A - Oven Dried Procedure
(2) Passing the #10 sieve (2.00 mm)

Test Pit : TP95-27
Sample :
Depth :

Tested By : LL
Calculated By : LL
Checked By : LL

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

Project No. 9521018
Date : 2/9/95

SPECIFIC GRAVITY OF SOILS
ASTM D 854-92

DETERMINATION NUMBER		1	2	3	4
BOTTLE NUMBER		1	3		
AIR REMOVAL METHOD		Vacuum	Vacuum		
WEIGHT OF BOTTLE , gm.		179.54	173.97		
INITIAL WEIGHT OF BOTTLE + SOIL, gm.		279.54	273.97		
INITIAL WEIGHT OF SOIL, gm		100.00	100.00		
WEIGHT OF BOTTLE + SOIL + WATER, gm.	W_1	741.45	735.71		
TEMPERATURE, °C	T	20.3	20.4		
WEIGHT OF BOTTLE + WATER, gm.	W_2	678.02	672.33		
EVAPORATING DISH NUMBER		18	27		
WEIGHT OF DISH + DRY SOIL, gm.		464.33	451.53		
WEIGHT OF DISH, gm.		365.41	352.61		
WEIGHT OF SOIL, gm.	W_S	98.92	98.92		
SPECIFIC GRAVITY OF WATER	G_T	0.9994	0.9994		
$G_T W_S$		98.86	98.86		
$W_1 - W_2$		63.43	63.38		
$W_S-(W_1-W_2)$		35.49	35.54		
SPECIFIC GRAVITY OF SOIL	G_s	**2.786**	**2.782**		

$$G_S = (G_T \cdot W_S)/((W_S-(W_1-W_2)) = \underline{2.78} \text{ (average value)}$$

REMARKS :
(1) Method A - Oven Dried Procedure
(2) Passing the #10 sieve (2.00 mm)

Test Pit: 95-35
Sample :
Depth :

Tested By : LL
Calculated By : LL
Checked By : LL

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

Project No. 9521018
Date : 2/9/95

SPECIFIC GRAVITY OF SOILS
ASTM D 854-92

DETERMINATION NUMBER		1	2	3	4
BOTTLE NUMBER		1	3		
AIR REMOVAL METHOD		Vacuum	Vacuum		
WEIGHT OF BOTTLE , gm.		179.54	173.97		
INITIAL WEIGHT OF BOTTLE + SOIL, gm.		279.54	273.97		
INITIAL WEIGHT OF SOIL, gm		100.00	100.00		
WEIGHT OF BOTTLE + SOIL + WATER, gm.	W_1	740.95	735.26		
TEMPERATURE, °C	T	20.3	20.0		
WEIGHT OF BOTTLE + WATER, gm.	W_2	678.01	672.38		
EVAPORATING DISH NUMBER		C	23		
WEIGHT OF DISH + DRY SOIL, gm.		292.50	458.26		
WEIGHT OF DISH, gm.		194.42	360.28		
WEIGHT OF SOIL, gm.	W_S	98.08	97.98		
SPECIFIC GRAVITY OF WATER	G_T	0.9994	0.9994		
$G_T W_S$		98.02	97.92		
$W_1 - W_2$		62.94	62.88		
$W_S-(W_1-W_2)$		35.14	35.10		
SPECIFIC GRAVITY OF SOIL	G_S	**2.789**	**2.790**		

$$G_S = (G_T \cdot W_S)/((W_S-(W_1-W_2)) = \underline{2.79} \text{ (average value)}$$

REMARKS :
(1) Method A - Oven Dried Procedure
(2) Passing the #10 sieve (2.00 mm)

Test Pit: 95-38
Sample :
Depth :

Tested By : LL
Calculated By : LL
Checked By : LL

GOLDER ASSOCIATES Ltd.
CONSULTING ENGINEERS

Project No. 9521018
Date : 2/9/95

SPECIFIC GRAVITY OF SOILS
ASTM D 854-92

DETERMINATION NUMBER		1	2	3	4
BOTTLE NUMBER		1	3		
AIR REMOVAL METHOD		Vacuum	Vacuum		
WEIGHT OF BOTTLE , gm.		179.54	173.97		
INITIAL WEIGHT OF BOTTLE + SOIL, gm.		279.54	273.97		
INITIAL WEIGHT OF SOIL, gm		100.00	100.00		
WEIGHT OF BOTTLE + SOIL + WATER, gm.	W_1	740.86	735.04		
TEMPERATURE, °C	T	20.0	20.0		
WEIGHT OF BOTTLE + WATER, gm.	W_2	678.05	672.38		
EVAPORATING DISH NUMBER		5	31		
WEIGHT OF DISH + DRY SOIL, gm.		220.97	209.10		
WEIGHT OF DISH, gm.		122.61	110.71		
WEIGHT OF SOIL, gm.	W_S	98.36	98.39		
SPECIFIC GRAVITY OF WATER	G_T	0.9994	0.9994		
$G_T W_S$		98.30	98.33		
$W_1 - W_2$		62.82	62.66		
$W_S-(W_1-W_2)$		35.54	35.73		
SPECIFIC GRAVITY OF SOIL	G_s	**2.766**	**2.752**		

$$G_S = (G_T \cdot W_S)/((W_S-(W_1-W_2)) = \underline{2.76} \text{ (average value)}$$

REMARKS :
(1) Method A - Oven Dried Procedure
(2) Passing the #10 sieve (2.00 mm)

Test Pit: 95-39
Sample :
Depth :

Tested By : LL
Calculated By : LL
Checked By : LL

Golder Associates

PROJECT No. 9521018 LAB No. 19

SITE LOCATION: TP95-7

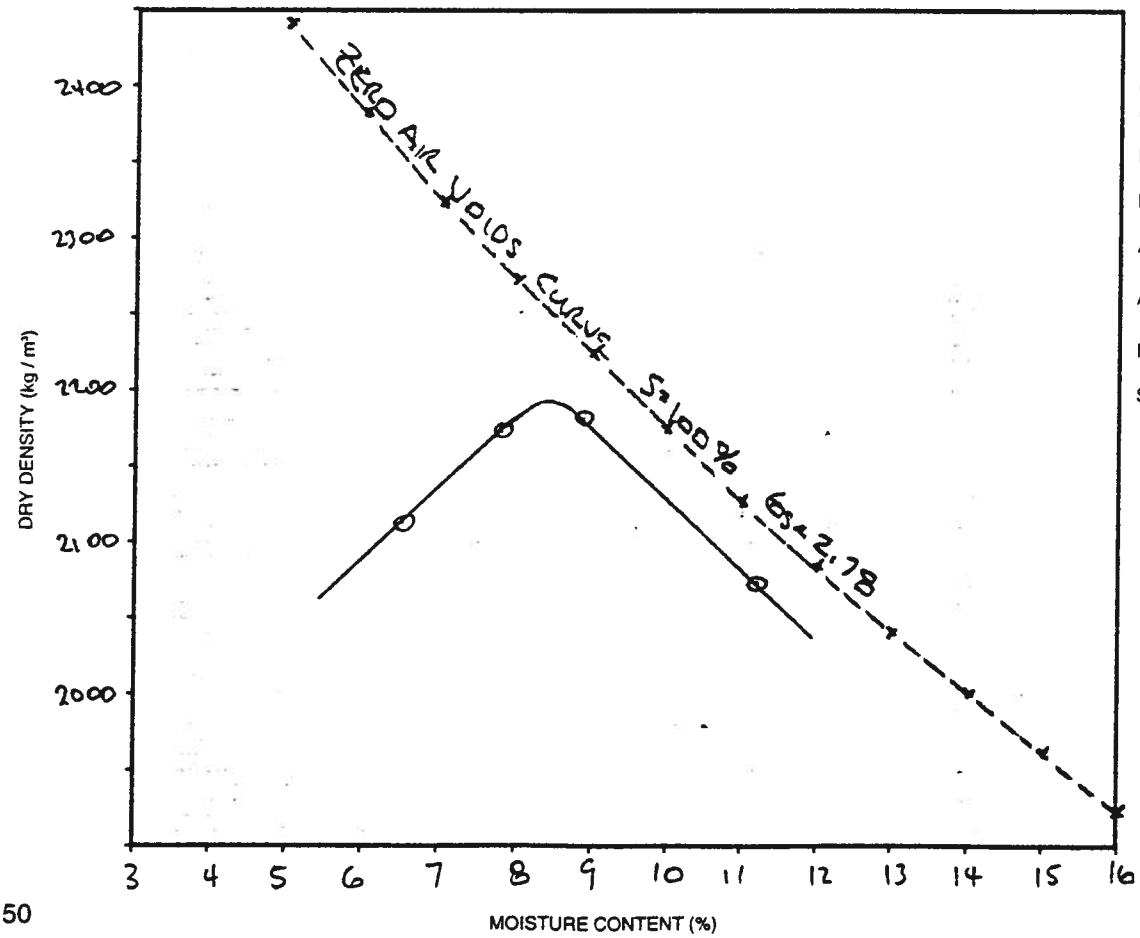
SOURCE:

DATE TESTED: JAN-25-95 BY: LC

MOISTURE DENSITY RELATIONSHIP (Modified)

	TRIAL NO.	1	2	3	4	5		
DENSITY	WT. OF SAMPLE WET + MOLD	10,517.7	10,394.6	10,598.0	10,660.7			
	WEIGHT OF MOLD	5618.4	5618.4	5618.4	5618.4	5618.4		
	WT. OF SAMPLE WET	4899.3	4776.2	4979.6	5042.3			
	WET DENSITY (kg / m³)	2306.6	2248.7	2344.4	2373.9			
	DRY DENSITY (kg / m³)	2074.3 ✓	2112.0 ✓	2175.2 ✓	2180.8 ✓			

	MOISTURE ADDED	NAT	-	+	+			
MOISTURE CONTENT	CONTAINER No.	23	17	7	23			
	WT. OF WET SOIL + TARE	1531.9	1083.4	1433.6	1710.3			
	WT. OF DRY SOIL + TARE	1414.4	1039.4	1356.8	1600.4			
	WEIGHT OF WATER	117.5	44.0	76.8	109.9			
	TARE WEIGHT	360.3	359.7	370.2	360.2			
	WEIGHT OF DRY SOIL	1054.1	679.7	986.6	1240.2			
	MOISTURE CONTENT (%)	11.2 ✓	6.47 ✓	7.78 ✓	8.86 ✓			



MAX. DRY DENSITY 2192 kg / m³

OPTIMUM MOISTURE 8.4 %

MOLD DIA. 15.24 cm

MOLD VOL. .002124 m³

ASTM D 698 ☐

ASTM D1557 ☑

METHOD C

SAMPLE DESCRIPTION:

% +19 mm = 4.3 %

Gs = 2.78

Golder Associates

✓ KGS Feb 14/95

PROJECT No. 9521018 LAB No. 19

SITE LOCATION: TP95-18

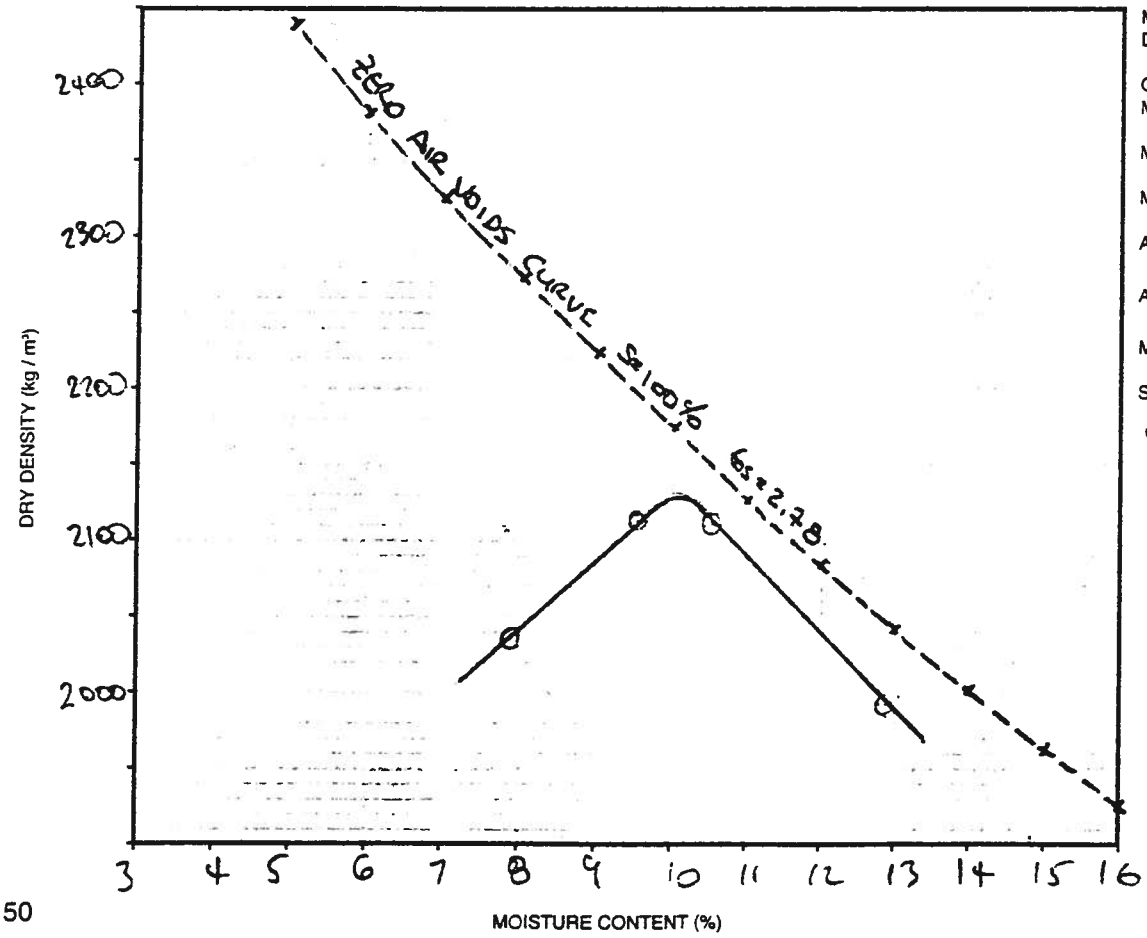
SOURCE:

DATE TESTED: Feb-01-95 BY: L. Lee

MOISTURE DENSITY RELATIONSHIP (MODIFIED)

	TRIAL NO.	1	2	3	4			
DENSITY	WT. OF SAMPLE WET + MOLD	10,396.7	10,281.3	10,539.5	10,578.3			
	WEIGHT OF MOLD	5618.4	5618.4	5618.4	5618.4			
	WT. OF SAMPLE WET	4778.3	4662.9	4921.1	4959.9			
	WET DENSITY (kg / m³)	2249.7	2195.3	2316.9	2335.2			
	DRY DENSITY (kg / m³)	1992.6 ✓	2036.3 ✓	2114.5 ✓	2112.4 ✓			

MOISTURE CONTENT	MOISTURE ADDED	NAT	—					
	CONTAINER No.	148	191	232	110			
	WT. OF WET SOIL + TARE	412.4	312.1	376.6	400.7			
	WT. OF DRY SOIL + TARE	367.5	290.8	345.3	364.2			
	WEIGHT OF WATER	44.9	21.3	31.3	36.5			
	TARE WEIGHT	18.2	18.1	18.4	18.2			
	WEIGHT OF DRY SOIL	349.3	272.7	326.9	346.0			
	MOISTURE CONTENT (%)	12.9 ✓	7.81 ✓	9.57 ✓	10.55 ✓			



MAX. DRY DENSITY 2130 kg / m³

OPTIMUM MOISTURE 10.1 %

MOLD DIA. 15.24 cm

MOLD VOL. .002124 m³

ASTM D 698 ☐

ASTM D1557 ☑

METHOD C

SAMPLE DESCRIPTION:

% +19 mm = 0 %

Golder Associates

PROJECT No. 9521018 LAB No. 19

SITE LOCATION: TP95-27

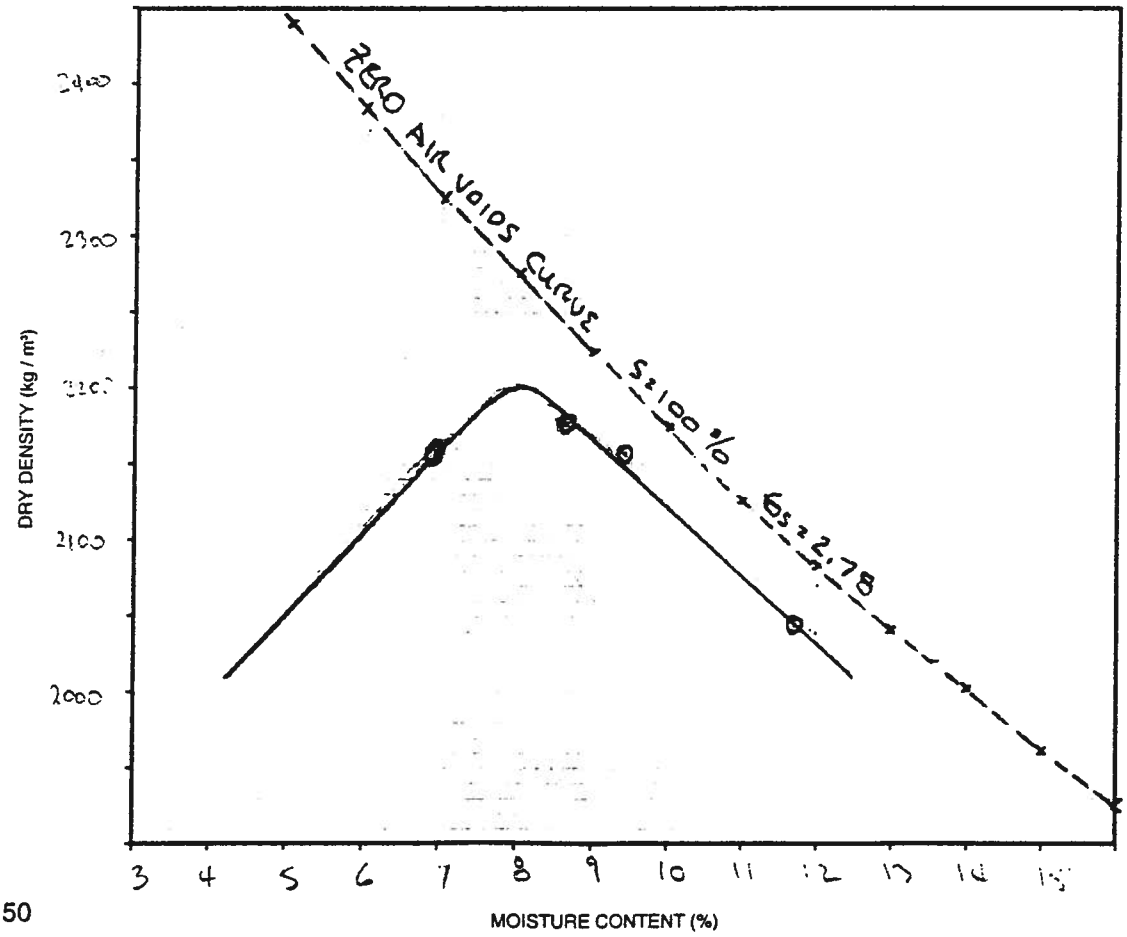
SOURCE:

DATE TESTED: JAN-23/95 BY: LL

MOISTURE DENSITY RELATIONSHIP (MODIFIED)

	TRIAL NO.	1	2	3	4	5		
DENSITY	WT. OF SAMPLE WET + MOLD	10,473.6	10,637.8	10,633.3	10,520.4			
	WEIGHT OF MOLD	5618.4	5618.4	5618.4	5618.4			
	WT. OF SAMPLE WET	4855.2	5019.4	5014.9	4902.0			
	WET DENSITY (kg / m³)	2285.9	2363.2	2361.1	2307.9			
	DRY DENSITY (kg / m³)	2046.4	2176.1	2158.2	2158.9			

MOISTURE CONTENT	MOISTURE ADDED	NAT	- -	—				
	CONTAINER No.	13	25	34	7			
	WT. OF WET SOIL + TARE	1483.3	1312.2	1295.4	1287.2			
	WT. OF DRY SOIL + TARE	1366.1	1237.0	1214.7	1228.0			
	WEIGHT OF WATER	117.2	75.2	80.7	59.2			
	TARE WEIGHT	364.7	362.4	353.5	370.1			
	WEIGHT OF DRY SOIL	1001.4	874.6	861.2	857.9			
	MOISTURE CONTENT (%)	11.7	8.60	9.4	6.9			



MAX. DRY DENSITY 2200 kg / m³

OPTIMUM MOISTURE 8.0 %

MOLD DIA. 15.24 cm

MOLD VOL. .002124 m³

ASTM D 698 ☐

ASTM D1557 ☑

METHOD C

SAMPLE DESCRIPTION:

% + 19 mm = ____

Golder Associates

1/[illegible] Feb 14/95

PROJECT No. 9521018 LAB No. _____

SITE LOCATION: TP95-31

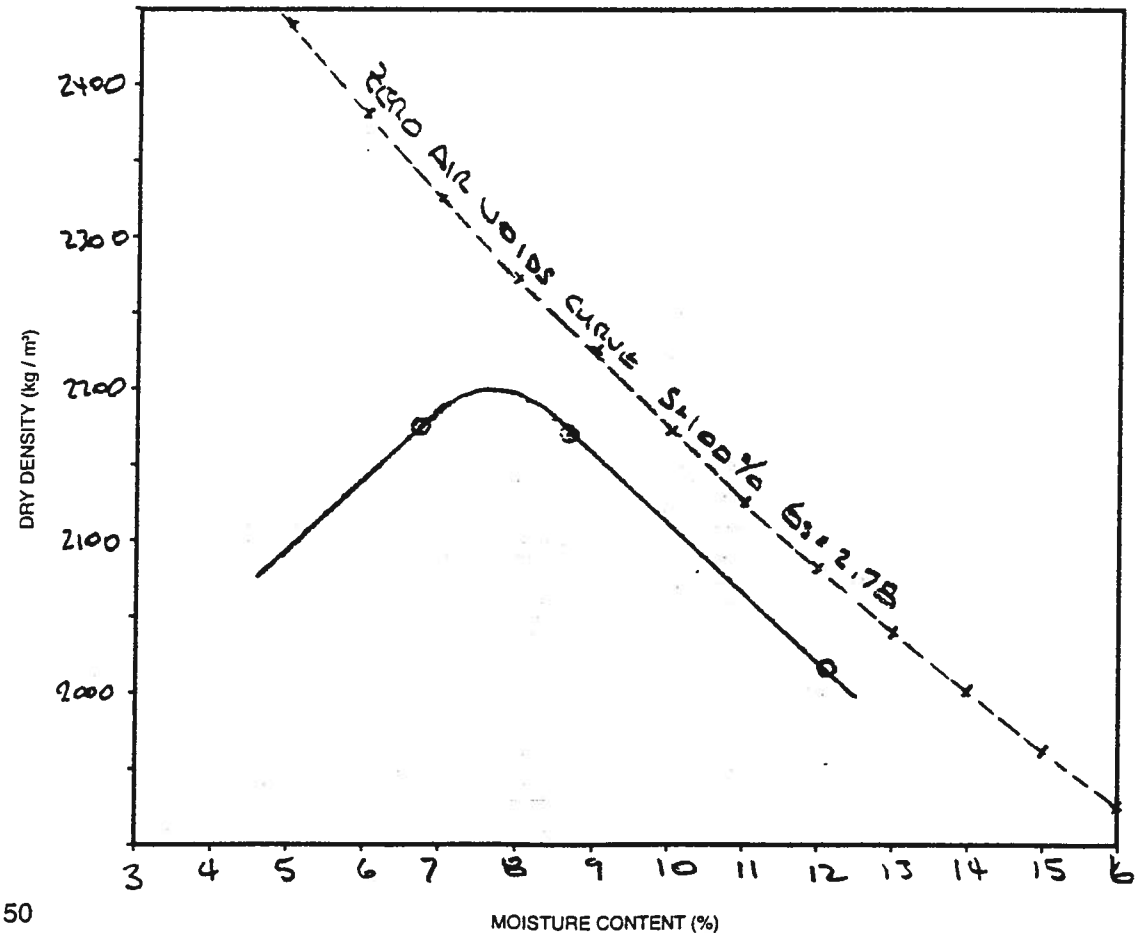
SOURCE: _____

DATE TESTED: Feb-02-95 BY: LC

MOISTURE DENSITY RELATIONSHIP (Modified)

	TRIAL NO.	1	2	3	4			
DENSITY	WT. OF SAMPLE WET + MOLD	10,424.6	10,631.1	10,551.5				
	WEIGHT OF MOLD	5618.4	5618.4	5618.4	5618.4			
	WT. OF SAMPLE WET	4806.2	5012.7	4933.1				
	WET DENSITY (kg / m³)	2262.8	2360.0	2322.6				
	DRY DENSITY (kg / m³)	2018.6	2172.7	2178.1				

MOISTURE CONTENT	MOISTURE ADDED	NAT	–	– –				
	CONTAINER No.	399	250	250				
	WT. OF WET SOIL + TARE	595.9	768.3	1075.8				
	WT. OF DRY SOIL + TARE	533.4	715.6	1015.4				
	WEIGHT OF WATER	62.5	52.7	60.4				
	TARE WEIGHT	17.6	104.1	104.1				
	WEIGHT OF DRY SOIL	515.8	611.5	911.3				
	MOISTURE CONTENT (%)	12.1 ✓	8.62 ✓	6.63 ✓				



MAX. DRY DENSITY 2200 kg / m³

OPTIMUM MOISTURE 7.6 %

MOLD DIA. 15.24 cm

MOLD VOL. .002124 m³

ASTM D 698 ☐

ASTM D1557 ☑

METHOD C

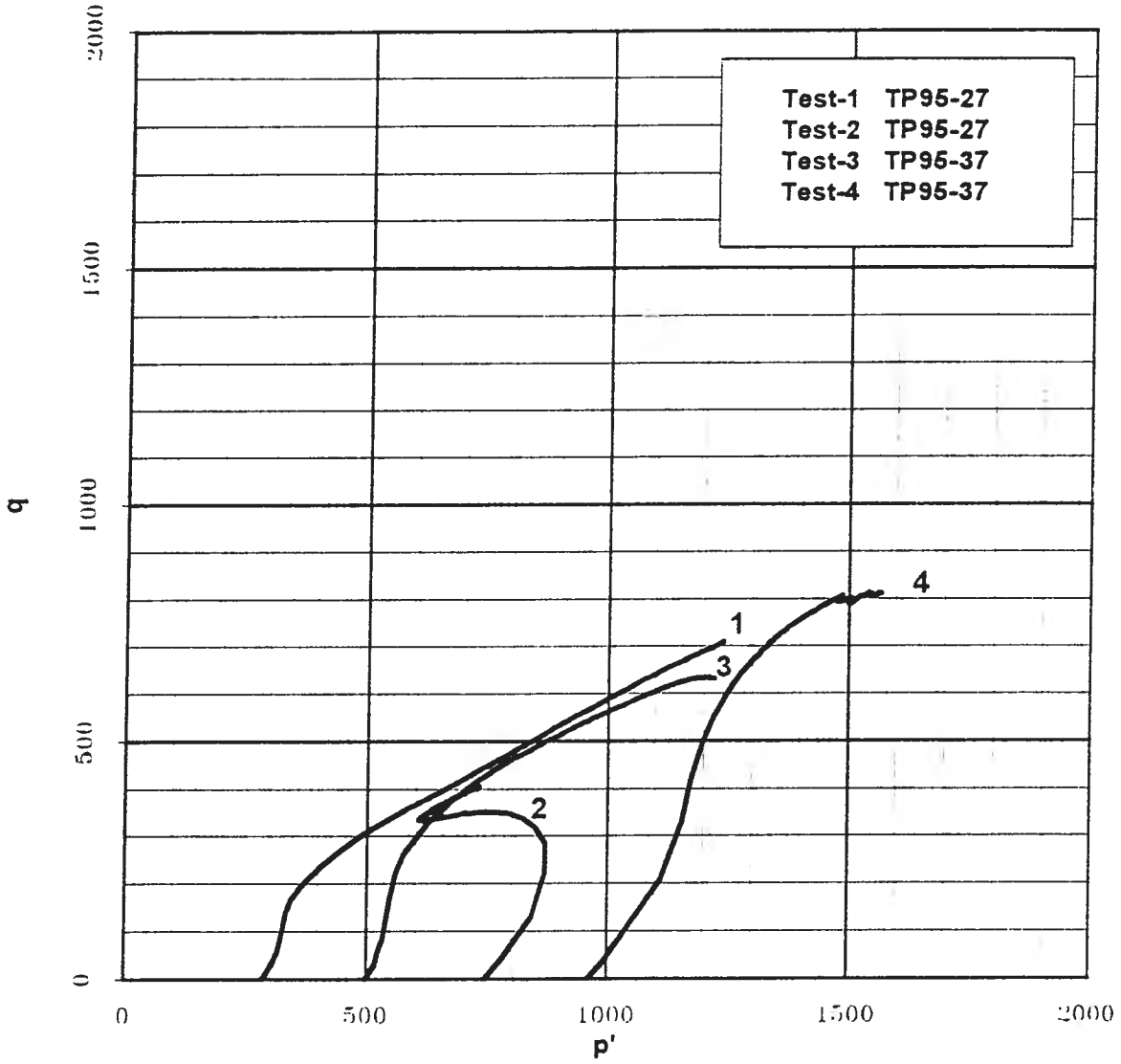
SAMPLE DESCRIPTION:

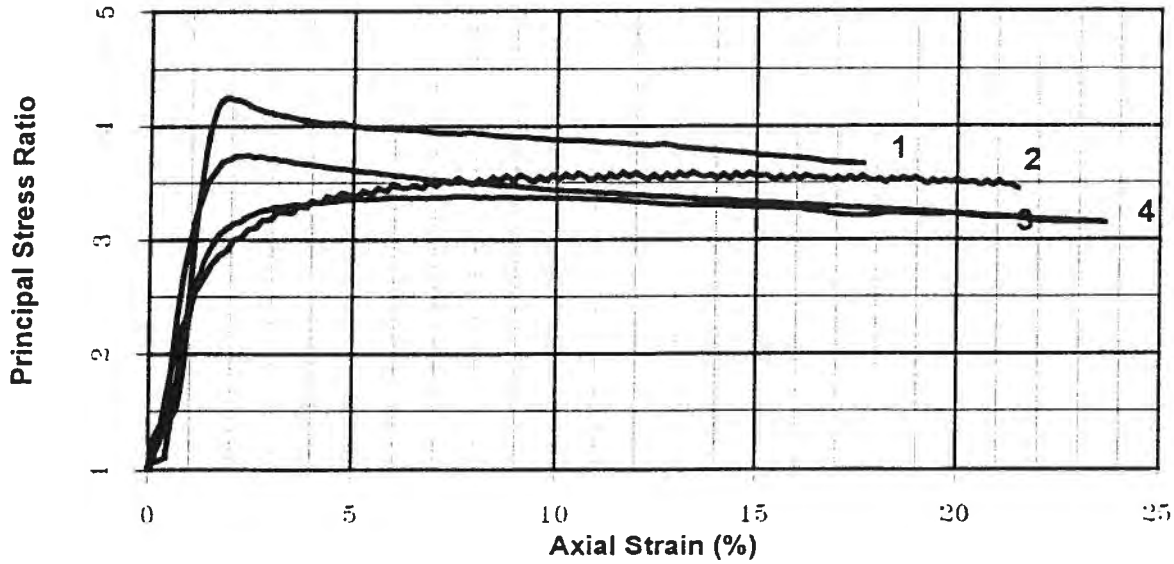
% + 19 mm = 28.1 %

γdry corrected: 2337 kg

Consolidated Undrained Triaxial Compression Test on Cohesive Soils
ASTM D 4767-88

Figure



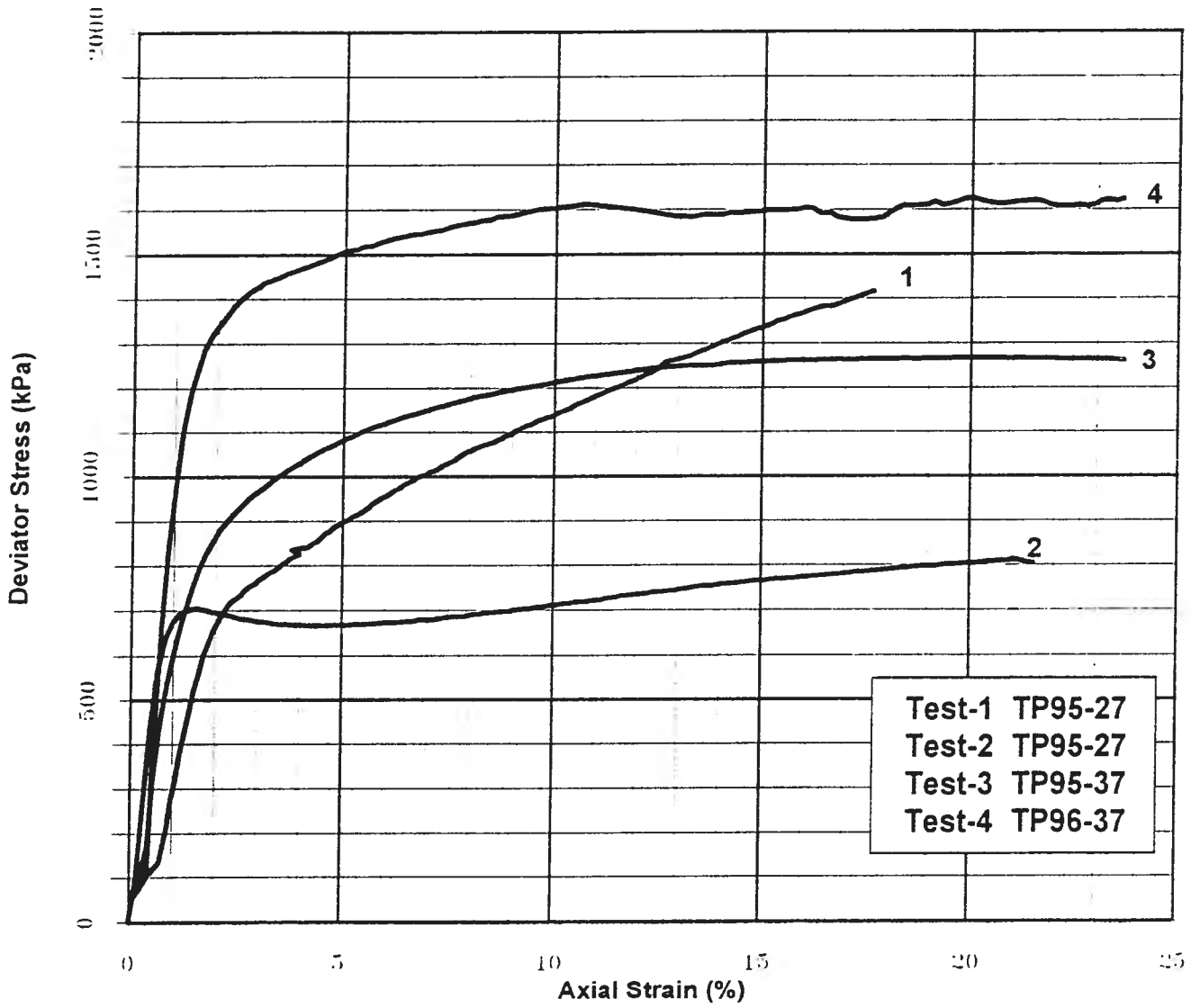


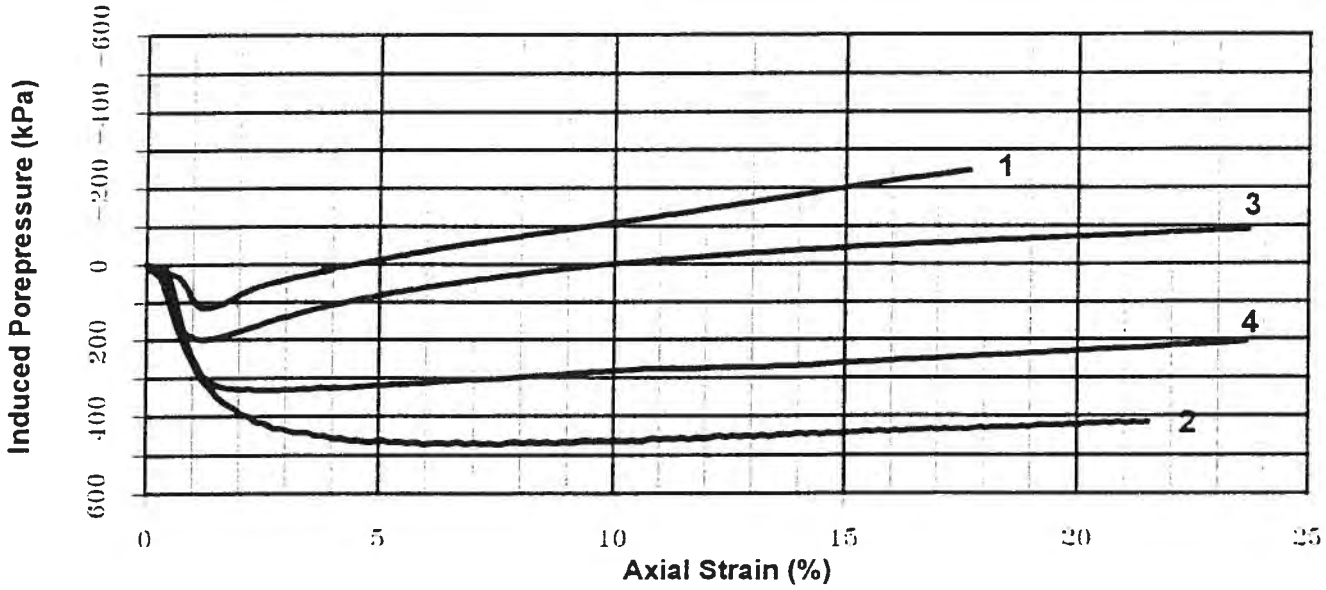
PROJECT No. 5 018A DRAWN LL REVIEWED DATE 02/27/95

Golder Associates

Consolidated Undrained Triaxial Compression Test on Cohesive Soils
ASTM D 4767-88

Figure





PROJECT No 95-18 DRAWN LL REVIEWED DATE 02/27/95

Golder Associates

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

Consolidated Undrained Triaxial Compression Test on Cohesive Soils
ASTM D 4767 - 88

PROJECT#	9421897-5040	L_c =	14.58	cm	DATE	20-Feb-95		Strength Results :				Density: (Kg/M³)	
Test Pit	TP95-27	A_c =	44.76	cm²	FILE :	3x-250.XLS		Max.σ_D' =	1415.6	kPa		γ_t =	2168
Sample		V_c =	657.1	cm³	TEST#	CIU-1		Strain @ =	17.86	%		γ_r =	2207
Depth								Max. PSR =	4.25			E_t =	0.259
REMARKS :		Consolidation Pressure :			CALIBRATIONS :			Strain @ =	1.35	%		E_r =	0.237
- Failure Mode Bulging		CP =	771.3	kPa	LOAD =	0.0025	kN/mV	Consolidation Results:				Water Contents:	
- Minus 19.5 mm material		BP =	484.4	kPa	PORE =	0.5895	kPa/mV	δV_c =	11.3	cc		W_i =	7.9
- Corrections applied for membrane		σ_{3c}' =	287.4	kPa	LVDT =	0.0235	mm/mV	T_{100} =	26.0	min		W_f =	9.7
		B_{value} =	0.965		Feed Rate =	0.010	mm/min	C_v =	2.7E-02	cm²/s			

δL (mV)	LOAD (mV)	δU (mV)	E (%)	LOAD (kN)	A_c (cm²)	σ_D (kPa)	δU (kPa)	σ_3' (kPa)	σ_1' (kPa)	PSR	A	p' (kPa)	q (kPa)
139.4	108.7	-702.2	0.00	0.00	44.76	0.0	0.0	287.4	287.4	1.00		287.4	0.0
143.2	169.1	-715.2	0.07	0.22	44.79	48.6	9.0	278.4	327.0	1.17	0.18	302.7	24.3
147.9	205.0	-723.3	0.16	0.35	44.83	77.2	14.5	272.9	350.1	1.29	0.19	311.5	38.6
153.4	231.1	-733.1	0.27	0.44	44.88	98.1	21.3	266.1	364.2	1.37	0.22	315.1	49.0
158.9	242.6	-738.3	0.33	0.48	44.93	107.1	24.9	262.5	369.6	1.41	0.23	316.1	53.6
164.1	244.8	-737.8	0.48	0.49	44.97	108.8	24.5	262.9	371.6	1.41	0.23	317.2	54.4
169.2	258.4	-742.0	0.58	0.54	45.02	119.4	27.4	260.0	379.4	1.46	0.23	319.7	59.7
175.4	276.8	-750.8	0.70	0.61	45.07	134.0	33.5	253.9	387.9	1.53	0.25	320.9	67.0
179.6	315.2	-765.7	0.73	0.74	45.11	164.5	43.3	243.6	408.1	1.68	0.27	325.9	82.2
185.3	378.8	-796.2	0.85	0.97	45.16	214.9	64.3	222.6	437.5	1.97	0.30	330.1	107.5
189.2	452.9	-830.2	0.97	1.24	45.19	272.8	88.2	199.1	472.9	2.37	0.32	336.0	136.9
195.7	526.6	-857.3	1.09	1.50	45.25	332.0	107.3	180.1	512.1	2.84	0.32	346.1	166.0
200.4	590.0	-869.3	1.13	1.73	45.29	382.1	115.2	172.2	554.2	3.22	0.30	363.2	191.0
206.1	650.8	-872.6	1.29	1.95	45.34	429.3	117.5	169.9	599.7	3.53	0.27	384.8	214.9
211.5	708.5	-871.7	1.42	2.16	45.39	475.1	116.9	170.5	645.6	3.79	0.25	408.1	237.6
216.7	764.5	-866.0	1.50	2.36	45.44	518.9	112.9	174.5	693.4	3.97	0.22	433.9	259.5
223.1	820.1	-858.4	1.62	2.56	45.50	562.2	107.7	179.7	741.9	4.13	0.19	460.8	281.1
228.3	868.5	-848.1	1.72	2.74	45.54	599.9	100.5	186.8	786.7	4.21	0.17	486.7	299.9
234.7	907.3	-838.0	1.85	2.88	45.60	629.7	93.8	193.8	823.4	4.25	0.15	508.6	314.8
240.0	938.8	-826.7	1.95	2.99	45.65	653.3	85.3	201.6	855.4	4.24	0.13	528.5	326.9
245.2	964.9	-816.2	2.05	3.08	45.69	673.7	78.6	208.3	882.5	4.23	0.12	545.6	336.8
251.1	989.1	-807.9	2.17	3.17	45.75	691.3	72.9	214.5	906.4	4.23	0.11	560.4	345.9
256.3	1009.3	-799.6	2.27	3.24	45.80	707.0	67.2	220.2	927.2	4.21	0.09	573.7	353.5
261.3	1023.9	-793.4	2.27	3.29	45.84	717.7	62.9	224.5	942.2	4.20	0.09	583.4	358.8
267.2	1036.0	-786.6	2.48	3.34	45.89	726.3	58.2	229.2	955.5	4.17	0.08	592.4	363.1
272.9	1047.3	-781.4	2.58	3.38	45.95	734.3	54.6	232.8	967.1	4.15	0.07	599.9	367.1
277.5	1060.3	-775.3	2.68	3.43	45.99	743.7	50.7	236.7	980.4	4.14	0.07	608.5	371.9
283.6	1071.5	-770.5	2.80	3.47	46.05	751.5	47.1	240.3	991.8	4.13	0.06	616.1	375.8
289.6	1081.3	-766.1	2.91	3.50	46.10	758.2	44.1	243.3	1001.6	4.12	0.06	622.5	379.1
294.6	1093.0	-761.0	3.01	3.54	46.15	766.5	40.5	246.9	1013.4	4.11	0.05	630.1	383.3
300.8	1103.7	-757.2	3.13	3.58	46.20	773.9	37.9	249.5	1023.3	4.10	0.05	636.4	386.9
304.9	1113.5	-752.4	3.21	3.62	46.24	780.3	34.6	252.8	1033.6	4.09	0.04	643.2	390.4
312.7	1123.4	-749.0	3.36	3.65	46.31	787.2	32.3	255.1	1042.4	4.09	0.04	648.7	393.6
317.3	1132.3	-744.3	3.45	3.69	46.36	793.4	29.0	258.4	1051.7	4.07	0.04	655.1	396.7
322.6	1144.0	-739.8	3.56	3.73	46.41	801.6	25.9	261.5	1063.0	4.07	0.03	662.3	400.8
327.6	1152.3	-736.3	3.65	3.76	46.45	807.1	23.5	263.9	1071.0	4.06	0.03	667.5	403.6
332.7	1162.4	-731.8	3.75	3.79	46.50	814.1	20.4	267.0	1081.1	4.05	0.03	674.0	407.0
339.6	1172.6	-728.5	3.89	3.83	46.57	820.8	18.1	269.3	1090.0	4.05	0.02	679.7	410.4
344.0	1180.9	-723.8	3.97	3.86	46.61	826.4	14.9	272.5	1098.9	4.03	0.02	685.7	413.2
335.6	1190.0	-720.6	3.81	3.89	46.53	834.9	12.7	274.7	1109.6	4.04	0.02	692.2	417.5
353.8	1201.4	-716.2	4.16	3.93	46.70	840.5	9.7	277.7	1118.2	4.03	0.01	698.0	420.2
359.7	1212.6	-711.8	4.28	3.97	46.76	848.1	6.6	280.8	1128.8	4.02	0.01	704.8	424.0
365.1	1222.0	-708.5	4.38	4.01	46.81	854.3	4.3	283.1	1137.4	4.02	0.01	710.2	427.2
370.7	1235.0	-704.5	4.49	4.05	46.86	863.3	1.6	285.8	1149.1	4.02	0.00	717.4	431.6
375.9	1247.1	-701.1	4.59	4.10	46.91	871.6	-0.8	288.2	1159.8	4.02	0.00	724.0	435.8
380.7	1255.8	-697.0	4.68	4.13	46.96	877.4	-3.6	291.0	1168.4	4.02	0.00	729.7	438.7
385.5	1268.1	-693.7	4.78	4.17	47.00	885.9	-5.9	293.3	1179.1	4.02	-0.01	736.2	442.9
390.7	1276.0	-689.4	4.88	4.20	47.05	890.9	-8.8	296.2	1187.2	4.01	-0.01	741.7	445.5
395.7	1284.5	-685.5	4.97	4.23	47.10	896.5	-11.5	298.9	1195.4	4.00	-0.01	747.2	448.2
403.0	1293.0	-682.5	5.12	4.26	47.17	901.6	-13.5	300.9	1202.5	4.00	-0.01	751.7	450.8
407.6	1302.6	-678.5	5.21	4.30	47.21	908.0	-16.3	303.7	1211.7	3.99	-0.02	757.7	454.0
412.3	1309.8	-675.4	5.30	4.32	47.26	912.6	-18.5	305.9	1218.4	3.98	-0.02	762.2	456.3
418.3	1318.7	-671.7	5.41	4.36	47.32	918.2	-21.0	308.4	1226.6	3.98	-0.02	767.5	459.1
423.2	1328.5	-669.0	5.51	4.39	47.37	924.6	-22.9	310.3	1234.9	3.98	-0.02	772.6	462.3
428.4	1338.4	-665.0	5.61	4.43	47.42	931.1	-25.6	313.0	1244.2	3.97	-0.03	778.6	465.6
432.2	1348.4	-661.1	5.68	4.46	47.45	937.9	-28.3	315.7	1253.7	3.97	-0.03	784.7	469.0
437.9	1359.3	-658.4	5.79	4.50	47.51	945.0	-30.2	317.6	1262.6	3.98	-0.03	790.1	472.5
443.9	1368.2	-654.8	5.91	4.53	47.57	950.6	-32.7	320.1	1270.6	3.97	-0.03	795.4	475.3
449.2	1376.8	-652.1	6.01	4.57	47.62	956.0	-34.5	321.9	1277.9	3.97	-0.04	799.9	478.0
454.5	1386.8	-648.6	6.12	4.60	47.67	962.4	-37.0	324.4	1286.8	3.97	-0.04	805.6	481.2
459.5	1395.4	-646.1	6.21	4.63	47.72	967.9	-38.7	326.1	1294.0	3.97	-0.04	810.0	483.9
464.9	1404.3	-642.5	6.32	4.66	47.78	973.4	-41.2	328.6	1302.0	3.96	-0.04	815.3	486.7
469.7	1414.7	-639.1	6.41	4.70	47.82	980.3	-43.5	330.9	1311.2	3.96	-0.04	821.0	490.1
475.3	1422.9	-636.8	6.52	4.73	47.88	985.2	-45.1	332.5	1317.7	3.96	-0.05	825.1	492.6
479.7	1428.8	-633.4	6.61	4.75	47.92	988.7	-47.4	334.8	1323.6	3.95	-0.05	829.2	494.4
484.1	1438.1	-630.9	6.69	4.79	47.97	994.8	-49.2	336.6	1331.3	3.96	-0.05	833.9	497.4
489.8	1445.4	-627.7	6.80	4.81	48.02	999.0	-51.4	338.8	1337.8	3.95	-0.05	838.3	499.5
495.3	1450.2	-625.5	6.91	4.83	48.08	1001.4	-52.9	340.3	1341.7	3.94	-0.05	841.0	500.7
500.2	1459.1	-622.2	7.00	4.86	48.13	1007.0	-55.2	342.6	1349.5	3.94	-0.05	846.1	503.5

δL	LOAD	δU	E	LOAD	A_c	σ_0'	δU	σ_1	σ_1'	PSR	A	p'	q
(mV)	(mV)	(mV)	(%)	(kN)	(cm²)	(kPa)	(kPa)	(kPa)	(kPa)			(kPa)	(kPa)
505.7	1466.6	-619.0	7.11	4.39	48.18	1011.4	-57.4	244.3	1355.1	3.92	-0.06	850.5	505.7
510.6	1475.2	-616.8	7.21	4.92	48.23	1016.7	-58.9	346.3	1362.0	3.94	-0.06	854.6	508.4
515.7	1484.7	-613.8	7.30	4.95	48.28	1022.7	-61.0	348.4	1371.0	3.94	-0.06	859.7	511.3
521.0	1492.2	-611.9	7.41	4.98	48.34	1027.1	-62.3	349.7	1376.7	3.94	-0.06	863.2	513.5
526.6	1500.2	-608.9	7.52	5.01	48.39	1031.8	-64.2	351.7	1383.5	3.93	-0.06	867.6	515.9
531.1	1507.7	-605.3	7.60	5.04	48.44	1036.2	-66.5	353.9	1390.2	3.93	-0.06	872.0	518.2
536.7	1517.7	-603.9	7.71	5.07	48.50	1042.5	-67.8	355.2	1397.6	3.94	-0.07	876.4	521.2
541.2	1527.9	-600.9	7.80	5.11	48.54	1048.0	-69.8	357.2	1405.2	3.94	-0.07	881.7	524.5
546.2	1536.6	-598.5	7.90	5.14	48.59	1054.2	-71.5	359.9	1412.2	3.94	-0.07	886.0	527.1
551.3	1541.8	-595.9	8.01	5.16	48.65	1056.9	-73.0	360.7	1417.5	3.92	-0.07	889.1	528.4
556.5	1550.5	-592.5	8.10	5.19	48.70	1062.2	-75.6	363.0	1425.2	3.92	-0.07	894.7	531.1
562.1	1557.2	-590.8	8.21	5.21	48.76	1065.8	-76.8	364.2	1430.0	3.93	-0.07	897.1	532.9
567.5	1564.1	-587.7	8.31	5.24	48.81	1069.5	-78.5	366.3	1436.0	3.92	-0.07	901.2	534.8
572.1	1568.5	-585.6	8.40	5.26	48.86	1071.8	-80.4	367.3	1439.6	3.91	-0.08	903.7	535.9
577.9	1575.5	-582.6	8.51	5.28	48.92	1075.6	-82.5	369.9	1445.4	3.91	-0.08	907.7	537.8
583.1	1583.4	-580.7	8.61	5.31	48.97	1080.1	-83.8	371.2	1451.3	3.91	-0.08	911.2	540.1
588.4	1591.4	-577.5	8.72	5.34	49.03	1084.8	-86.0	373.4	1458.1	3.91	-0.08	915.8	542.4
593.4	1599.5	-574.7	8.79	5.37	49.07	1089.8	-87.9	375.3	1465.1	3.90	-0.08	920.2	544.9
599.2	1607.3	-572.7	8.93	5.40	49.14	1093.8	-89.2	378.7	1470.5	3.90	-0.08	923.5	546.9
603.3	1615.3	-569.5	9.01	5.42	49.19	1098.5	-91.5	378.9	1477.4	3.90	-0.08	928.2	549.3
609.0	1623.5	-567.3	9.12	5.45	49.25	1103.3	-92.7	380.1	1483.3	3.90	-0.08	931.7	551.8
614.4	1633.0	-564.8	9.22	5.48	49.30	1108.9	-94.7	382.1	1491.0	3.90	-0.09	936.6	554.4
619.2	1639.9	-562.3	9.31	5.51	49.35	1112.7	-96.5	383.9	1496.6	3.90	-0.09	940.2	556.4
624.2	1645.7	-559.7	9.41	5.52	49.41	1115.7	-98.3	385.7	1501.4	3.89	-0.09	943.5	557.9
629.4	1653.6	-556.7	9.51	5.55	49.46	1120.2	-100.3	387.7	1507.9	3.89	-0.09	947.8	560.1
634.0	1662.6	-554.6	9.60	5.55	49.51	1125.6	-101.8	389.2	1514.7	3.89	-0.09	952.0	562.8
639.9	1669.0	-551.7	9.72	5.62	49.57	1128.7	-103.8	391.2	1519.9	3.89	-0.09	955.8	564.4
651.1	1681.5	-546.5	9.93	5.66	49.69	1135.0	-107.4	394.8	1529.7	3.88	-0.09	962.2	567.5
661.8	1697.2	-542.3	10.14	5.72	49.81	1143.6	-110.3	397.7	1541.2	3.88	-0.10	969.4	571.8
671.7	1711.4	-536.8	10.33	5.77	49.91	1151.3	-114.0	401.4	1552.7	3.87	-0.10	977.1	575.6
682.5	1729.6	-532.7	10.54	5.84	50.03	1161.6	-116.9	404.3	1565.9	3.87	-0.10	985.1	580.8
692.9	1745.4	-527.1	10.74	5.89	50.14	1170.2	-120.7	408.1	1578.3	3.87	-0.10	993.2	585.1
702.6	1761.2	-522.4	10.93	5.95	50.25	1179.0	-124.0	411.4	1590.3	3.87	-0.11	1000.9	589.5
712.6	1775.5	-516.5	11.13	6.00	50.35	1186.5	-128.0	415.4	1602.0	3.86	-0.11	1008.7	593.3
723.2	1791.0	-512.5	11.33	6.06	50.48	1194.7	-130.8	418.2	1612.9	3.86	-0.11	1015.6	597.4
733.0	1804.8	-507.0	11.52	6.11	50.59	1201.9	-134.5	422.0	1623.9	3.85	-0.11	1022.9	600.9
743.5	1821.0	-502.4	11.72	6.16	50.70	1210.5	-137.8	425.2	1635.7	3.85	-0.11	1030.4	605.3
753.4	1834.5	-497.0	11.92	6.21	50.81	1217.3	-141.5	428.9	1646.2	3.84	-0.12	1037.5	608.7
762.4	1849.7	-492.0	12.09	6.27	50.91	1225.6	-144.9	432.3	1657.9	3.83	-0.12	1045.1	612.9
773.4	1866.0	-486.6	12.31	6.33	51.04	1234.0	-148.7	436.1	1670.0	3.83	-0.12	1053.1	617.0
782.6	1884.2	-482.1	12.49	6.39	51.14	1244.2	-151.3	439.2	1683.4	3.83	-0.12	1061.3	622.1
792.0	1909.3	-476.7	12.67	6.42	51.25	1259.1	-155.5	442.9	1702.0	3.84	-0.12	1072.5	629.6
802.3	1917.8	-471.7	12.87	6.51	51.37	1262.1	-158.9	446.3	1708.4	3.83	-0.13	1077.4	631.1
811.5	1928.0	-466.0	13.05	6.55	51.47	1266.6	-162.9	450.3	1716.8	3.81	-0.13	1083.5	633.3
822.1	1940.4	-461.7	13.25	6.59	51.59	1272.1	-165.8	453.2	1725.3	3.81	-0.13	1089.3	636.1
831.6	1955.0	-455.8	13.44	6.65	51.70	1279.5	-169.9	457.3	1736.8	3.80	-0.13	1097.0	639.7
841.6	1968.8	-451.5	13.63	6.70	51.82	1286.1	-172.9	460.3	1746.4	3.79	-0.13	1103.3	643.0
850.9	1983.2	-445.9	13.81	6.75	51.93	1293.3	-176.7	464.1	1757.4	3.79	-0.14	1110.8	646.6
860.7	1998.8	-441.3	14.00	6.80	52.04	1301.1	-179.9	467.3	1768.4	3.78	-0.14	1117.9	650.6
870.6	2014.3	-436.0	14.19	6.86	52.16	1308.8	-183.5	470.9	1779.8	3.78	-0.14	1125.4	654.4
880.5	2027.8	-431.1	14.39	6.91	52.28	1315.1	-186.9	474.3	1789.4	3.77	-0.14	1131.9	657.6
889.9	2042.4	-425.5	14.57	6.96	52.39	1322.2	-190.8	478.2	1800.4	3.77	-0.14	1139.2	661.1
899.9	2056.9	-420.6	14.76	7.01	52.51	1329.1	-194.2	481.6	1810.6	3.76	-0.15	1146.1	664.5
909.7	2070.0	-415.3	14.95	7.06	52.63	1334.9	-197.8	485.2	1820.2	3.75	-0.15	1152.7	667.5
918.8	2080.5	-410.5	15.13	7.10	52.74	1339.2	-201.1	488.5	1827.8	3.74	-0.15	1158.2	669.6
928.5	2098.8	-405.4	15.32	7.16	52.85	1348.6	-204.6	492.0	1840.7	3.74	-0.15	1166.4	674.3
939.1	2112.4	-400.4	15.52	7.21	52.98	1354.5	-208.1	495.5	1850.0	3.73	-0.15	1172.7	677.2
948.9	2127.4	-395.8	15.71	7.27	53.10	1361.5	-211.3	498.7	1860.2	3.73	-0.16	1179.4	680.8
958.5	2139.1	-390.6	15.90	7.31	53.22	1366.3	-214.8	502.2	1868.6	3.72	-0.16	1185.4	683.2
968.1	2151.4	-386.2	16.09	7.35	53.34	1371.5	-217.9	505.3	1876.8	3.71	-0.16	1191.0	685.7
978.4	2167.3	-381.2	16.29	7.41	53.46	1378.8	-221.3	508.7	1887.5	3.71	-0.16	1198.1	689.4
988.6	2177.6	-376.8	16.48	7.45	53.59	1382.4	-224.4	511.8	1894.1	3.70	-0.16	1202.9	691.2
998.8	2183.5	-372.1	16.68	7.47	53.72	1382.9	-227.6	515.0	1897.9	3.69	-0.16	1206.5	691.5
1008.4	2196.8	-366.7	16.87	7.52	53.84	1388.5	-231.3	518.7	1907.4	3.68	-0.17	1212.0	694.3
1018.7	2213.1	-363.0	17.07	7.58	53.97	1396.1	-233.9	521.3	1917.3	3.68	-0.17	1219.3	698.0
1028.9	2228.8	-357.9	17.27	7.63	54.10	1403.1	-237.4	524.8	1927.9	3.67	-0.17	1225.3	701.5
1038.7	2243.9	-354.1	17.46	7.69	54.22	1409.8	-240.0	527.4	1937.2	3.67	-0.17	1232.0	704.9
1049.0	2258.1	-349.4	17.66	7.74	54.35	1415.5	-243.3	530.7	1946.3	3.67	-0.17	1238.5	707.8

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

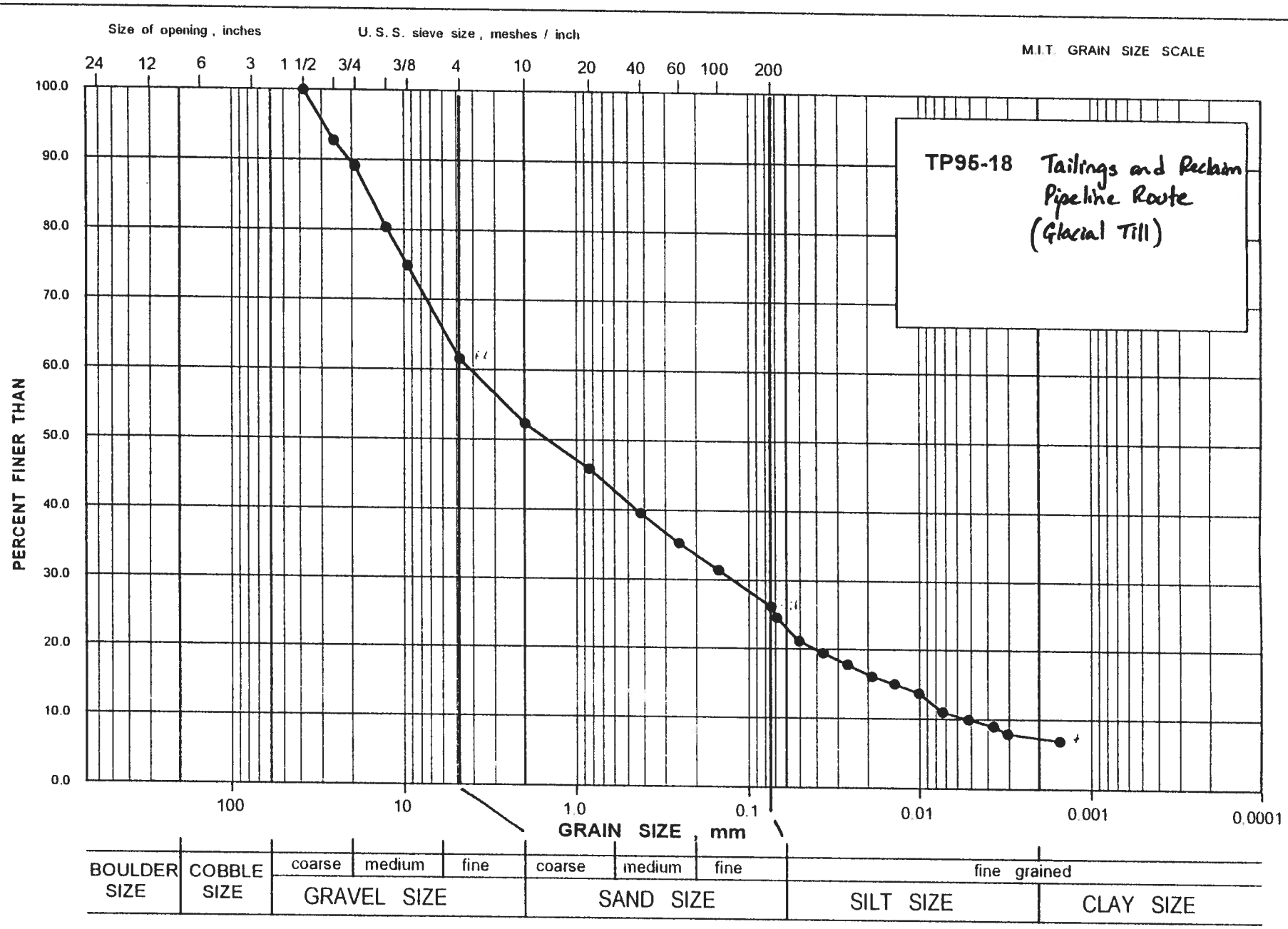
Consolidated Undrained Triaxial Compression Test on Cohesive Soils

ASTM D 4767 - 88

									Strength Results :			Density: (Kg/M³)	
PROJECT#	3421897-5040		L_c =	15.21	cm	DATE :	27-Feb-95		Max. σ_D' =	812.3	kPa	γ_t =	2079
Test Pit	TP95-27		A_c =	44.20	cm²	FILE :	3x-750.XLS		Strain @ =	4.50	%	γ_r =	2161
Sample			V_c =	572.4	cm³	TEST=	CIU-2		Max. PSR =	3.50		E_t =	2.212
Depth									Strain @ =	3.58	%	E_r =	2.284
REMARKS :			Consolidation Pressure :			CALIBRATIONS :			Consolidation Results:			Water Contents:	
- Failure Mode Bulging			CP =	1220.2	kPa	LOAD =	0.0423	kN/mV	δV_c =	26.5	cc	W_i =	7.5
- Minus 19.5 mm material			BP =	475.5	kPa	PORE =	0.6895	kPa/mV	T_{100} =	1.32	min	W_f =	9.8
- Corrections applied for membrane			σ_{3c}' =	744.7	kPa	LVDT =	0.0285	mm/mV	C_v =	2.3E-02	cm²/s		
- Corrections applied for filter paper			B_{VALUE} =	0.954		Feed Rate =	0.024	mm/min					

δL (mV)	LOAD (mV)	δU (mV)	E (%)	LOAD (kN)	A_c (cm²)	σ_D' (kPa)	δU (kPa)	σ_3' (kPa)	σ_1' (kPa)	PSR	A	p' (kPa)	q (kPa)
-174.3	14.3	-689.3	0.00	0.00	44.20	0.0	0.0	744.7	744.7	1.00		744.7	0.0
-166.5	22.4	-698.0	0.15	0.34	44.26	77.1	5.7	739.0	816.2	1.10	0.07	777.6	38.6
-157.5	41.9	-723.7	0.31	1.17	44.34	263.1	33.7	711.0	974.1	1.37	0.13	842.5	131.5
-148.3	61.3	-831.3	0.48	1.99	44.41	446.9	97.6	647.1	1094.0	1.69	0.22	870.6	223.4
-140.7	73.9	-918.5	0.63	2.52	44.48	566.1	137.7	587.0	1153.1	1.96	0.28	870.1	283.1
-130.9	81.6	-1003.1	0.81	2.94	44.56	637.5	216.0	528.7	1166.3	2.21	0.34	847.5	318.8
-121.4	85.6	-1064.9	0.99	3.01	44.64	674.8	258.5	486.1	1160.9	2.39	0.38	823.5	337.4
-112.5	87.7	-1123.2	1.18	3.10	44.72	693.5	298.8	445.9	1139.4	2.56	0.43	792.6	346.8
-102.3	88.6	-1160.3	1.35	3.14	44.80	700.4	324.4	420.3	1120.7	2.67	0.46	770.5	350.2
-93.1	89.1	-1197.7	1.52	3.16	44.88	703.4	350.2	394.5	1097.9	2.78	0.50	746.2	351.7
-83.8	88.9	-1222.2	1.69	3.15	44.96	700.5	367.1	377.6	1078.2	2.86	0.52	727.9	350.3
-73.7	88.5	-1239.3	1.88	3.14	45.05	695.7	379.2	365.5	1061.2	2.90	0.55	713.3	347.9
-64.9	88.5	-1264.6	2.05	3.13	45.12	693.7	396.3	348.4	1042.1	2.99	0.57	695.2	346.9
-54.7	88.1	-1274.9	2.24	3.12	45.21	689.2	403.2	341.5	1030.7	3.02	0.59	686.1	344.6
-46.1	87.8	-1294.8	2.40	3.11	45.28	685.1	417.1	327.6	1012.6	3.09	0.61	670.1	342.5
-36.0	87.5	-1300.4	2.59	3.09	45.37	680.5	421.0	323.7	1004.2	3.10	0.62	663.9	340.3
-27.5	87.5	-1317.4	2.75	3.09	45.45	679.3	432.7	312.0	991.3	3.18	0.64	651.6	339.7
-17.1	87.2	-1320.2	2.94	3.08	45.54	675.0	434.7	310.0	985.0	3.18	0.64	647.5	337.5
-7.4	87.2	-1333.0	3.13	3.08	45.62	674.4	443.5	301.2	975.6	3.24	0.66	638.4	337.2
1.2	87.0	-1335.2	3.29	3.07	45.70	671.1	445.0	299.7	970.7	3.24	0.66	635.2	335.5
11.5	86.8	-1335.6	3.48	3.07	45.79	668.0	445.3	299.4	967.4	3.23	0.67	633.4	334.0
20.3	87.0	-1347.1	3.65	3.07	45.87	668.5	453.2	291.5	960.0	3.29	0.68	625.7	334.2
30.5	86.9	-1345.5	3.84	3.07	45.96	666.3	452.1	292.6	958.9	3.28	0.68	625.7	333.1
39.4	87.1	-1356.7	4.00	3.08	46.04	666.9	459.8	284.9	951.7	3.34	0.69	618.3	333.4
49.5	87.0	-1354.1	4.19	3.07	46.13	664.4	458.0	286.7	951.0	3.32	0.69	618.8	332.2
58.7	87.4	-1364.6	4.36	3.09	46.21	666.2	465.3	279.4	945.6	3.38	0.70	612.5	333.1
67.2	87.4	-1361.0	4.52	3.09	46.29	665.0	462.8	281.9	946.9	3.36	0.70	614.4	332.5
77.8	87.6	-1369.0	4.72	3.10	46.39	666.2	468.3	276.4	942.6	3.41	0.70	609.5	333.1
87.4	87.8	-1366.8	4.90	3.11	46.48	666.0	466.8	277.9	943.9	3.40	0.70	610.9	333.0
96.8	87.8	-1362.3	5.08	3.11	46.56	665.3	464.0	280.7	946.0	3.37	0.70	613.3	332.7
105.4	88.3	-1371.4	5.24	3.13	46.64	667.8	470.0	274.7	942.6	3.43	0.70	608.7	333.9
115.8	88.3	-1366.8	5.42	3.13	46.74	667.0	466.7	278.0	945.0	3.40	0.70	611.5	333.5
124.9	88.7	-1374.3	5.60	3.14	46.82	668.7	472.3	272.4	941.1	3.45	0.71	606.7	334.4
134.5	88.8	-1369.8	5.78	3.15	46.91	668.5	468.9	275.8	944.4	3.42	0.70	610.1	334.3
143.5	89.3	-1378.4	5.95	3.17	47.00	671.7	474.3	269.9	941.6	3.49	0.71	605.8	335.9
153.5	89.4	-1373.0	6.14	3.18	47.09	671.6	471.1	273.6	945.3	3.45	0.70	609.5	335.8
162.4	89.7	-1372.4	6.31	3.19	47.17	672.5	470.7	274.0	946.6	3.45	0.70	610.3	336.3
172.3	90.0	-1375.8	6.49	3.20	47.27	674.2	473.0	271.7	945.9	3.48	0.70	608.8	337.1
181.9	90.2	-1370.0	6.67	3.21	47.36	674.2	469.0	275.7	949.9	3.45	0.70	612.8	337.1
191.0	90.8	-1378.0	6.84	3.23	47.44	678.6	474.5	270.2	948.8	3.51	0.70	609.5	339.3
200.3	90.8	-1371.8	7.02	3.23	47.53	677.0	470.2	274.5	951.4	3.47	0.69	612.9	338.5
209.6	91.2	-1379.6	7.19	3.25	47.62	679.6	475.6	269.1	948.7	3.53	0.70	608.9	339.8
218.8	91.5	-1373.6	7.36	3.26	47.71	680.9	471.5	273.2	954.1	3.49	0.69	613.7	340.5
228.5	92.0	-1380.4	7.55	3.29	47.81	684.0	476.2	268.5	952.5	3.55	0.70	610.5	342.0
237.2	92.2	-1374.8	7.71	3.29	47.89	684.0	472.3	272.4	956.3	3.51	0.69	614.4	342.0
247.0	92.4	-1368.8	7.89	3.30	47.98	684.8	468.2	276.5	961.3	3.48	0.68	618.9	342.4
256.4	93.1	-1375.6	8.07	3.33	48.08	688.8	472.9	271.8	960.6	3.53	0.69	616.2	344.4
265.1	93.3	-1369.2	8.23	3.34	48.16	689.4	468.4	276.3	965.5	3.50	0.68	621.0	344.7
274.6	93.8	-1376.4	8.41	3.36	48.26	692.7	473.4	271.3	964.0	3.55	0.68	617.6	346.3
282.7	94.0	-1369.8	8.56	3.37	48.34	692.7	468.9	275.8	968.5	3.51	0.68	622.2	346.3
292.5	94.6	-1376.6	8.74	3.39	48.43	696.5	473.5	271.2	967.6	3.57	0.68	619.4	348.2
301.4	94.7	-1370.0	8.91	3.40	48.52	696.4	469.0	275.7	972.1	3.53	0.67	623.9	348.2
310.4	95.3	-1375.2	9.08	3.42	48.61	700.1	472.6	272.1	972.2	3.57	0.68	622.2	350.0
318.8	95.5	-1370.4	9.24	3.43	48.70	701.0	469.3	275.4	976.5	3.55	0.67	625.9	350.5
328.7	95.8	-1364.2	9.42	3.44	48.80	701.7	465.0	279.7	981.4	3.51	0.66	630.5	350.8
337.0	96.3	-1370.4	9.58	3.47	48.88	704.9	469.3	275.4	980.3	3.56	0.67	627.9	352.4
345.5	96.5	-1363.4	9.74	3.48	48.97	705.6	464.4	280.3	985.8	3.52	0.66	633.0	352.8
354.2	97.1	-1370.2	9.90	3.50	49.05	709.0	469.1	275.6	984.6	3.57	0.66	630.1	354.5
363.0	97.4	-1363.4	10.07	3.51	49.14	709.8	464.4	280.3	990.1	3.53	0.65	635.2	354.9
371.0	97.9	-1369.8	10.22	3.53	49.23	712.8	468.9	275.8	988.7	3.58	0.66	632.3	356.4
380.1	98.0	-1363.2	10.39	3.54	49.32	712.9	464.3	280.4	993.2	3.54	0.65	636.8	356.4
388.4	98.7	-1368.2	10.54	3.57	49.41	717.2	467.8	276.9	994.1	3.59	0.65	635.5	358.6
397.1	98.8	-1363.2	10.70	3.57	49.50	716.8	464.3	280.4	997.2	3.56	0.65	638.8	358.4
405.2	99.1	-1356.7	10.86	3.59	49.58	718.3	459.8	284.9	1003.2	3.52	0.64	644.0	359.2
414.3	99.6	-1362.8	11.03	3.61	49.68	720.9	464.0	280.7	1001.6	3.57	0.64	641.1	360.4
422.7	100.0	-1355.7	11.18	3.62	49.76	722.6	459.1	285.6	1008.2	3.53	0.64	646.9	361.3
430.9	100.5	-1362.2	11.34	3.64	49.85	725.7	463.6	281.1	1006.8	3.58	0.64	643.9	362.8
439.2	100.7	-1355.1	11.49	3.65	49.94	726.4	458.7	286.0	1012.4	3.54	0.63	649.2	363.2
448.4	101.4	-1361.6	11.67	3.68	50.03	730.6	463.2	281.5	1012.1	3.60	0.63	646.8	365.3

δL	LOAD	δU	E	LOAD	A_c	σ_D'	δU	σ_3	σ_1'	PSR	A	p'	q
(mV)	(mV)	(mV)	(%)	(kN)	(cm²)	(kPa)	(kPa)	(kPa)	(kPa)			(kPa)	(kPa)
456.7	101.6	-1354.9	11.32	3.69	50.12	730.8	458.5	286.1	1016.9	3.55	0.63	651.5	365.4
465.2	102.1	-1359.9	11.93	3.71	50.21	733.5	462.0	282.7	1016.1	3.59	0.63	649.4	366.7
472.6	102.3	-1354.5	12.12	3.72	50.29	734.3	458.3	286.4	1020.7	3.56	0.62	653.6	367.2
482.1	102.7	-1347.9	12.30	3.74	50.39	735.7	453.8	290.9	1026.6	3.53	0.62	658.3	367.9
490.1	103.3	-1353.7	12.45	3.76	50.48	739.6	457.8	286.6	1026.5	3.58	0.62	656.7	369.8
498.5	103.4	-1346.9	12.60	3.77	50.57	738.5	453.1	291.6	1030.5	3.53	0.61	661.0	369.4
507.3	103.9	-1353.1	12.77	3.79	50.67	741.5	457.3	287.4	1028.9	3.58	0.62	658.1	370.8
514.7	104.1	-1346.3	12.91	3.80	50.75	742.0	452.7	292.0	1034.1	3.54	0.61	663.0	371.0
523.9	104.6	-1352.7	13.08	3.82	50.85	745.1	457.1	287.6	1032.7	3.59	0.61	660.2	372.6
532.1	105.0	-1345.9	13.23	3.83	50.94	746.7	452.4	292.2	1039.0	3.55	0.61	665.7	373.4
540.7	105.5	-1351.1	13.39	3.86	51.03	748.7	456.0	288.7	1038.4	3.60	0.61	663.6	374.9
548.8	105.9	-1345.5	13.55	3.87	51.12	751.5	452.1	292.6	1044.1	3.57	0.60	668.4	375.8
557.2	106.2	-1341.4	13.70	3.89	51.22	752.6	449.3	295.4	1048.1	3.55	0.60	671.7	376.3
566.0	106.6	-1344.9	13.87	3.90	51.31	753.9	451.7	293.0	1046.9	3.57	0.60	670.0	377.0
574.3	107.0	-1338.0	14.02	3.92	51.41	755.5	446.9	297.8	1053.3	3.54	0.59	675.5	377.8
582.7	107.4	-1344.2	14.18	3.93	51.50	757.6	451.2	293.5	1051.1	3.58	0.60	672.3	378.8
591.3	107.5	-1337.2	14.34	3.94	51.60	756.7	446.4	298.3	1055.1	3.54	0.59	676.7	378.4
599.4	108.1	-1343.6	14.49	3.96	51.69	760.1	450.3	293.9	1054.0	3.59	0.59	674.0	380.1
608.3	108.3	-1337.0	14.66	3.98	51.79	760.9	446.2	298.5	1059.3	3.55	0.59	678.9	380.4
616.6	108.8	-1342.6	14.82	4.00	51.89	763.5	450.1	294.5	1058.1	3.59	0.59	675.3	381.7
624.9	109.1	-1336.4	14.97	4.01	51.98	764.1	445.8	298.9	1063.0	3.56	0.58	680.9	382.1
633.9	109.4	-1336.8	15.14	4.02	52.08	764.8	446.1	298.6	1063.4	3.56	0.58	681.0	382.4
642.2	109.9	-1335.8	15.30	4.04	52.18	767.4	445.4	299.3	1066.7	3.56	0.58	683.0	383.7
650.6	110.0	-1329.0	15.45	4.05	52.28	767.0	440.7	304.0	1070.9	3.52	0.57	687.5	383.5
659.3	110.5	-1335.2	15.62	4.07	52.38	769.1	445.0	299.7	1068.8	3.57	0.58	684.2	384.6
667.3	110.7	-1328.0	15.77	4.07	52.47	769.4	440.0	304.7	1074.1	3.53	0.57	689.4	384.7
676.2	111.2	-1334.4	15.93	4.10	52.57	771.8	444.5	300.2	1072.0	3.57	0.58	686.1	385.9
684.3	111.4	-1327.4	16.08	4.10	52.67	772.0	439.6	305.1	1077.0	3.53	0.57	691.1	386.0
691.9	111.8	-1333.2	16.23	4.12	52.76	773.9	443.6	301.1	1074.9	3.57	0.57	688.0	386.9
701.2	112.2	-1327.4	16.40	4.14	52.87	775.0	439.6	305.1	1080.0	3.54	0.57	692.6	387.5
709.6	112.5	-1327.8	16.56	4.15	52.97	776.3	439.9	304.8	1081.1	3.55	0.57	692.9	388.1
717.7	112.9	-1327.2	16.71	4.17	53.07	778.0	439.5	305.2	1083.2	3.55	0.56	694.2	389.0
725.7	113.1	-1320.2	16.86	4.18	53.16	778.3	434.7	310.0	1088.3	3.51	0.56	699.2	389.1
734.4	113.6	-1326.2	17.02	4.20	53.27	730.4	438.8	305.9	1086.4	3.55	0.56	696.1	390.2
742.4	113.9	-1319.4	17.17	4.21	53.36	781.4	434.1	310.6	1092.0	3.52	0.56	701.3	390.7
750.4	114.5	-1325.6	17.32	4.24	53.46	784.4	438.4	306.3	1090.7	3.56	0.56	698.5	392.2
758.1	114.5	-1319.2	17.47	4.24	53.55	783.0	434.0	310.7	1093.7	3.52	0.55	702.2	391.5
766.7	115.1	-1324.6	17.63	4.26	53.66	786.3	437.7	307.0	1093.3	3.56	0.56	700.2	393.2
774.6	115.4	-1319.2	17.78	4.27	53.75	786.8	434.0	310.7	1097.5	3.53	0.55	704.1	393.4
782.5	115.7	-1315.5	17.92	4.29	53.85	787.6	431.4	313.3	1100.9	3.51	0.55	707.1	393.8
790.4	116.1	-1318.8	18.07	4.30	53.95	789.2	433.7	311.0	1100.2	3.54	0.55	705.6	394.6
798.7	116.3	-1311.9	18.23	4.31	54.05	789.3	428.9	315.8	1105.1	3.50	0.54	710.4	394.7
806.0	116.8	-1318.2	18.36	4.33	54.14	792.2	433.3	311.4	1103.6	3.54	0.55	707.5	396.1
814.3	117.1	-1311.7	18.52	4.35	54.24	793.0	429.8	315.9	1108.9	3.51	0.54	712.4	396.5
822.0	117.7	-1317.4	18.66	4.37	54.34	795.7	432.7	312.0	1107.7	3.55	0.54	709.8	397.9
829.5	117.9	-1311.3	18.80	4.38	54.43	795.8	428.5	316.2	1112.0	3.52	0.54	714.1	397.9
837.7	118.3	-1315.5	18.96	4.39	54.54	797.2	431.4	313.3	1110.5	3.54	0.54	711.9	398.6
845.8	118.4	-1311.1	19.11	4.40	54.64	796.8	428.4	316.3	1113.1	3.52	0.54	714.7	398.4
853.5	118.6	-1304.7	19.25	4.41	54.74	797.0	424.0	320.7	1117.7	3.49	0.53	719.2	398.5
861.1	119.3	-1310.5	19.40	4.44	54.83	800.3	428.0	316.7	1117.0	3.53	0.53	716.9	400.2
869.1	119.4	-1304.1	19.55	4.44	54.94	800.0	423.6	321.1	1121.1	3.49	0.53	721.1	400.0
876.6	119.7	-1310.1	19.69	4.46	55.03	801.0	427.7	317.0	1118.0	3.53	0.53	717.5	400.5
884.8	120.0	-1303.7	19.84	4.47	55.14	801.4	423.3	321.4	1122.3	3.49	0.53	722.1	400.7
893.0	120.5	-1309.3	19.99	4.49	55.24	803.7	427.1	317.6	1121.2	3.53	0.53	719.4	401.8
900.7	120.7	-1303.5	20.14	4.50	55.34	803.5	423.1	321.6	1125.0	3.50	0.53	723.3	401.7
908.7	121.1	-1302.2	20.29	4.52	55.45	805.3	422.2	322.5	1127.7	3.50	0.52	725.1	402.6
916.7	121.6	-1303.1	20.44	4.54	55.55	807.4	422.9	321.8	1129.3	3.51	0.52	725.5	403.7
924.2	121.7	-1296.8	20.58	4.54	55.65	806.6	418.5	326.2	1132.8	3.47	0.52	729.5	403.3
932.6	122.3	-1302.9	20.74	4.57	55.76	809.3	422.7	322.0	1131.3	3.51	0.52	726.6	404.7
940.8	122.4	-1296.4	20.89	4.57	55.87	808.3	418.3	326.4	1134.8	3.48	0.52	730.6	404.2
948.6	123.1	-1302.0	21.04	4.60	55.97	812.3	422.1	322.6	1134.9	3.52	0.52	728.8	406.2
956.8	123.0	-1296.0	21.19	4.59	56.08	809.4	418.0	326.7	1136.1	3.48	0.52	731.4	404.7
964.9	122.7	-1299.8	21.34	4.58	56.19	805.9	420.6	324.1	1130.0	3.49	0.52	727.0	402.9
972.9	122.5	-1295.4	21.49	4.57	56.30	802.4	417.5	327.1	1129.5	3.45	0.52	728.4	401.2



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Date .....02/09/95.....

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GRAIN SIZE DISTRIBUTION

Figure

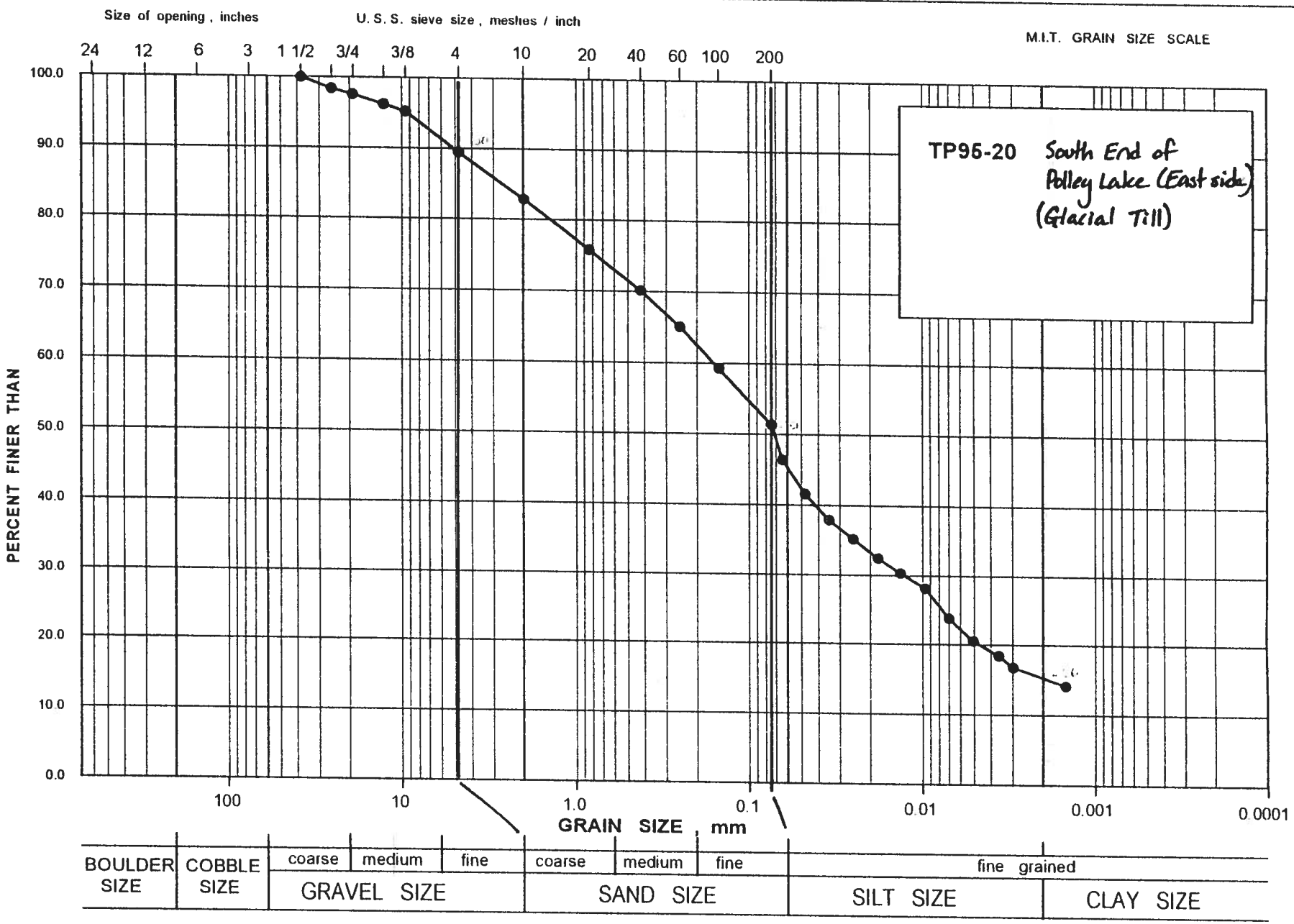

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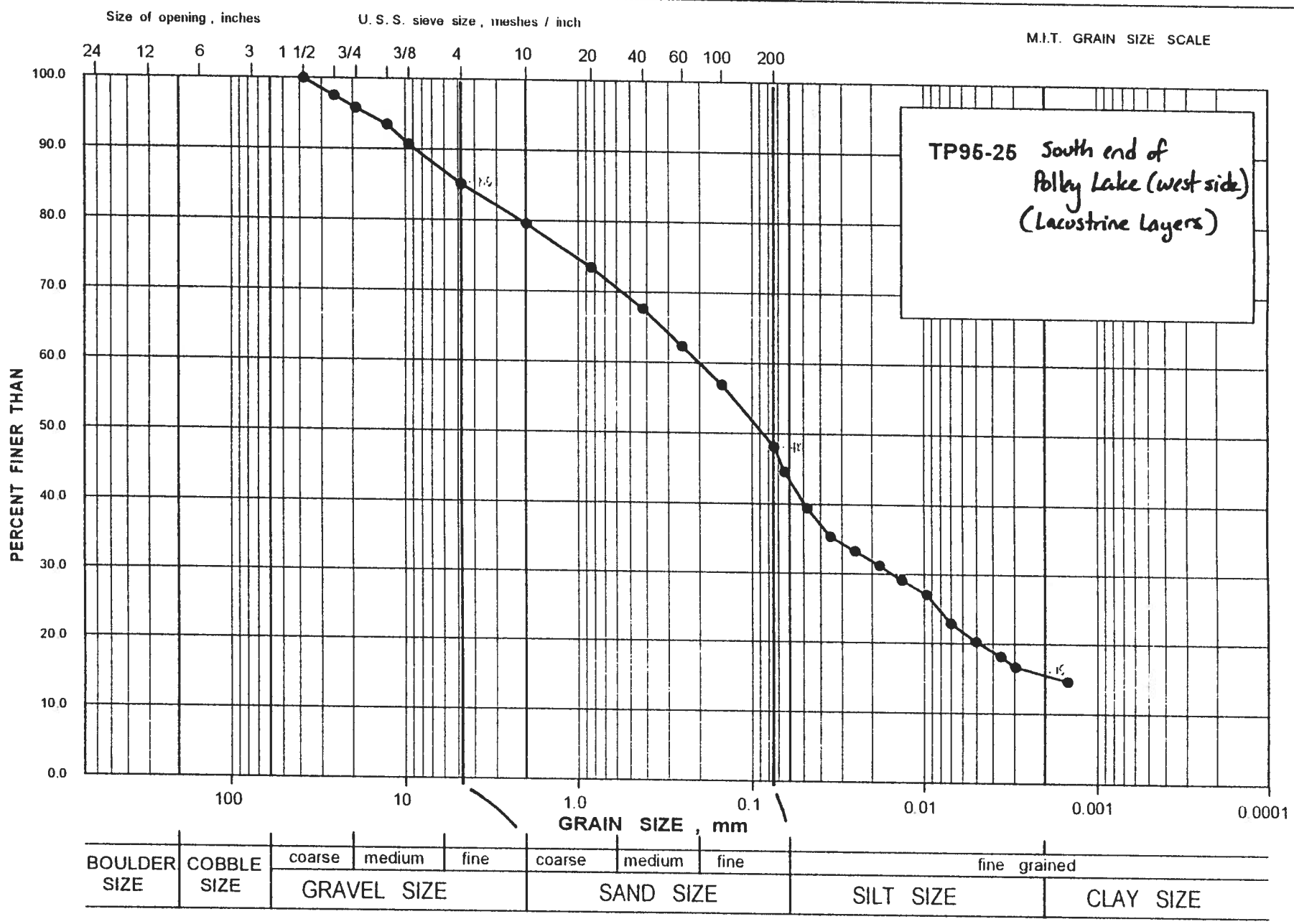
Figure



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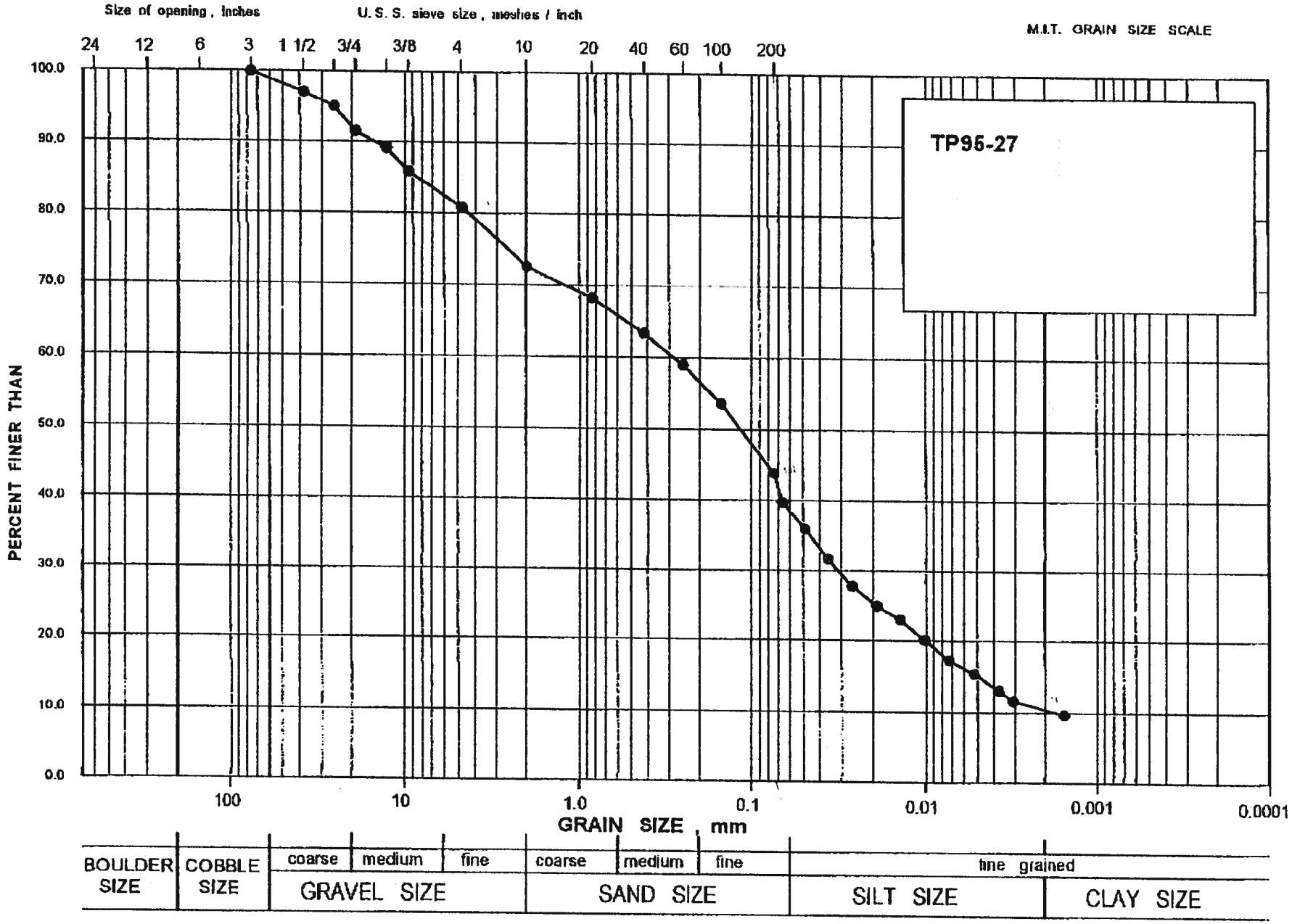
GRAIN SIZE DISTRIBUTION

Figure



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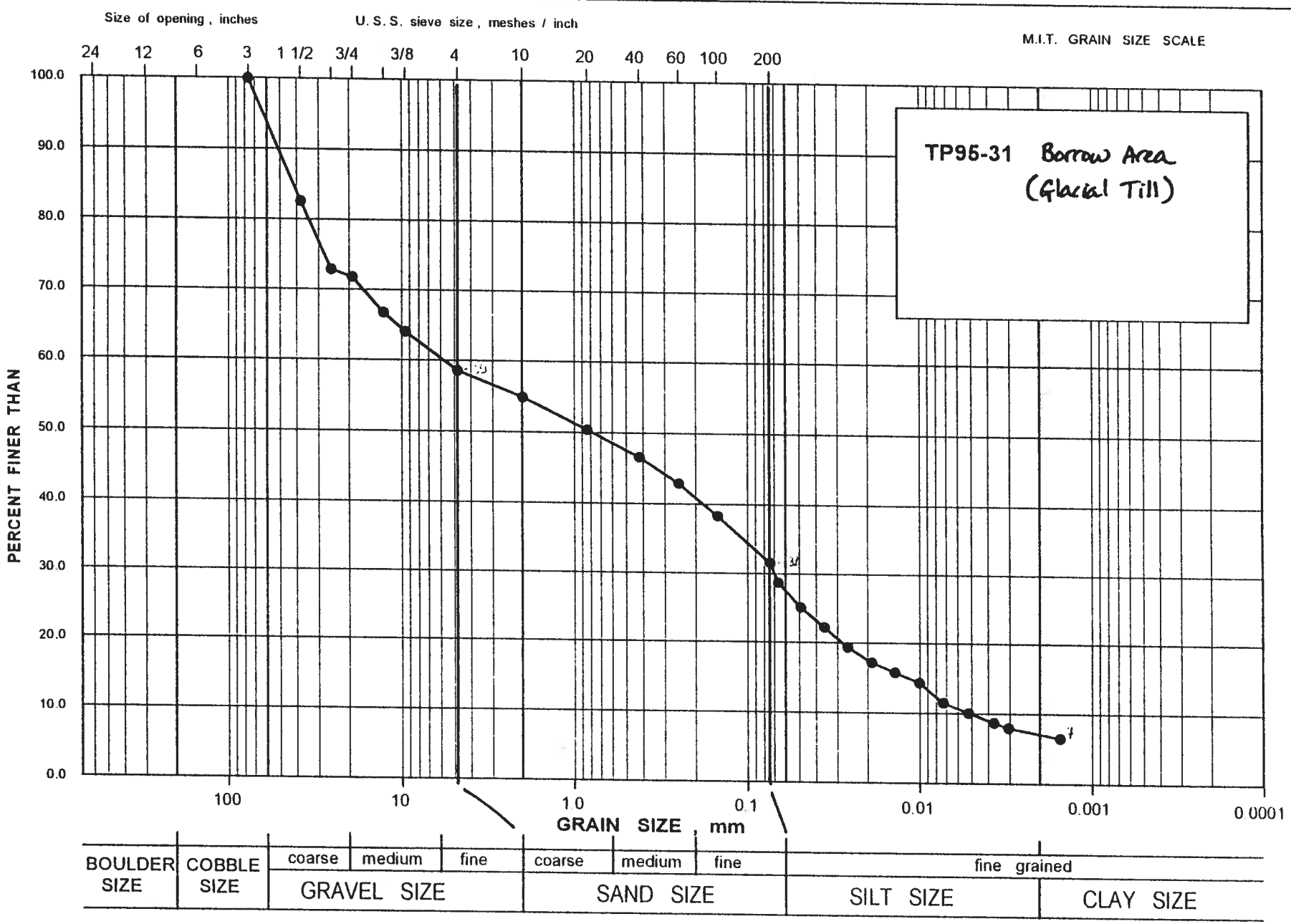
GRAIN SIZE DISTRIBUTION

Figure



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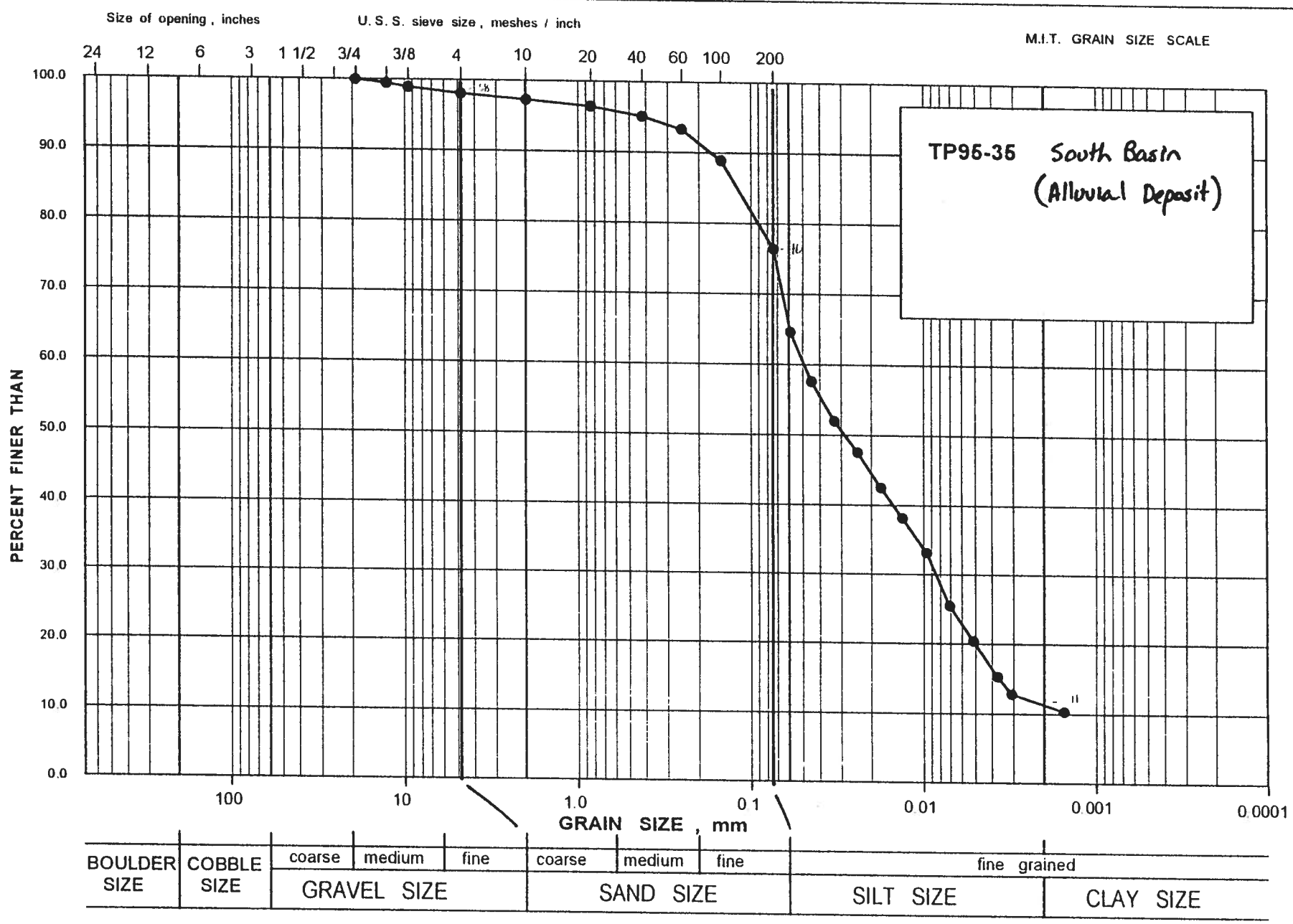
GRAIN SIZE DISTRIBUTION

Figure



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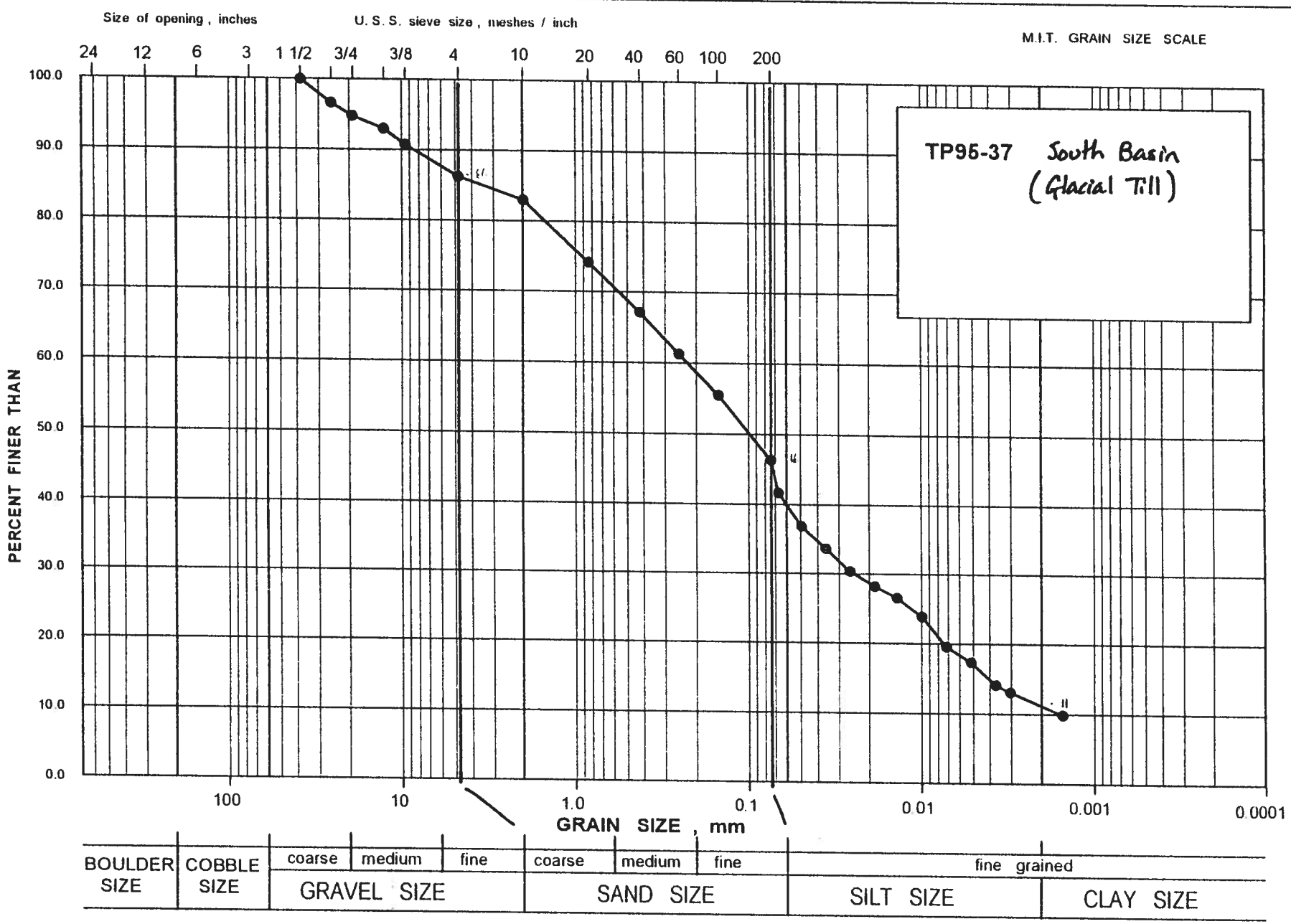
GRAIN SIZE DISTRIBUTION

Figure



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Date .....02/09/95.....

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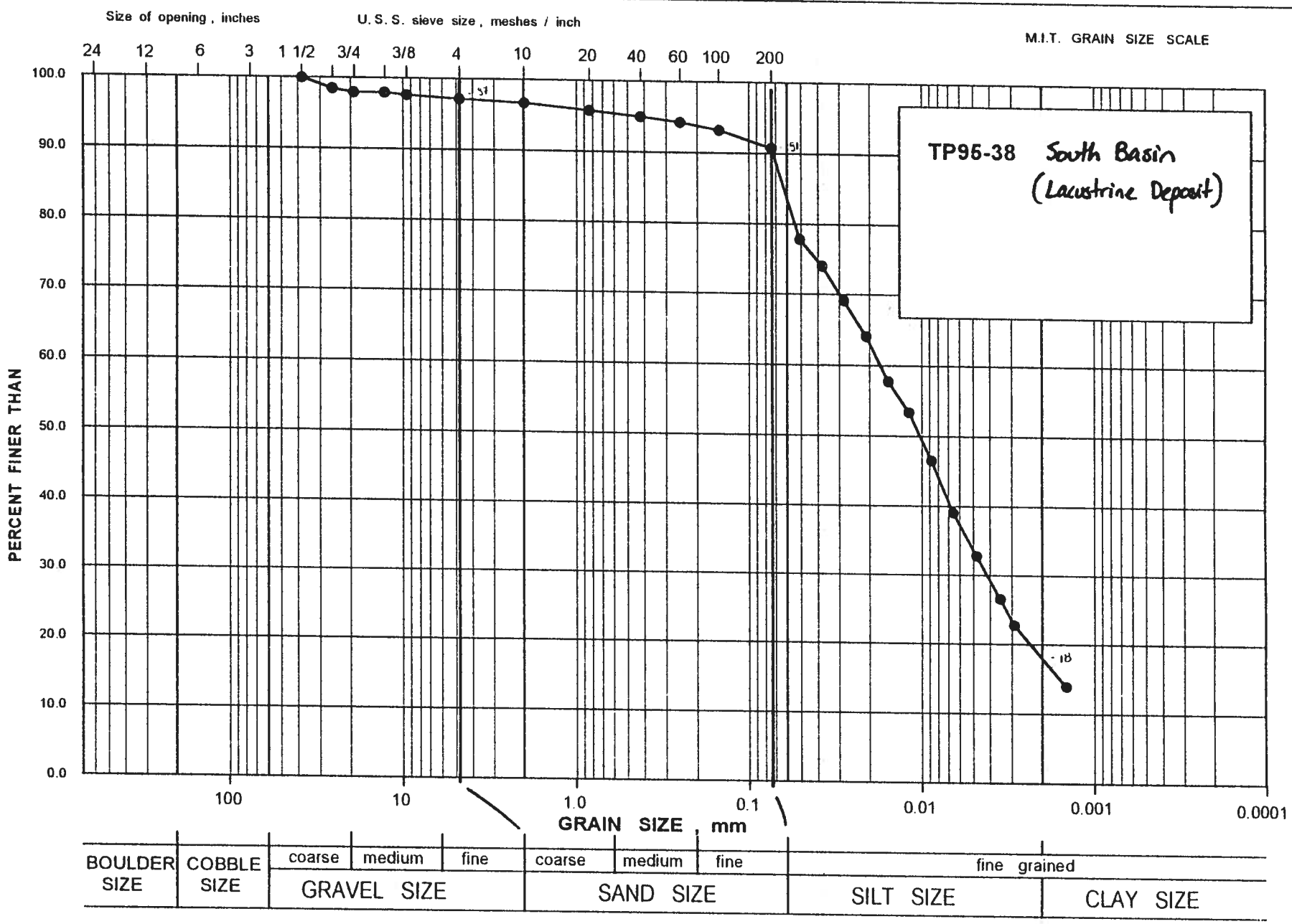
GRAIN SIZE DISTRIBUTION

Figure



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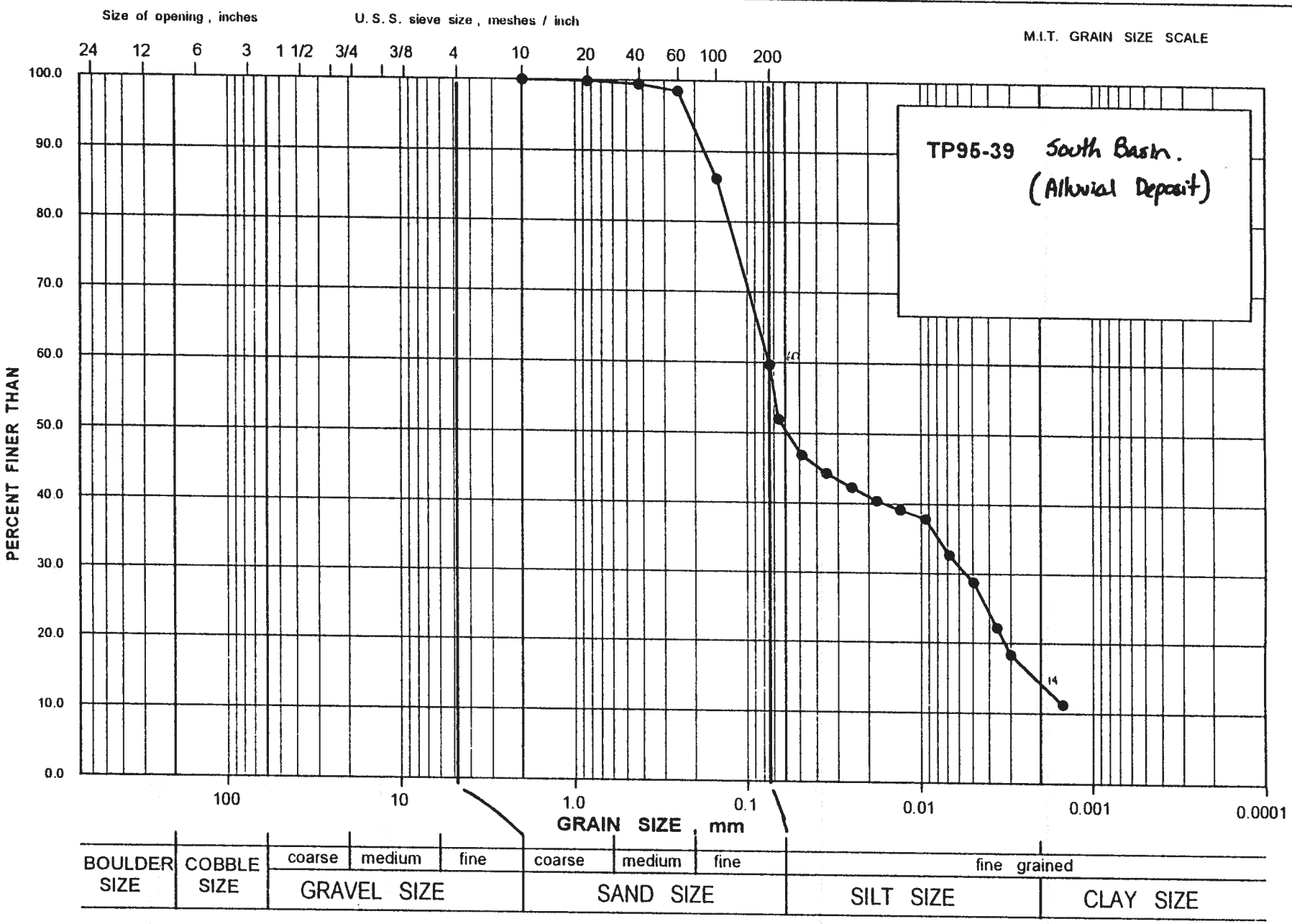
GRAIN SIZE DISTRIBUTION

Figure



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GRAIN SIZE DISTRIBUTION

Figure

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd.	Test Pit :	TP95-1
Date :	02/09/95	Project :	Job No. 1623/1	Sample :	
Lab Work:	LL	Location:	Burnaby	Depth :	

	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.7	
	Total Weight	3468.7	Before Wash	75.0	Total -200	38.0	
			After Wash	37.7	Gs	2.78	
Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	41.8	1.2			1.2	25.4	98.8
3/4"	87.4	2.5			2.5	19.1	96.3
1/2"	172.3	5.0			5.0	12.7	91.3
3/8"	127.0	3.7			3.7	9.52	87.6
#4	308.0	8.9			8.9	4.76	78.8
#10	294.9	8.5			8.5	2.00	70.3
#20			8.9	11.9	8.3	0.840	61.9
#40			9.3	12.4	8.7	0.420	53.2
#60			6.6	8.8	6.2	0.250	47.0
#100			5.9	7.9	5.5	0.149	41.5
#200			8.9	11.9	8.3	0.074	33.2
Pan			38.0	50.7	35.6		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	38.0	20.1		-3.76	34.2	0.0700	31.2
1	34.0	20.1		-3.76	30.2	0.0511	27.6
2	30.0	20.1		-3.76	26.2	0.0372	23.9
4	27.0	20.1		-3.76	23.2	0.0269	21.2
8	24.5	20.1		-3.76	20.7	0.0194	18.9
15	23.0	20.0		-3.77	19.2	0.0143	17.5
30	20.0	20.0		-3.77	16.2	0.0103	14.8
60	17.0	20.0		-3.77	13.2	0.0074	12.0
120	15.0	20.0		-3.77	11.2	0.0053	10.2
240	13.0	20.0		-3.77	9.2	0.0038	8.4
360	12.0	20.0		-3.77	8.2	0.0031	7.5
1440	10.0	19.9		-3.77	6.2	0.0016	5.7

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd.		Test Pit :	TP95-7	
Date :	02/09/95	Project :	Job No. 1623/1		Sample :		
Lab Work:	LL	Location:	Burnaby		Depth :		
	1ST SIEVING		Hydrometer: (Minus #10)		Residual #200	0.1	
	Total Weight	2807.3	Before Wash	75.0	Total -200	43.3	
			After Wash	31.8	Gs	2.78	
Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	0.0					25.4	100.0
3/4"	120.2	4.3			4.3	19.1	95.7
1/2"	74.8	2.7			2.7	12.7	93.1
3/8"	71.4	2.5			2.5	9.52	90.5
#4	182.0	6.5			6.5	4.76	84.0
#10	177.5	6.3			6.3	2.00	77.7
#20			6.4	8.5	6.6	0.840	71.1
#40			5.9	7.9	6.1	0.420	65.0
#60			4.8	6.4	5.0	0.250	60.0
#100			5.1	6.8	5.3	0.149	54.7
#200			9.3	12.4	9.6	0.074	45.1
Pan			43.3	57.7	44.9		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	44.0	20.1		-3.76	40.2	0.0664	40.5
1	38.5	20.1		-3.76	34.7	0.0493	35.0
2	35.5	20.1		-3.76	31.7	0.0357	32.0
4	33.0	20.1		-3.76	29.2	0.0257	29.5
8	30.0	20.1		-3.76	26.2	0.0186	26.4
15	28.0	20.0		-3.77	24.2	0.0138	24.4
30	25.0	20.0		-3.77	21.2	0.0100	21.4
60	21.0	20.0		-3.77	17.2	0.0072	17.4
120	19.0	20.0		-3.77	15.2	0.0052	15.3
240	17.0	20.0		-3.77	13.2	0.0037	13.3
360	15.0	20.0		-3.77	11.2	0.0031	11.3
1440	12.5	19.9		-3.77	8.7	0.0015	8.8

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd.	Test Pit :	TP95-10
Date :	02/09/95	Project :	Job No. 1623/1	Sample :	
Lab Work:	LL	Location:	Burnaby	Depth :	

	1ST SIEVING		Hydrometer (Minus #10)		Residual #200	0.1	
	Total Weight	2183.6	Before Wash	75.0	Total -200	37.2	
			After Wash	37.9	Gs	2.78	
Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	158.4	7.3			7.3	25.4	92.7
3/4"	79.7	3.6			3.6	19.1	89.1
1/2"	190.4	8.7			8.7	12.7	80.4
3/8"	119.2	5.5			5.5	9.52	74.9
#4	290.9	13.3			13.3	4.76	61.6
#10	201.3	9.2			9.2	2.00	52.4
#20			9.3	12.4	6.5	0.840	45.9
#40			9.0	12.0	6.3	0.420	39.6
#60			6.2	8.3	4.3	0.250	35.3
#100			5.5	7.3	3.8	0.149	31.4
#200			7.5	10.0	5.2	0.074	26.2
Pan			37.2	49.6	26.0		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	40.0	20.1		-3.76	36.2	0.0688	24.6
1	35.0	20.1		-3.76	31.2	0.0507	21.2
2	32.5	20.1		-3.76	28.7	0.0366	19.5
4	30.0	20.1		-3.76	26.2	0.0263	17.8
8	27.5	20.1		-3.76	23.7	0.0190	16.1
15	26.0	20.0		-3.77	22.2	0.0140	15.1
30	24.0	20.0		-3.77	20.2	0.0100	13.7
60	20.0	20.0		-3.77	16.2	0.0073	11.0
120	18.5	20.0		-3.77	14.7	0.0052	10.0
240	17.0	20.0		-3.77	13.2	0.0037	9.0
360	15.5	20.0		-3.77	11.7	0.0031	8.0
1440	14.0	19.9		-3.77	10.2	0.0015	6.9

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd	Test Pit :	TP95-18
Date :	02/09/95	Project :	Job No. 1623/1	Sample :	
Lab Work:	LL	Location:	Burnaby	Depth :	

	1ST SIEVING		Hydrometer (Minus #10)		Residual #200	0.2	
	Total Weight	2189.2	Before Wash	75.0	Total -200	50.0	
			After Wash	25.2	Gs	2.78	
Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	0.0					25.4	100.0
3/4"	0.0					19.1	100.0
1/2"	5.1	0.2			0.2	12.7	99.8
3/8"	19.5	0.9			0.9	9.52	98.9
#4	44.0	2.0			2.0	4.76	96.9
#10	59.5	2.7			2.7	2.00	94.1
#20			3.5	4.7	4.4	0.840	89.8
#40			3.8	5.1	4.8	0.420	85.0
#60			4.1	5.5	5.1	0.250	79.8
#100			4.9	6.5	6.2	0.149	73.7
#200			8.4	11.2	10.5	0.074	63.1
Pan			50.0	66.7	62.8		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	49.0	20.1		-3.76	45.2	0.0633	55.2
1	44.0	20.1		-3.76	40.2	0.0470	49.1
2	41.0	20.1		-3.76	37.2	0.0341	45.5
4	38.0	20.1		-3.76	34.2	0.0247	41.8
8	35.0	20.1		-3.76	31.2	0.0179	38.1
15	33.0	20.0		-3.77	29.2	0.0133	35.7
30	30.0	20.0		-3.77	26.2	0.0096	32.0
60	27.0	20.0		-3.77	23.2	0.0069	28.4
120	23.0	20.0		-3.77	19.2	0.0050	23.5
240	20.0	20.0		-3.77	16.2	0.0036	19.8
360	18.5	20.0		-3.77	14.7	0.0030	18.0
1440	15.0	19.9		-3.77	11.2	0.0015	13.7

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd.	Test Pit :	TP95-20
Date :	02/09/95	Project :	Job No. 1623/1	Sample :	
Lab Work:	LL	Location:	Burnaby	Depth :	

	1ST SIEVING		Hydrometer (Minus #10)		Residual #200	0.2	
	Total Weight	3344.7	Before Wash	75.0	Total -200	46.6	
			After Wash	28.6	Gs	2.78	
Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	51.7	1.5			1.5	25.4	98.5
3/4"	26.8	0.8			0.8	19.1	97.7
1/2"	46.0	1.4			1.4	12.7	96.3
3/8"	34.6	1.0			1.0	9.52	95.2
#4	192.4	5.8			5.8	4.76	89.5
#10	221.1	6.6			6.6	2.00	82.9
#20			6.3	8.4	7.0	0.840	75.9
#40			5.2	6.9	5.7	0.420	70.2
#60			4.6	6.1	5.1	0.250	65.1
#100			5.2	6.9	5.7	0.149	59.3
#200			7.2	9.6	8.0	0.074	51.4
Pan			46.6	62.1	51.5		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	47.0	20.1		-3.76	43.2	0.0645	46.5
1	42.5	20.1		-3.76	38.7	0.0476	41.6
2	39.0	20.1		-3.76	35.2	0.0347	37.9
4	36.5	20.1		-3.76	32.7	0.0250	35.2
8	34.0	20.1		-3.76	30.2	0.0181	32.5
15	32.0	20.0		-3.77	28.2	0.0134	30.3
30	30.0	20.0		-3.77	26.2	0.0096	28.2
60	26.0	20.0		-3.77	22.2	0.0070	23.9
120	23.0	20.0		-3.77	19.2	0.0050	20.7
240	21.0	20.0		-3.77	17.2	0.0036	18.5
360	19.5	20.0		-3.77	15.7	0.0030	16.9
1440	17.0	19.9		-3.77	13.2	0.0015	14.2

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	9521018	Client :	Knight Piesold Ltd.		Test Pit :	TP95-27	
Date :	02/11/95	Project :	Job No. 1623/1		Sample :		
Lab Work:	LL	Location:	Burnaby		Depth :		
	1ST SIEVING		Hydrometer (Minus #10)		Residual #200	1.5	
	Total Weight	4128.7	Before Wash	75.0	Total -200	45.3	
			After Wash	31.2	Gs	2.73	

Size (USS)	Weight Retained	% Retained	Weight Retained	% Retained	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	122.4	3.0			3.0	38.1	97.0
1"	81.1	2.0			2.0	25.4	95.1
3/4"	146.7	3.6			3.6	19.1	91.5
1/2"	97.9	2.4			2.4	12.7	89.1
3/8"	134.4	3.3			3.3	9.52	85.9
#4	204.6	5.0			5.0	4.76	80.9
#10	344.3	8.3			8.3	2.00	72.6
#20			4.5	6.0	4.4	0.840	68.2
#40			5.0	6.7	4.8	0.420	63.4
#60			4.5	6.0	4.4	0.250	59.0
#100			5.6	7.5	5.4	0.149	53.6
#200			10.1	13.5	9.8	0.074	43.8
Pan			45.3	60.4	43.8		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	45.5	19.5		-3.84	41.7	0.0665	39.6
1	41.5	19.5		-3.84	37.7	0.0488	35.8
2	37.0	19.5		-3.84	33.2	0.0358	31.5
4	33.0	19.5		-3.84	29.2	0.0261	27.7
8	30.0	19.5		-3.84	26.2	0.0189	24.9
15	28.0	19.5		-3.84	24.2	0.0140	23.0
30	25.0	19.5		-3.84	21.2	0.0101	20.1
60	22.0	19.6		-3.83	18.2	0.0073	17.3
120	20.0	19.8		-3.80	16.2	0.0052	15.4
240	17.5	19.8		-3.80	13.7	0.0038	13.0
360	16.0	19.8		-3.80	12.2	0.0031	11.6
1440	14.0	20.0		-3.80	10.2	0.0015	9.7

GOLDER ASSOCIATES Ltd.

CONSULTING ENGINEERS

Project No. 9521018

Date : 1/26/95

Laboratory Determination of Water Content of Soil and Rock
ASTM D 2216-92

BOREHOLE NUMBER	TP95-1	TP95-7	TP95-10	TP95-18	TP95-20	TP95-25
SAMPLE NUMBER						
DEPTH OF SAMPLE (m)						
CONTAINER NUMBER						
MASS WET SOIL + TARE	8547.7	9217.5	6633.9	3836.5	8948.7	7546.4
MASS DRY SOIL + TARE	7876.2	8452.1	6049.8	3537.7	7961.0	6650.8
MASS OF WATER	671.5	765.4	584.1	298.8	987.7	895.6
MASS OF CONTAINER	1426.5	1414.0	1427.8	1378.4	1130.6	1414.3
MASS OF DRY SOIL	6449.7	7038.1	4622.0	2159.3	6830.4	5236.5
WATER CONTENT W (%)	10.4	10.9 ✓	12.6	13.8	14.5	17.1

BOREHOLE NUMBER	TP95-27	TP95-31	TP95-35	TP95-37	TP95-38	TP95-39
SAMPLE NUMBER						
DEPTH OF SAMPLE (m)						
CONTAINER NUMBER						
MASS WET SOIL + TARE	5937.6	8386.3	7978.9	7623.2	8130.7	7168.1
MASS DRY SOIL + TARE	5481.6	7669.7	7036.9	6654.4	6637.4	5794.5
MASS OF WATER	456.0	716.6	942.0	968.8	1493.3	1373.6
MASS OF CONTAINER	1380.1	1177.8	1344.6	1494.2	1383.6	974.9
MASS OF DRY SOIL	4101.5	6491.9	5692.3	5160.2	5253.8	4819.6
WATER CONTENT W (%)	11.1	11.0	16.5	18.8 ✓	28.4	28.5

BOREHOLE NUMBER						
SAMPLE NUMBER						
DEPTH OF SAMPLE (m)						
CONTAINER NUMBER						
MASS WET SOIL + TARE						
MASS DRY SOIL + TARE						
MASS OF WATER						
MASS OF CONTAINER						
MASS OF DRY SOIL						
WATER CONTENT W (%)						

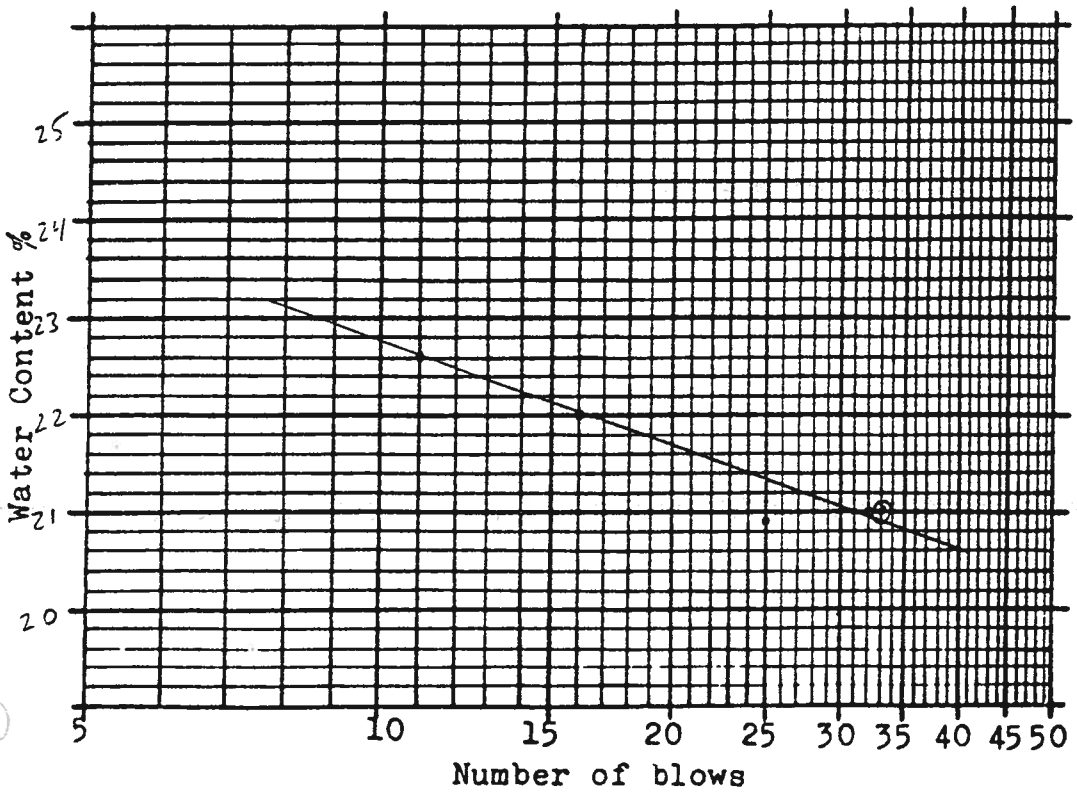
LABORATORY TEST SHEET – ATTERBERG LIMITS

Lab Work 112.0 Project # 952/018 Date Jan. 31-95

/LAB Feb 4/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	#15	#3	#82	#27		
Number of blows	25	16	11	33		
Wt.sample wet + tare	31.68	30.60	34.29	31.47		
Wt.sample dry + tare	28.70	27.57	30.70	28.57		
Weight of water	2.98	3.03	3.59	2.9		
Tare	14.44	13.74	14.81	14.72		
Wt. of dry soil	14.26	13.83	15.89	13.85		
Water content %	20.9 ✓	22.0 ✓	22.6 ✓	21.0 ✓		

Type of Test	PL	PL	Borehole #	TP95-1
Container #	#2	#51	Sample #	—
Wt.sample wet + tare	27.55	27.00	Depth	—
Wt.sample dry + tare	26.07	25.52	Liquid Limit	~~21.3~~ 21.4
Wt. of water	1.48	1.48	Plastic Limit	13.0
Tare	14.54	14.29	Plasticity index	~~8.3~~ 8.4
Weight of dry soil	11.53	11.23	Moisture content	10.4
water content	12.8 ✓	13.2 ✓	Liquidity Index	-0.31



SAMPLE DESCRIPTION

CL

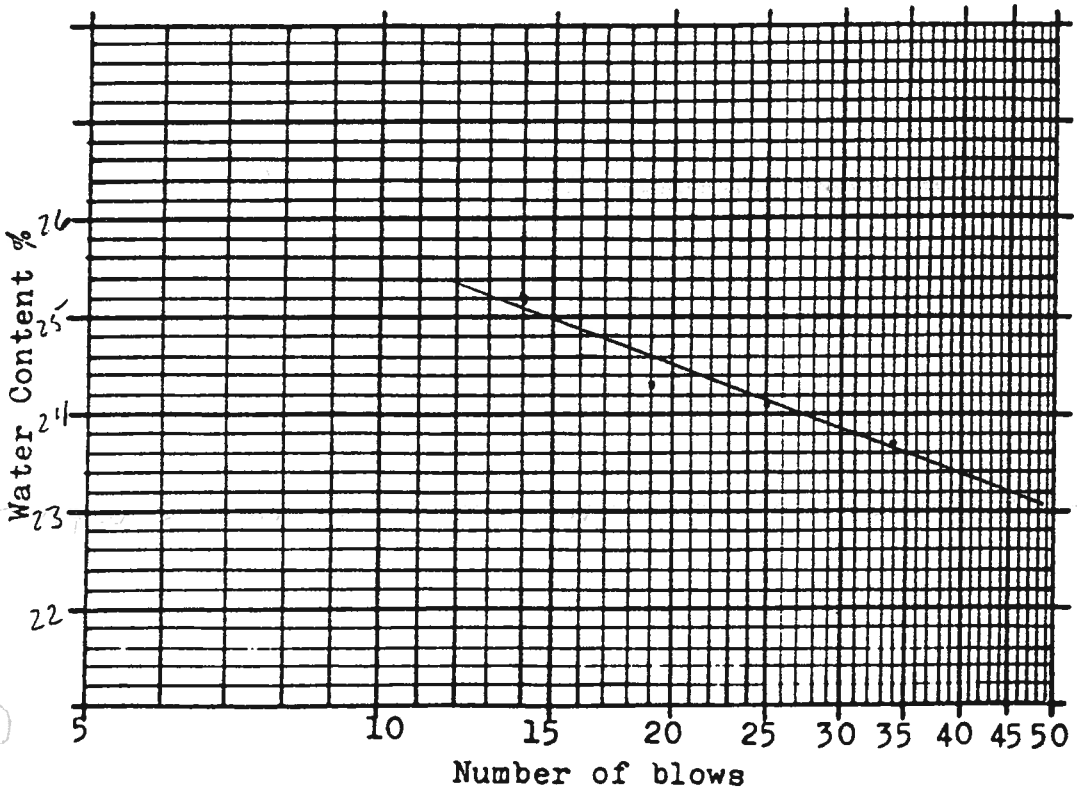
LABORATORY TEST SHEET – ATTERBERG LIMITS

Lab Work M.O Project # 9521018 Date Jan. 31-95

Was Feb 4/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	#5	#18	#26	#3		
Number of blows	14	19	25	34		
Wt.sample wet + tare	31.76	31.83	31.38	34.23		
Wt.sample dry + tare	28.26	28.42	28.09	30.41		
Weight of water	3.5	3.41	3.29	3.82		
Tare	14.35	14.40	14.42	14.32		
Wt. of dry soil	13.91	14.02	13.67	16.09		
Water content %	25.2 ✓	24.3 ✓	24.1 ✓	23.7 ✓		

Type of Test	PL	PL	Borehole #	TP 95-7
Container #	#14	#12	Sample #	—
Wt.sample wet + tare	28.53	25.50	Depth	—
Wt.sample dry + tare	26.75	24.19	Liquid Limit	24.1 ✓
Wt. of water	1.78	1.31	Plastic Limit	13.5 ✓
Tare	13.23	14.72	Plasticity index	10.6 ✓
Weight of dry soil	13.52	9.47	Moisture content	10.9
Water content	13.2 ✓	13.8 ✓	Liquidity Index	-0.25 ✓



SAMPLE DESCRIPTION

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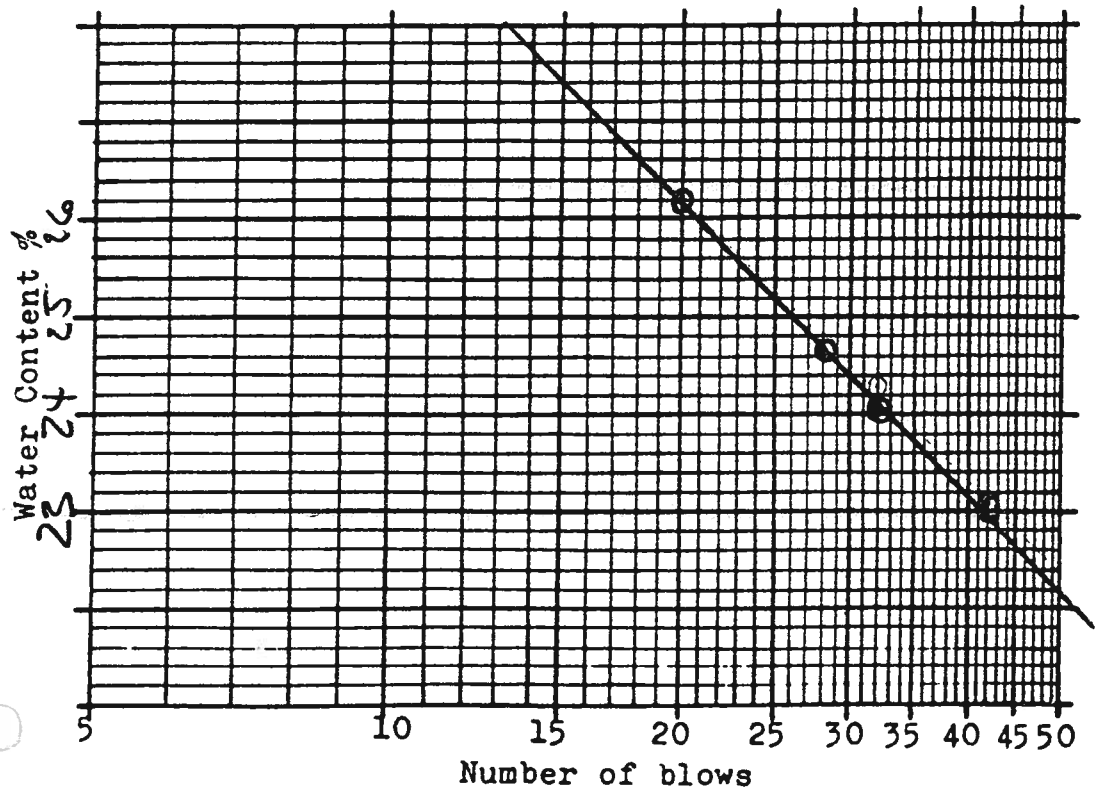
LABORATORY TEST SHEET – ATTERBERG LIMITS

Lab Work _____ Project # 952-1018 Date FEB 3/95

VGE Feb 14, 95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	49	9	B2 2	E2		
Number of blows	42	32	28	20		
Wt.sample wet + tare	37.30	36.36	35.87	42.76		
Wt.sample dry + tare	31.04	29.92	29.47	34.60		
Weight of water	6.26	6.44	6.40	8.16		
Tare	3.90	3.38	3.56	3.50		
Wt. of dry soil	27.14	26.54	25.91	31.10		
Water content %	23.1 ✓	24.3 ✓	24.7 ✓	26.2 ✓		12.6

Type of Test	PL	PL	Borehole #	TP 95-10
Container #	C4	87	Sample #	
Wt.sample wet + tare	11.47	13.14	Depth	
Wt.sample dry + tare	10.38	11.80	Liquid Limit	~~25.2~~ → 25.3 ✓
Wt. of water	1.09	1.34	Plastic Limit	16.5 ✓
Tare	3.60	3.85	Plasticity index	~~8.7~~ → 8.8 ✓
Weight of dry soil	6.78	7.95	Moisture content	12.6
Water content	16.1 ✓	16.9 ✓	Liquidity Index	~~-0.45~~ → -0.44 ✓



SAMPLE DESCRIPTION

BROWN CLAYEY SILT

CITTLE [illegible]

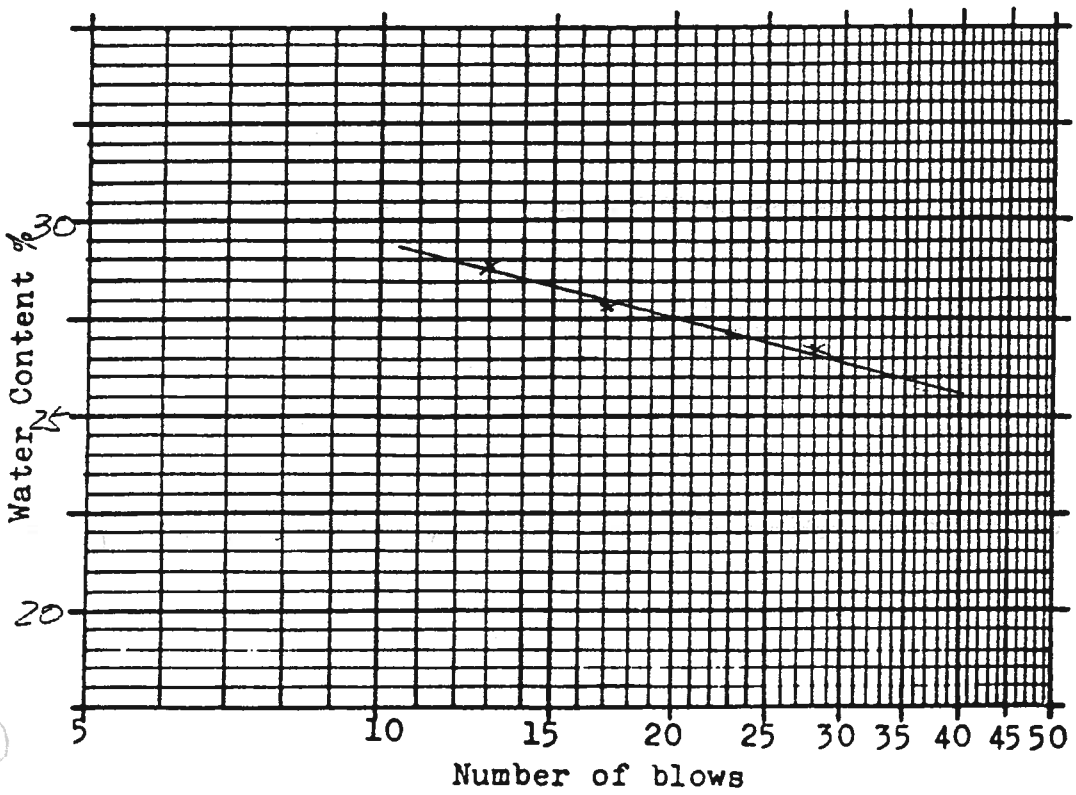
LABORATORY TEST SHEET – ATTERBERG LIMITS

Lab Work DD.O Project # 9521015 Date Jan. 3-94
JLB Feb 14/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	#24	#1	#16	#21		
Number of blows	28	17	23	13		
Wt.sample wet + tare	28.39	30.13	34.05	29.66		
Wt.sample dry + tare	25.38	26.54	29.85	26.24		
Weight of water	3.01	3.59	4.20	3.42		
Tare	13.57	13.67	14.36	14.41		
Wt. of dry soil	11.71	12.87	15.49	11.83		
Water content %	25.7 ✓	27.9 ✓	27.1 ✓	28.9 ✓		

Type of Test	PL	PL	Borehole #	TP95-15
Container #	#29	#22	Sample #	—
Wt.sample wet + tare	24.11	25.75	Depth	—
Wt.sample dry + tare	22.97	24.38	Liquid Limit	26.9 ✓
Wt. of water	1.14	1.37	Plastic Limit	13.3 ✓
Tare	14.55	13.86	Plasticity index	13.6 ✓
Weight of dry soil	8.42	10.52	Moisture content	13.8 ✓
Water content	13.5 ✓	13.0 ✓	Liquidity Index	0.04 ✓

$\frac{13.8-13.3}{13.6}$



SAMPLE DESCRIPTION

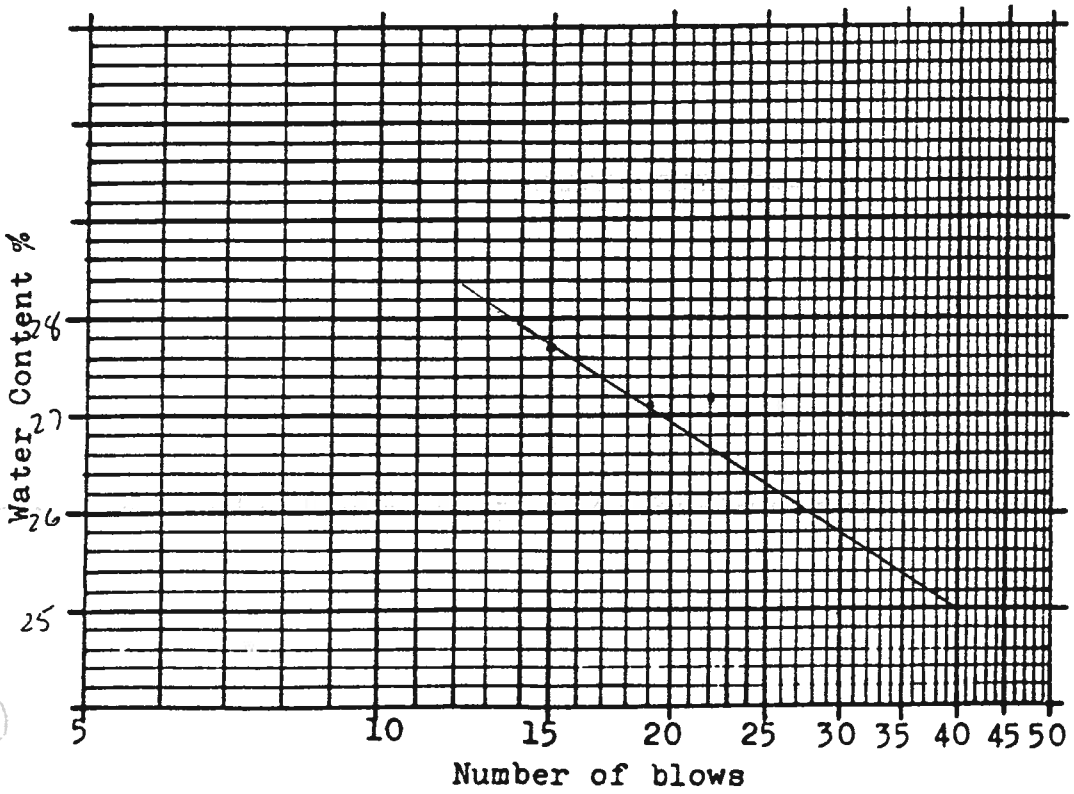
CL

LABORATORY TEST SHEET – ATTERBERG LIMITS

Lab Work M.O Project # 152/017 Date [illegible] 31-95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	#11A	#10	#33	#35		
Number of blows	15	19	22	27		
Wt.sample wet + tare	28.78	30.94	30.51	31.77		
Wt.sample dry + tare	25.62	27.39	27.04	28.16		
Weight of water	3.16	3.55	3.47	3.61		
Tare	14.22	14.31	14.22	14.26		
Wt. of dry soil	11.4	13.08	12.76	13.9		
Water content %	27.7 ✓	27.1 ✓	27.2 ✓	26.0 ✓		

Type of Test	PL	PL	Borehole #	TP95-[illegible]0
Container #	#70	#30	Sample #	—
Wt.sample wet + tare	35.36	23.44	Depth	—
Wt.sample dry + tare	34.53	22.35	Liquid Limit	26.3 ✓
Wt. of water	1.83	1.09	Plastic Limit	13.1 ✓
Tare	20.60	14.04	Plasticity index	13.2 ✓
Weight of dry soil	13.93	8.31	Moisture content	14.5 ✓
Water content	13.1 ✓	13.1 ✓	Liquidity Index	0.11 ✓



SAMPLE DESCRIPTION

CL

LABORATORY TEST SHEET – ATTERBERG LIMITS

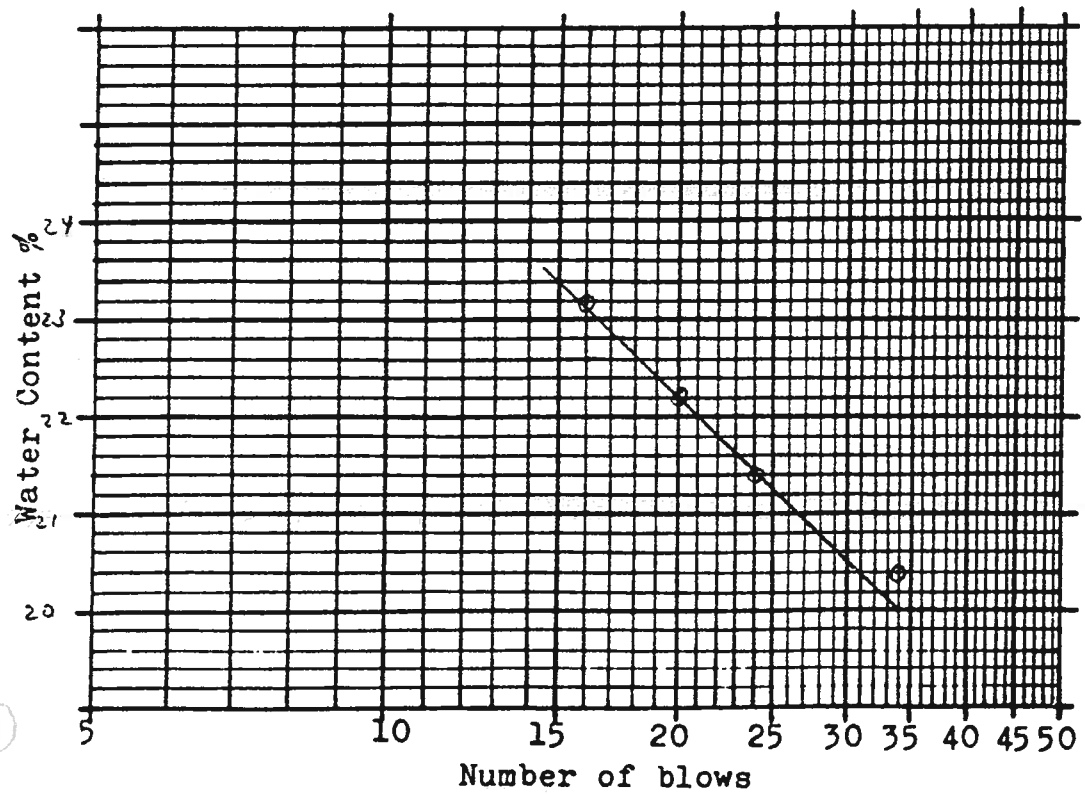
Lab Work 19 Project # 95-1013 Date Jan. 26/95

Lab Feb 14/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	B2	2	8	12		
Number of blows	34	24	20	16		
Wt.sample wet + tare	51.86	57.86	57.51	58.77		
Wt.sample dry + tare	45.57	50.22	49.55	50.31		
Weight of water	6.29	7.64	7.96	8.46		
Tare	14.75	14.50	13.62	13.89		
Wt. of dry soil	30.82	35.72	35.93	36.42		
Water content %	20.4 ✓	21.4 ✓	22.2 ✓	23.2 ✓		

Type of Test	PL	PL	Borehole #	TP 95-27
Container #	15	51	Sample #	
Wt.sample wet + tare	24.90	25.53	Depth	
Wt.sample dry + tare	23.70	24.25	Liquid Limit	21.20 ✓
Wt. of water	1.20	1.28	Plastic Limit	~~12.87~~ 12.9 ✓
Tare	14.41	14.26	Plasticity index	8.3 ✓
Weight of dry soil	9.29	9.99	Moisture content	11.1
Water content	12.92 ✓	12.81 ✓	Liquidity Index	~~0.21~~ 0.22

$\frac{11.1 - 12.87}{8.33}$



SAMPLE DESCRIPTION

TILL-LIKE SOILS
SAMPLE - MINUS #40
SIEVE. BROWN
CLAYEY SILT. TRACE->
LITTLE SAND
CL

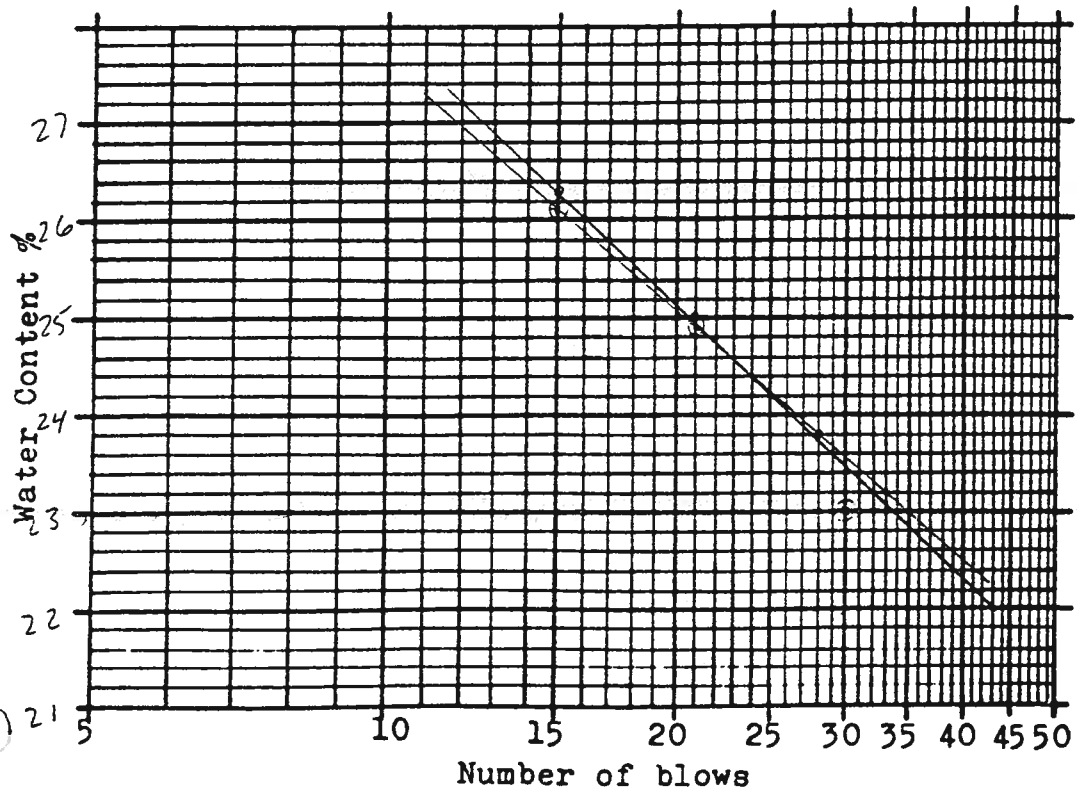
LABORATORY TEST SHEET – ATTERBERG LIMITS

Lab Work MO Project # 952 1018 Date Jan. 31-95

VKB Feb 14/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	#22	#21	#16	#24		
Number of blows	30	28	21	15		
Wt.sample wet + tare	29.58	31.20	32.45	34.24		
Wt.sample dry + tare	26.64	27.97	28.83	29.98		
Weight of water	2.94	3.23	3.62	4.3		
Tare	13.84	14.39	14.33	13.64		
Wt. of dry soil	12.8	13.58	14.5	16.34		
Water content %	23.0 ✓	23.8 ✓	24.9 ✓	~~26.3~~ 26.1		

Type of Test	PL	PL	Borehole #	TP 95-25
Container #	#29	#1	Sample #	—
Wt.sample wet + tare	27.08	23.30	Depth	—
Wt.sample dry + tare	25.80	22.30	Liquid Limit	24.2 ✓
Wt. of water	1.28	1.0	Plastic Limit	~~11.3~~ 11.5
Tare	14.52	13.67	Plasticity index	~~12.9~~ 12.7
Weight of dry soil	11.28	9.63	Moisture content	17.1 ✓
Water content	~~11.3~~ 11.4	~~11.2~~ 11.6	Liquidity Index	~~0.45~~ 0.44



SAMPLE DESCRIPTION

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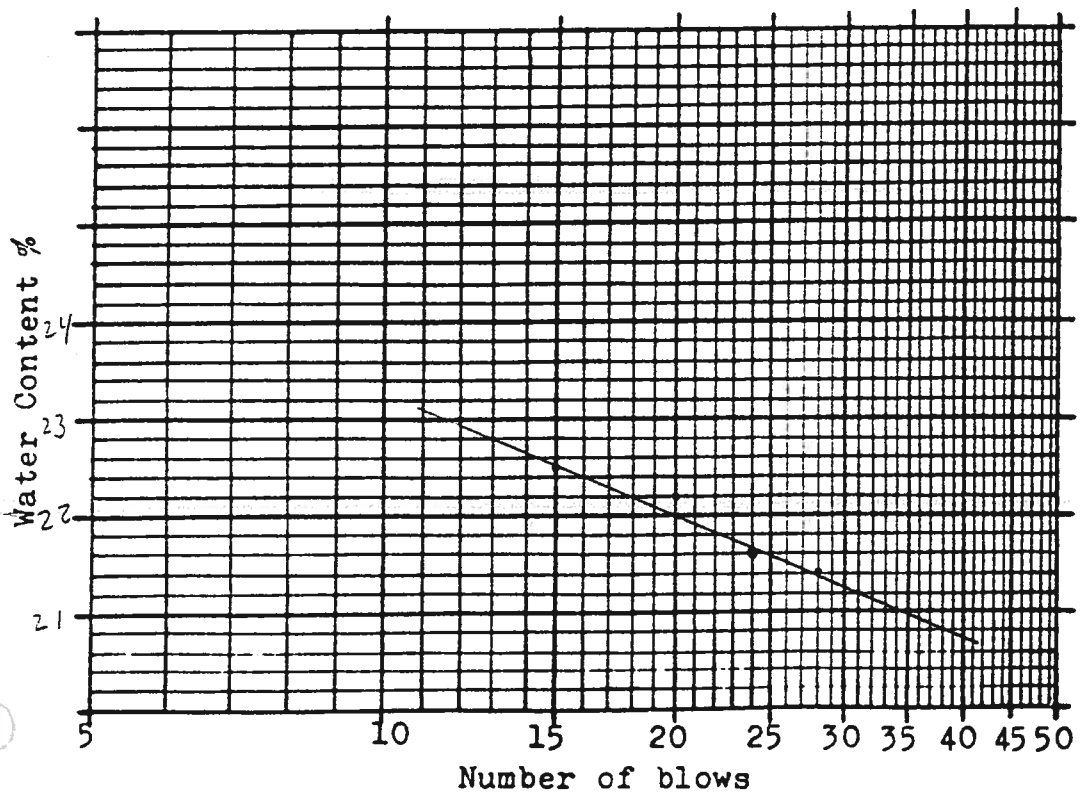
LABORATORY TEST SHEET – ATTERBERG LIMITS

Lab Work [illegible] Project # [illegible] Date Jan. 31-95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	#102	#30	#42	#74		
Number of blows	15	20	24	28		
Wt.sample wet + tare	30.63	32.90	40.59	40.41		
Wt.sample dry + tare	27.58	29.54	37.00	36.93		
Weight of water	3.05	3.36	3.59	3.48		
Tare	14.05	14.40	20.37	20.69		
Wt. of dry soil	13.53	15.14	16.63	16.24		
Water content %	22.5 ✓	22.2 ✓	21.6 ✓	21.4 ✓		

Type of Test	PL	PL	Borehole #	TP95-31
Container #	#82	#51	Sample #	—
Wt.sample wet + tare	34.07	37.00	Depth	—
Wt.sample dry + tare	32.45	35.04	Liquid Limit	21.6 ✓
Wt. of water	1.62	1.96	Plastic Limit	14.0 ✓
Tare	20.92	20.83	Plasticity index	7.6 ✓
Weight of dry soil	11.53	14.21	Moisture content	11.0 ✓
Water content	14.1 ✓	13.8 ✓	Liquidity Index	-0.40 ✓



SAMPLE DESCRIPTION

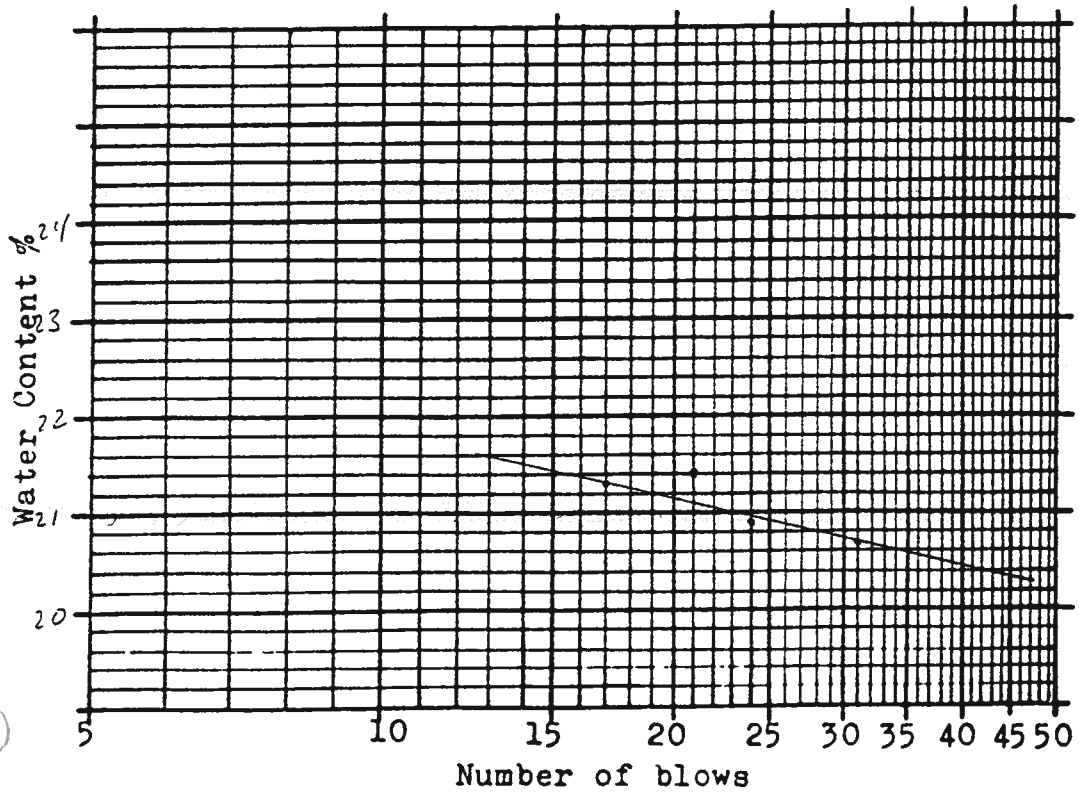
CL/ML

LABORATORY TEST SHEET – ATTERBERG LIMITS

Lab Work M.O. Project # 952 0018 Date Jan. 21-95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	#31	#14	#12A	#3		
Number of blows	17	24	31	31		
Wt.sample wet + tare	31.74	31.10	32.26	32.24		
Wt.sample dry + tare	28.73	28.24	29.06	29.21		
Weight of water	3.01	2.86	3.2	3.03		
Tare	14.59	14.55	14.11	14.59		
Wt. of dry soil	14.14	13.69	14.95	14.62		
Water content %	21.3 ✓	20.9 ✓	21.4 ✓	20.7 ✓		

Type of Test	PL	PL	Borehole #	TP95-35
Container #	#12	#9	Sample #	—
Wt.sample wet + tare	25.83	33.70	Depth	—
Wt.sample dry + tare	24.35	22.61	Liquid Limit	20.9 ✓
Wt. of water	1.48	1.19	Plastic Limit	14.1 ✓
Tare	13.91	14.08	Plasticity index	6.8 ✓
Weight of dry soil	10.44	8.53	Moisture content	16.5 ✓
Water content	14.2 ✓	14.0 ✓	Liquidity Index	0.35 ✓



SAMPLE DESCRIPTION

CL/ML

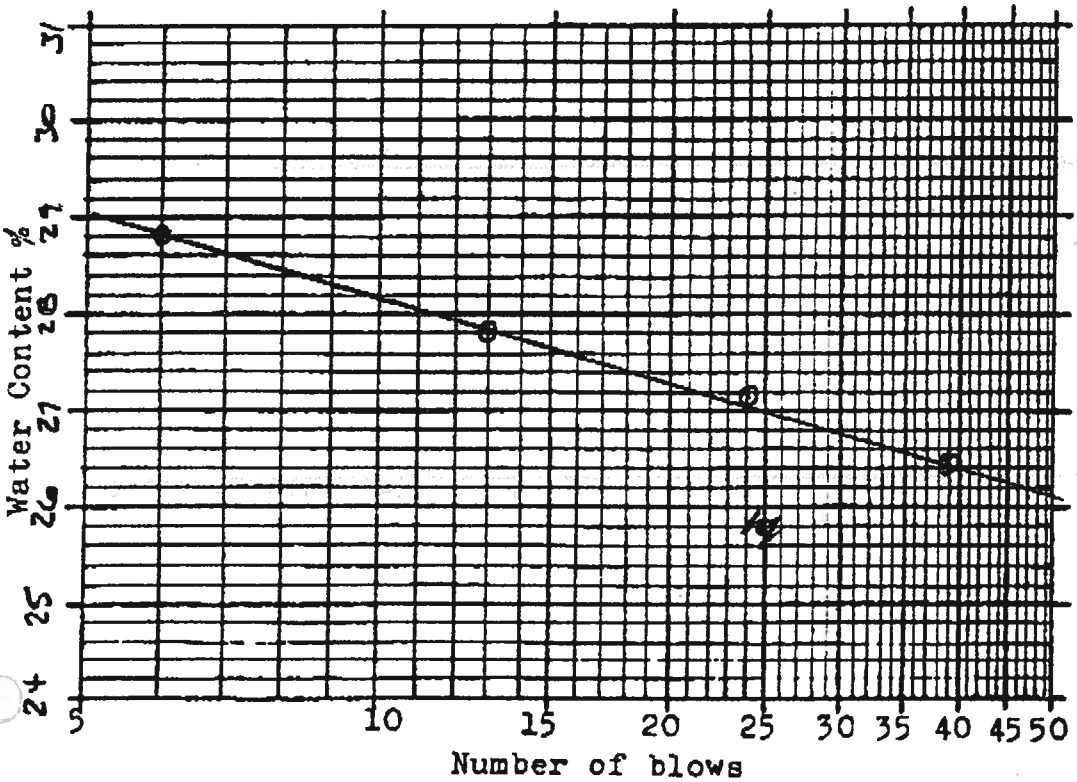
Golder Associates

LABORATORY TEST SHEET – ATTERBERG LIMITS

Lab Work _____ Project # 952-1018 Date Feb 3/95

Type of Test	LL	LL	LL	LL		Nat MC
Container #	36	4	91	CC	4	
Number of blows	13	25	24	6	39	
Wt.sample wet + tare	22.69	18.83	31.27	20.33	35.20	
Wt.sample dry + tare	18.75	15.70	25.39	16.57	30.88	
Weight of water	3.94	3.13	5.88	3.76	4.32	
Tare	4.55	3.57	3.76	3.50	14.57	
Wt. of dry soil	14.20	12.13	21.63	13.07	16.31	
Water content %	27.8	25.8	27.2	28.8	26.5	18.8%

Type of Test	PL	PL	Borehole #	TP 95-37
Container #	A8	B13	Sample #	
Wt.sample wet + tare	17.80	17.14	Depth	
Wt.sample dry + tare	15.81	15.26	Liquid Limit	27.0 %
Wt. of water	1.99	1.88	Plastic Limit	16.3 %
Tare	3.59	3.67	Plasticity index	10.7 %
Weight of dry soil	12.22	11.59	Moisture content	18.8 %
Water content	16.3	16.2	Liquidity Index	0.23



SAMPLE DESCRIPTION

CL

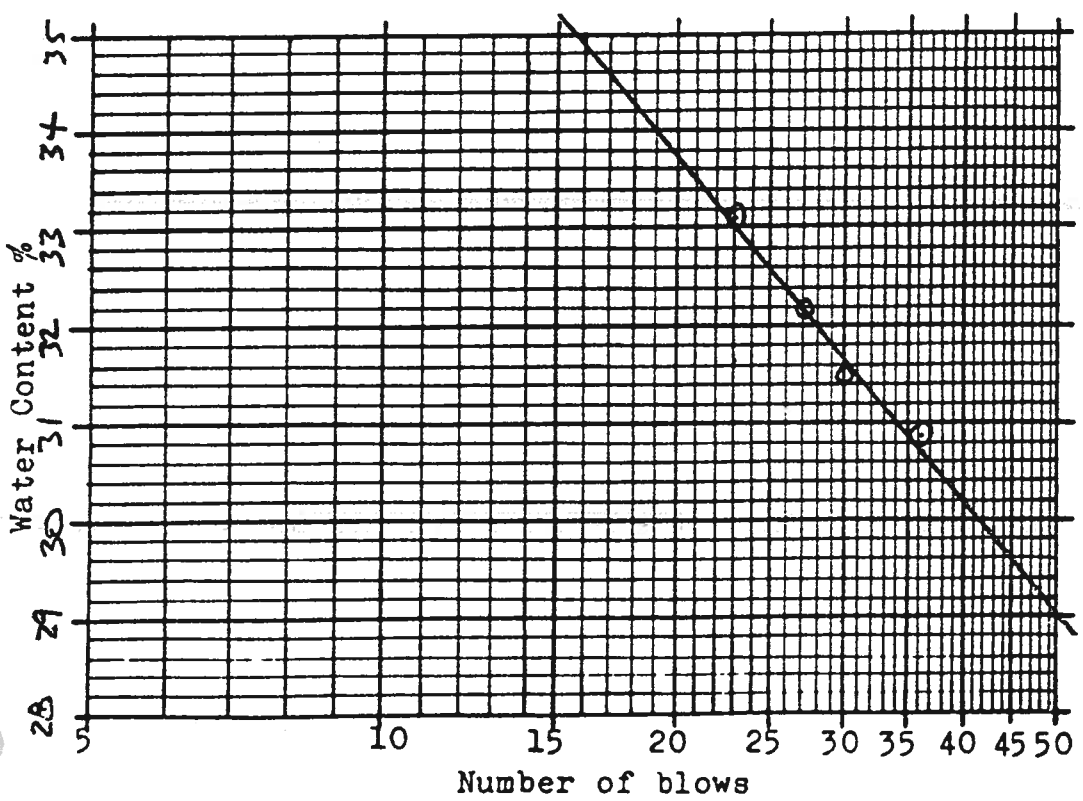
Golder Associates

LABORATORY TEST SHEET – ATTERBERG LIMITS

Lab Work _____ Project # 952 1018 Date Feb 3 /95 IAB Fr...

Type of Test	LL	LL	LL	LL		Nat MC
Container #	61	78	65	69		
Number of blows	36	30	27	23		
Wt.sample wet + tare	49.50	50.11	51.16	61.30		
Wt.sample dry + tare	42.74	43.08	43.70	51.05		
Weight of water	6.76	7.03	7.46	10.25		
Tare	20.84	20.75	20.53	20.05		
Wt. of dry soil	21.90	22.33	23.17	31.00		
Water content %	30.9 ✓	31.5 ✓	32.2 ✓	33.1 ✓		28.4

Type of Test	PL	PL	Borehole #	TP 95-38
Container #	6	25	Sample #	
Wt.sample wet + tare	25.14	30.91	Depth	
Wt.sample dry + tare	23.97	29.81	Liquid Limit	32.6 ✓
Wt. of water	1.17	1.10	Plastic Limit	18.7 ✓
Tare	17.77	23.84	Plasticity index	13.9 ✓
Weight of dry soil	6.20	5.97	Moisture content	28.4 ✓
Water content	18.9 ✓	18.4 ✓	Liquidity Index	0.70 ✓



SAMPLE DESCRIPTION

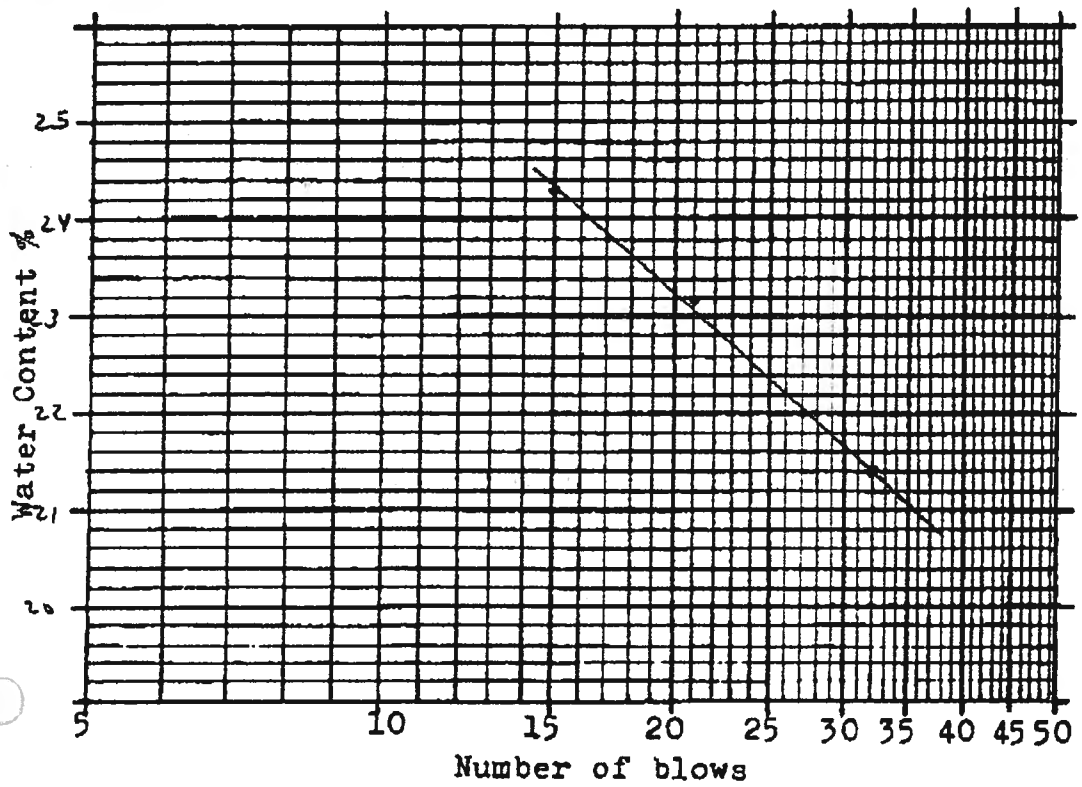
Brown CLAYEY SILT
TRACE SAND

LABORATORY TEST SHEET – ATTERBERG LIMITS

Lab Work _____ Project # 952-1018 Date Feb 14/95

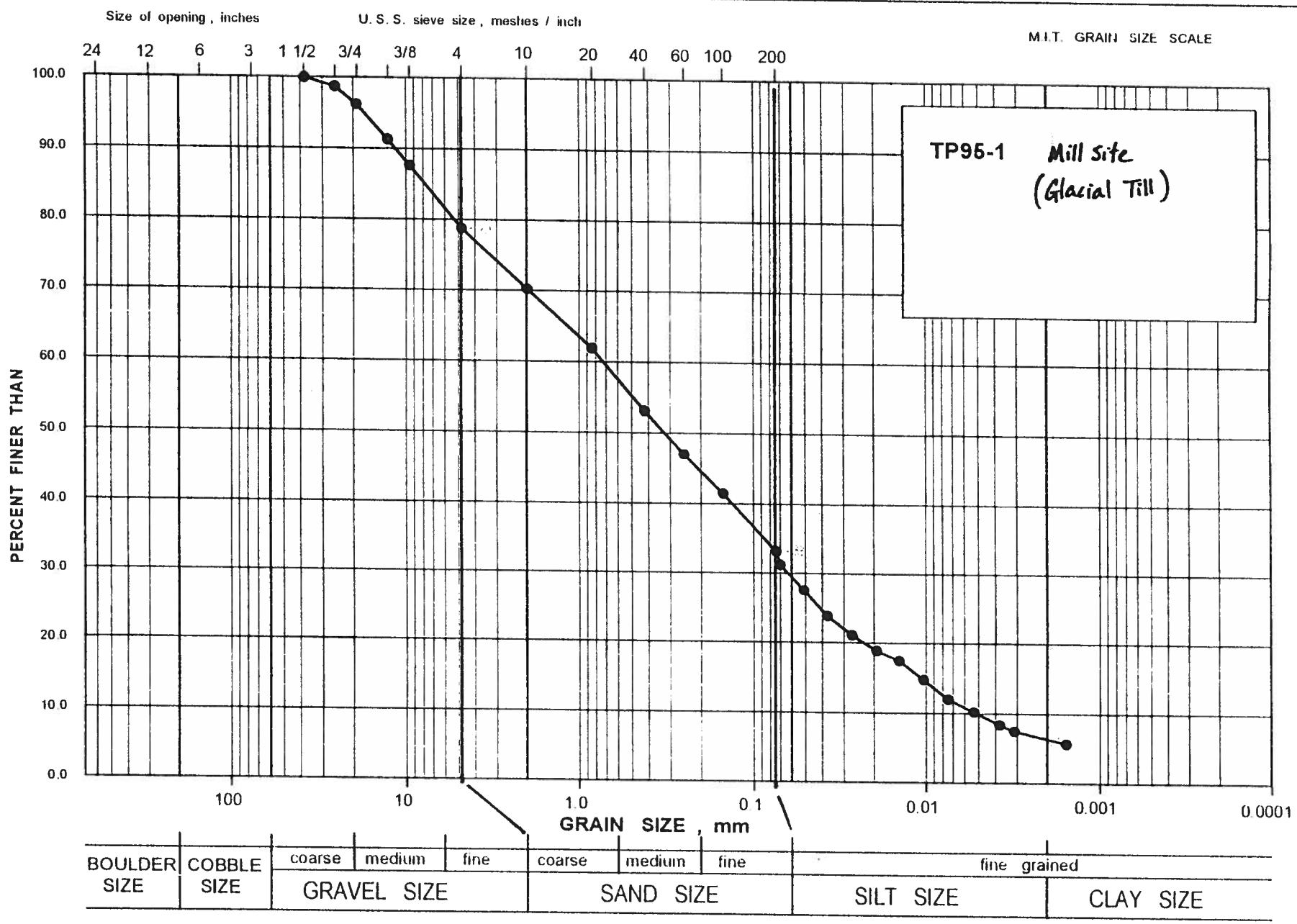
Type of Test	LL	LL	LL	LL		Nat MC
Container #	B2	12	12A	14		
Number of blows	32	27	21	15		
Wt.sample wet + tare	46.53	49.52	48.06	51.84		
Wt.sample dry + tare	40.93	43.09	41.78	44.47		
Weight of water	5.60	6.43	6.28	7.37		
Tare	14.79	13.89	14.73	14.19		
Wt. of dry soil	26.14	29.20	27.05	30.28		
Water content %	21.4	22.0	23.2	24.3		11.1

Type of Test	PL	PL	Borehole #	TP 95-27
Container #	30	102	Sample #	
Wt.sample wet + tare	25.60	24.04	Depth	
Wt.sample dry + tare	24.24	22.80	Liquid Limit	22.4
Wt. of water	1.36	1.24	Plastic Limit	13.9
Tare	14.39	13.95	Plasticity index	8.5
Weight of dry soil	9.85	8.85	Moisture content	11.1
Water content	13.8	14.0	Liquidity Index	-0.32



SAMPLE DESCRIPTION

Brown CLAYEY SILT
TRACE SAND.
CL

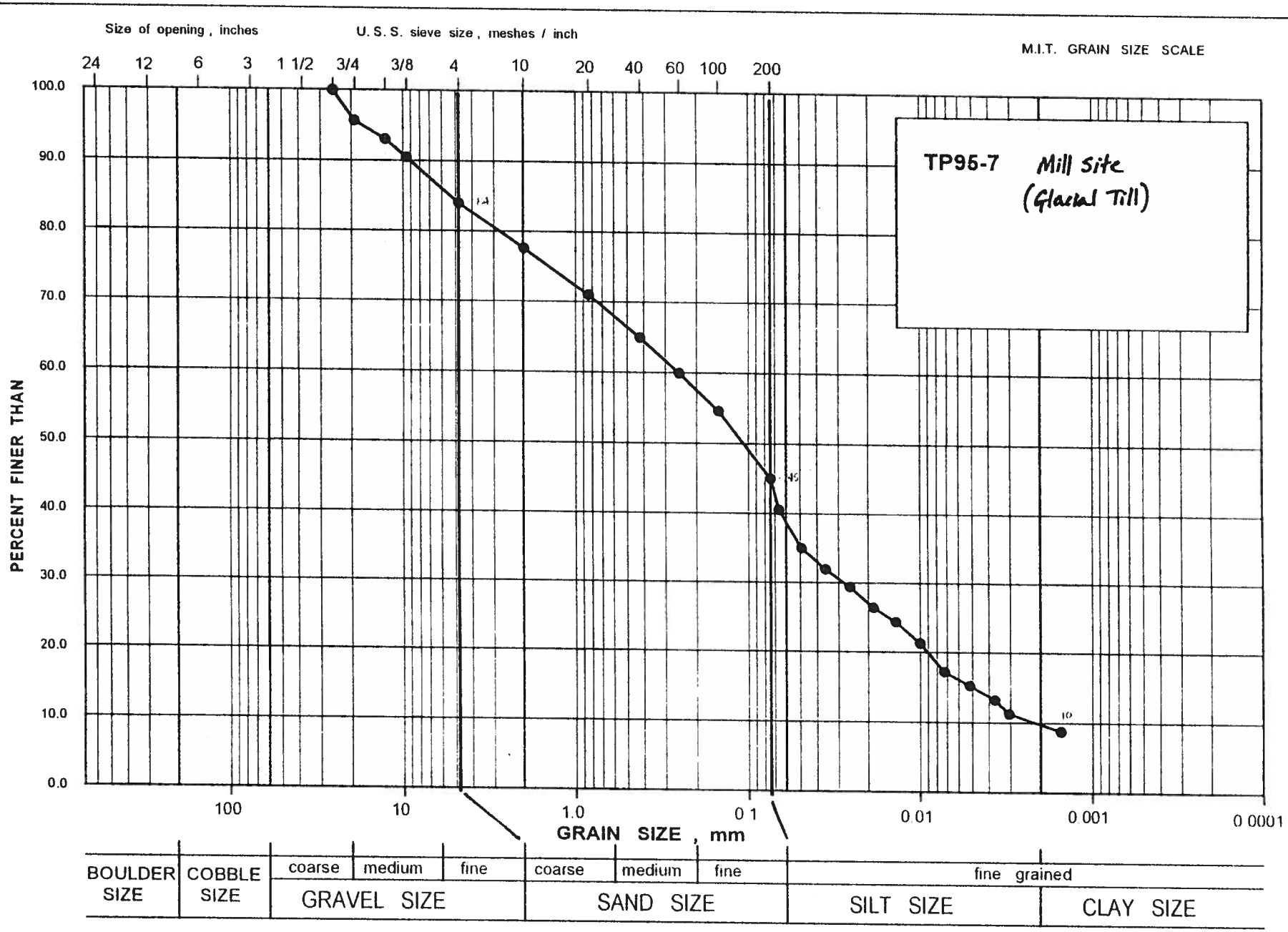


Project No. 9521018
Drawn LL
Reviewed
Date 02/09/95

Golder Associates

GRAIN SIZE DISTRIBUTION

Figure

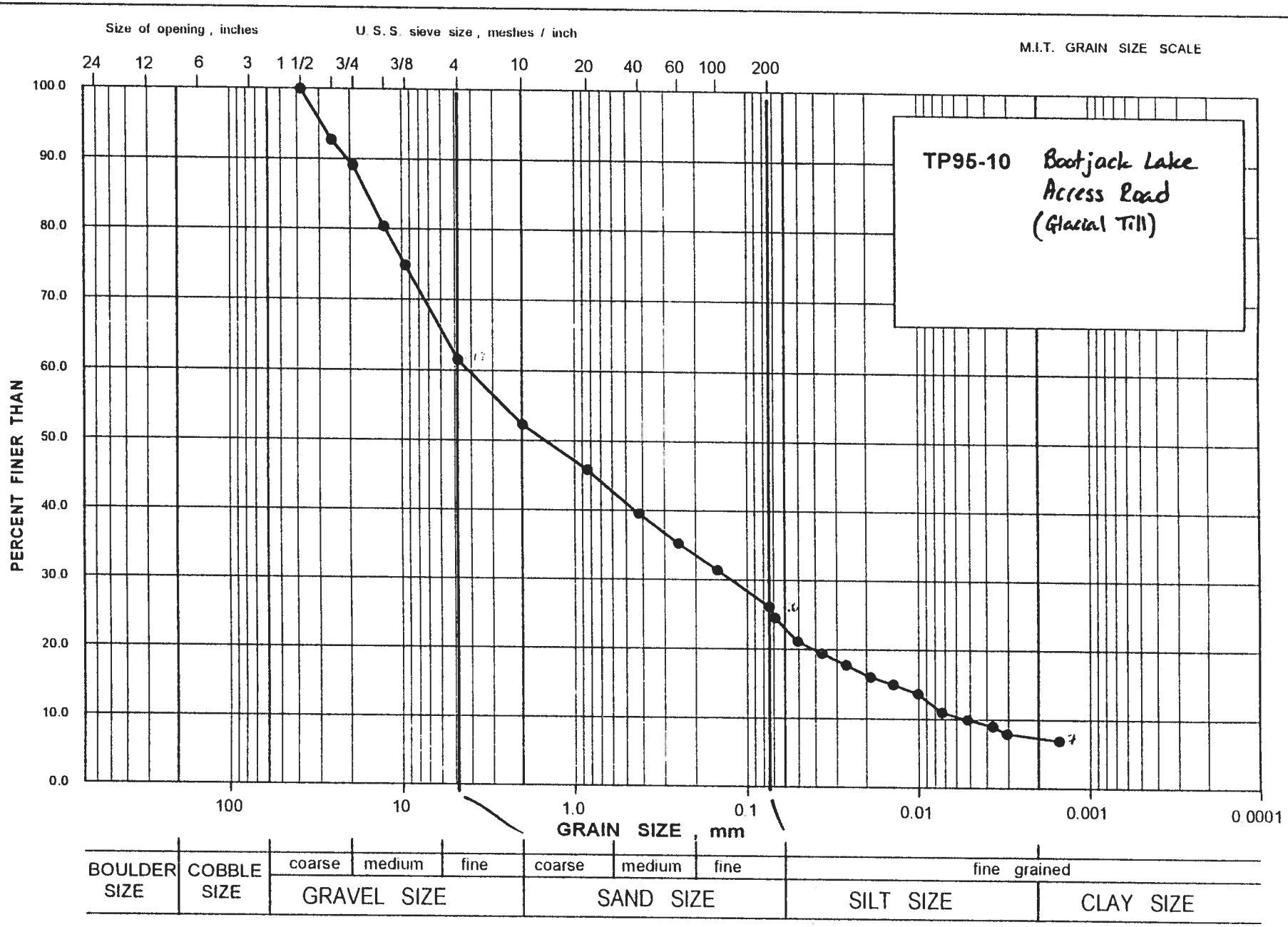


Project No. ..9521018.....
Drawn .....LL.....
Reviewed .....
Date .....02/09/95.....

Golder Associates

GRAIN SIZE DISTRIBUTION

Figure



Project No. ..9521018.....
Drawn .....LL.....
Reviewed .....
Date .....02/09/95.....

Golder Associates

GRAIN SIZE DISTRIBUTION

Figure

B.2 EXCERPTS FROM 1990 GEOTECHNICAL INVESTIGATION REPORT

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. MT 89-2
SHEET 1 of

PROJECT Mt. Polley
LOCATION OF TEST HOLE Tailings Area B
DATE BEGUN Oct. 29, 1989 DATE FINISHED Oct. 29, 1989

PROJECT No. 1621
GROUND ELEVATION 929.
LOGGED BY RNK & K. Illich

NOTES (Water loss, type and size of hole, drilling method, groundwater level, etc.)	CORE RECOVERY %	RQD	DEFECT SPACING (cm)	PERMEABILITY ($\times 10^{-6}$ cm/s)	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
					50		- dense, grey silty till
NO PIEZOMETER INSTALLATIONS	40	0	5				
	95	20					
	100	20			100		
TRICONE BIT USED TO DRILL OVER 71.5m.		30					
		40	10				
		40					- weathered reddish brown volcanic conglomerate with rough planar to wavy joints infilled with calcite
		40					
		60	<3		150		
		80	20				
		30	20				
		0	<3				- 75 % clay and gouge
		40	<3				
		40	10				
HOLE SIZE: NQ		60	50		200		
		90					
		85					
		85					
		40	10		250		
		60	10				- purple basalt
		60	20				
		80					
		85					
		80			300		
		90					
		90					
		70					
		85	50				
		85	50		350		
		80	50				
		90	20				
		80					
		90					
	100	90					EOH

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. MP89-23
SHEET 1 of

PROJECT Mt. Polley
LOCATION OF TEST HOLE Tailings Area E
DATE BEGUN Oct. 30 1989 DATE FINISHED Oct. 30 1989

PROJECT No. 1621
GROUND ELEVATION 939.
LOGGED BY RNK + K.[illegible]

NOTES (Water loss, type and size of hole, drilling method, groundwater level, etc.)	CORE RECOVERY %	RQD	DEFECT SPACING (cm)	PERMEABILITY ($\times 10^{-6}$ cm/s)	DEPTH	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
					50		- dense, grey, silty till
NO PIEZOMETER INSTALLATIONS	40	0	<3				
	70	30					
	40	5					
	55	40			100		
	70	20					- very weathered soft, volcanic conglomerate (weathered to purple clay, sand, and gravel)
	75	35					
TRICONE BIT USED TO DRILL OVERBURDEN	100	20					
	80	35					
	100	40			150		
	100	30					
	95	25					
	90	40					
	70	10					
HOLE SIZE: NQ	95	15			200		
	100	40					
	60	10					
	80	10					
	0	0	<3				EOH
					250		
					300		
					350		

KNIGHT AND PIESOLD LTD.
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TEST HOLE LOG

TEST HOLE MP89-23
SHEET 1 of

PROJECT Mt. Polley
LOCATION OF TEST HOLE Tailings Area B
DATE BEGUN Oct 31, 1989 DATE FINISHED Nov. 1, 1989

PROJECT No. 1621
GROUND ELEVATION [illegible]
LOGGED BY RNK + K[illegible]

NOTES (Water loss, type and size of hole, drilling method, groundwater level, etc.)	CORE RECOVERY %	RQD	DEFECT SPACING (cm)	PERMEABILITY ($\times 10^{-6}$ cm/s)	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
pneumatic leads; water table at surface; $1\frac{1}{2}$" Ø PVC standpipe piezometer slotted to surface	10			6.4			s-water table at surface - dense, grey, silty till with abundant rounded pebbles
					50		
	20						- reddish brown coarse sand and gravel (weathered K-spar rich intrusive)
	50						- fine beach sand with minor clay binder
	0						- reddish brown coarse sand and gravel (weathered K-spar rich intrusive)
	85				100		
sand backfill; bentonite seal	100	70	10	1.6			
	100	70					
	90	50		.29			- purple weathered volcanic conglomerate with rough planar joints infilled with clay, hematite, or calcite (decreasing weathering down hole)
	90	20	<3		150		
	100	30					
		50					
		65	10				
		50					
		50			200		
		40					
		40					
sand backfill		35					
		50					
		60			250		
		70	30				
		70	30				
		20	<3				
		70	20				
		20	<3		300		- Conglomerate strained to sandy clay gouge
		0	<3				
		20	<3				
bentonite seal		40	30				
		85					
		65			350		
sand backfill		70					
		40	10				
		40	10				
pneumatic piezometer, tip at 385'		75	30				
	80	50	10				EOH

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE # mP89-22
SHEET 1 of 1

PROJECT Mt. Polley
LOCATION OF TEST HOLE [illegible]
DATE BEGUN Nov. 1, 1989 DATE FINISHED Nov. 4, 1989

PROJECT No. 1621
GROUND ELEVATION 910 -
LOGGED BY RNK + K [illegible]

NOTES (Water loss, type and size of hole, drilling method, groundwater level, etc.)	CORE RECOVERY %	RQD	DEFECT SPACING (cm)	PERMEABILITY ($\times 10^{-6}$ cm/s)	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
$1\frac{1}{2}$" ϕ PVC standpipe piezometer							▽ water table at 7'
	15						dense, grey silty glacial till
	30						-clay rich silt, becoming coarser grained down hole
hole sloughed in at 50'	40			7.7	50		-layered clay rich very fine sand and silts
	0						
	15						
	30	0	<3				-purple weathered, soft, clayey volcanic conglomerate with abundant cobbles and gravel
	45	0			100		
	90	20					
	40	0		3.2			sand and clay rich volcanic mud
	90	25	10				
	95	75	30				(dominant fractures at 90° and 45° to core axis, tight, rough and planar with calcite infilling)
	100	25	<3	10	150		sandy clay gouge
		80	30				
		80					
		65					
		75					
		40	10				
		25	<3		200		-well stratified purple mudstone with calcite infilled rough planar joints
		35					
		0					
		35	10				
		10	<3		250		-well stratified purple sandstone with clay matrix
		0					
		0					
		10					
		70	30				
		60					
		60			300		-volcanic conglomerate (as above)
		70					
		40	10				
		10	<3				
		10			350		
		25					
		80	30				
		100					
		100					
		98					EOH

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE mP89-23
SHEET 1 of 1

PROJECT Mt. Polley
LOCATION OF TEST HOLE Tailings Area 5
DATE BEGUN Nov. 5, 1989 DATE FINISHED Nov. 6 1989

PROJECT No. 1621
GROUND ELEVATION 933.
LOGGED BY RNK + K Mc

NOTES (Water loss, type and size of hole, drilling method, groundwater level, etc.)	CORE RECOVERY %	RQD	DEFECT SPACING (cm)	PERMEABILITY ($\times 10^{-6}$ cm/s)	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
$1\frac{1}{2}$" Ø PVC standpipe piezometer; bentonite seal	5, 15, 0			11	50		- dense grey silty glacial till with abundant pebbles (recovery mostly pebbles and silty clay)
							▽ water table at 56'
					100		- grey sandy glacial till with some pebbles (recovery mostly pebbles)
hole sloughed in at 100'	10, 50, 15, 15, 25, 70, 70, 75, 75, 60	0, 40, 40, 0	<3, 10, <3	22, 16, 17			- heavily weathered volcanic conglomerate, with matrix leached to leave sand and gravel
	95, 55, 70, 100, 100, 70, 70, 100, 100, 95	50, 10, 20, 35, 45, 30, 0	10, <3, <3, 10, 10, 10, <3		150, 200, 250		
	80, 70, 40, 40, 10, 40, 70, 30, 20, 20	25, 10, 0, 0	10, 10, <3, <3		300, 350		EOH

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE MP89-23
SHEET 1 of

PROJECT Mt. Polley
LOCATION OF TEST HOLE Tailings Area B
DATE BEGUN Nov 7, 1989 DATE FINISHED Nov. 7, 1989

PROJECT No. 1621
GROUND ELEVATION 909.
LOGGED BY RNK + KMcN

NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	CORE RECOVERY %	RQD	DEFECT SPACING (cm)	PERMEABILITY ($\times 10^{-6}$ cm/s)	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
pneumatic leads							- water table at surface
	50			14			- dense grey clay and silt with a trace of pebbles, and rare 5 cm bands of clean sa
$1\frac{1}{2}$" Ø PVC standpipe piezometer	1				50		- grey clayey sand with some pebb
	20						
	0						
	85				100		
	100	35	10				- weathered purple volcanic conglomerate (altered to sand and gravel) defects oriented 60° and 90° to core axis
		40	10	.32			
		65	30				
bentonite seal		85	30				
		70	30				
		20	<3	3.3	150		
		50	50				
	10	0	<3				
	90	70	30				
	100	90	30				- decreasing degree of weathering with depth
	90	15	<3		200		
sand backfill	95	25					
	70	0					
	100	30					
bentonite seal		40			250		
sand backfill		40	10				
		40	10				
pneumatic piezometer tip at 270'		70	10				
		10	<3				
hole sloughed in at 270'		10			300		
		0					
		0					
		25					
		40	30				
		20	10		350		
		30	30				
		80					
		60					
		80					
		70					EOH

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

MP89-235
SHEET 1 of 1

PROJECT Mt. Polley
LOCATION OF TEST HOLE Tailings Area B
DATE BEGUN Nov. 9, 1989 DATE FINISHED Nov. 10, 1989

PROJECT No. 1621
GROUND ELEVATION 946.2
LOGGED BY RNK + KMcN

NOTES (Water loss, type and size of hole, drilling method, groundwater level, etc.)	CORE RECOVERY %	RQD	DEFECT SPACING (cm)	PERMEABILITY ($\times 10^{-6}$ cm/s)	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
							- water table at 6'
pneumatic leads							dense gray sandy glacial till
	80	20	<3				
	100	40	10				
		70	10	510			
$1\frac{1}{2}$" ϕ PVC standpipe piezometer		90	30		50		- very weathered purple volcanic conglomerate with rough, wavy, thin clay filled fractures
		70		.086			
		85					
		95					
		70	10	.40			
sand backfill		60					
					100		
bentonite seal		60					
		60					
		50		11			
		65					
		65					
					150		
		85					
		90	30				
		70					
		80					
		90					
					200		
		85					
sand backfill		75					
		70					
		85					
		60			250		healed shear 20°
		70	10				
		75	30				
		85					
		90					
		60					
					300		
	90	60	10				
	100	60					
	90	50					
	95	50					
	100	80	30		350		- purple basalt
bentonite seal		40	10				
		60	10				
sand backfill		100	30				
		70	30				
pnematic piezometer tipat 390'		60	10				EOH

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

MP89-236
SHEET 1 of 1

PROJECT Mt. Polley
LOCATION OF TEST HOLE Tailings Area B
DATE BEGUN Nov. 10, 1989 DATE FINISHED Nov. 11, 1989

PROJECT No. 1621
GROUND ELEVATION 944
LOGGED BY RNK + K

NOTES (Water loss, type and size of hole, drilling method, groundwater level, etc.)	CORE RECOVERY %	RQD	DEFECT SPACING (cm)	PERMEABILITY ($\times 10^{-6}$ cm/s)	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
pneumatic leads	5						- water table at surface.
	10						- dense grey silty till with some pebbles
	10	0	<3				
	40	0		27			
1½" Ø PVC standpipe piezometer	60	0			50		- weathered golfball syenite with thin calcite and chlorite filled tight planar, smooth fractures. Defects at 20° and 70° to core axis
	80	10					
	40	10		2.7			
	70	20					
	70	10	10				
sand backfill	95	30		2.0	100		
	80	25					
bentonite seal	100	25	<3				
	60	30	10				
	90	15		.77			
	100	60			150		
	80	60					
	100	50					
sand backfill	80	20	<3				
	100	35	<3				
	100	45	10		200		
	90	20	<3				
	90	15	<3				
	100	40	10				
	45	10	<3				
	80	25	10		250		
	60	5	10				
	70	10	<3				
	80	15					
	80	0					
	50	0					
bentonite seal	30	0			300		
	45	10					
sand backfill	40	0					
	70	0					
	90	30			350		
	95	45	10				
	100		10				
pneumatic piezometer tip at 380'	100		<3				

EOH

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APPENDIX C

TESTWORK ON TAILINGS
PHYSICAL CHARACTERISTICS* AND
GEOCHEMICAL CHARACTERISTICS**

Taken from "Mt. Polley Project, Report on Geotechnical Investigations and Design of Open Pit, Waste Dumps and T.S.F", dated February 19, 1990

* Appendix D: Laboratory Testwork on Tailings

** Appendix E: Geochemical Tests on Tailings

Knight Piésold Ltd.
CONSULTING ENGINEERS

PHYSICAL CHARACTERISTICS

Association of Consulting Engineers of Canada
Association des Ingénieurs-Conseils du Canada

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT

APPENDIX D
LABORATORY TESTWORK ON TAILINGS

SECTION 1.0 - GENERAL

A series of laboratory tests were carried out on tailings samples obtained from Coastech Research Inc. The performance of the tailings slurry was evaluated at different solids contents and using different deposition techniques.

The following tests were carried out:

- Particle size distribution by sieve and hydrometer
- Solids specific gravity
- Particle diameter versus settling velocity
- Undrained settling tests
- Drained settling tests
- Permeability tests on drained and settled tailings
- Air drying of tailings to determine the densities achievable and the reduction in saturation levels.

SECTION 2.0 - TAILINGS SOLIDS CHARACTERISTICS

The specific gravity of the tailings solids was measured to be 2.78. The particle size distribution was determined using sieve and hydrometer analyses. The tailings gradation is shown on Figure D1. The tailings material is a non plastic, yellow-grey, fine grained material with 6 percent clay, 64 percent silt and 30 percent fine sand.

SECTION 3.0 - TAILINGS DEPOSITION AND WATER RECOVERY CHARACTERISTICS

Drained and undrained settling tests were carried out on three slurries at 25 percent solids, 35 percent solids and 45 percent solids.

The undrained settling tests indicate the water recovery and settled densities of tailings deposited underwater while the drained settling tests indicate the increase in density and water recovery resulting from drainage. The results of the tests are given on Figures D2 and D3 and in Tables D1 and D2.

The tailings solids settled rapidly and a pronounced segregation was observed. The sandy materials settled first and were overlain by progressively finer fractions of silt. The supernatant water remained quite cloudy as the fine colloidal clay fraction remained in suspension.

Additional slurry samples were allowed to settle and surface water was decanted. When settling was complete the water losses and sample volume changes due to evaporation were recorded. This was continued until the tailings reached the maximum density achievable by air drying.

The dry densities achieved by undrained settling, drained settling and by air drying of the tailings are shown on Figure D4 and summarized as follows:

Initial Solids Content	25%	35%	45%
Dry Density			
Undrained Settling	0.84 t/m^3	0.89 t/m^3	0.96 t/m^3
Drained Settling	1.12 t/m^3	1.10 t/m^3	1.19 t/m^3
Air Drying	1.44 t/m^3	1.49 t/m^3	1.33 t/m^3

On the basis of the above tests and for an initial solids content of 35 percent, it is predicted that the tailings will settle on deposition to a dry density of 0.9 t/m^3 yielding 1.18 m^3 of supernatant per tonne of deposited tailings. The tailings could then be expected to drain and consolidate to 1.1 t/m^3. Continued consolidation, air drying and freeze-thaw consolidation will further increase the tailings density thereby reducing the tailings storage requirements. On-going monitoring will determine the actual densities achieved by the tailings. This will allow accurate planning of the construction of future stages of the tailings facility.

SECTION 4.0 - TAILINGS PERMEABILITY

Falling head permeability tests were carried out on the settled and drained tailings slurry after completion of the settling tests. The results are summarized as follows:

Initial solids content (%)	25	35	45
Drained density (t/m^3)	1.12	1.10	1.19
Permeability (cm/s)	1.4×10^{-5}	2.0×10^{-5}	2.4×10^{-5}

SECTION 5.0 - PARTICLE SETTLING VELOCITY ANALYSIS

Particle settling velocities are used in conjunction with particle specific gravity, solids content, flow data, etc. to determine friction losses in slurry pipelines. Settling velocity as a function of particle diameter is plotted on Figure D5.

TABLE D2

MT. POLLEY
TAILINGS STORAGE FACILITY

RESULTS OF DRAINED SETTLING TESTS ON TAILINGS

Solids content of initial slurry (%)	25	35	45
Pulp density of initial slurry (t/m^3)	1.19	1.26	1.37
Water to supernatant (% of total water)	72.9	63.6	49.8
Additional water recovered with underdrainage (% of total water)	9.1	8.4	12.2
Total water recovered (% of total water)	82	72	62
Void ratio of drained slurry	1.48	1.53	1.34
Bulk density of settled slurry (t/m^3)	1.46	1.70	1.76
Dry density of settled slurry (t/m^3)	1.12	1.10	1.19

TABLE D1

MT. POLLEY
TAILINGS STORAGE FACILITY

RESULTS OF UNDRAINED SETTLING TESTS ON TAILINGS

Solids content of initial slurry (%)	25	35	45
Pulp density of initial slurry (t/m^3)	1.19	1.26	1.37
Water to supernatant (% of total water)	72.9	63.6	49.8
Void ratio of settled slurry	2.33	2.12	1.90
Bulk density of settled slurry	1.54	1.57	1.62
Dry density of settled slurry (t/m^3)	0.84	0.89	0.96

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UNIFIED SOIL CLASSIFICATION SYSTEM

PROJECT No. 1621
SAMPLE No.
DATE

PROJECT : MT. POLLEY TAILINGS GRADATION

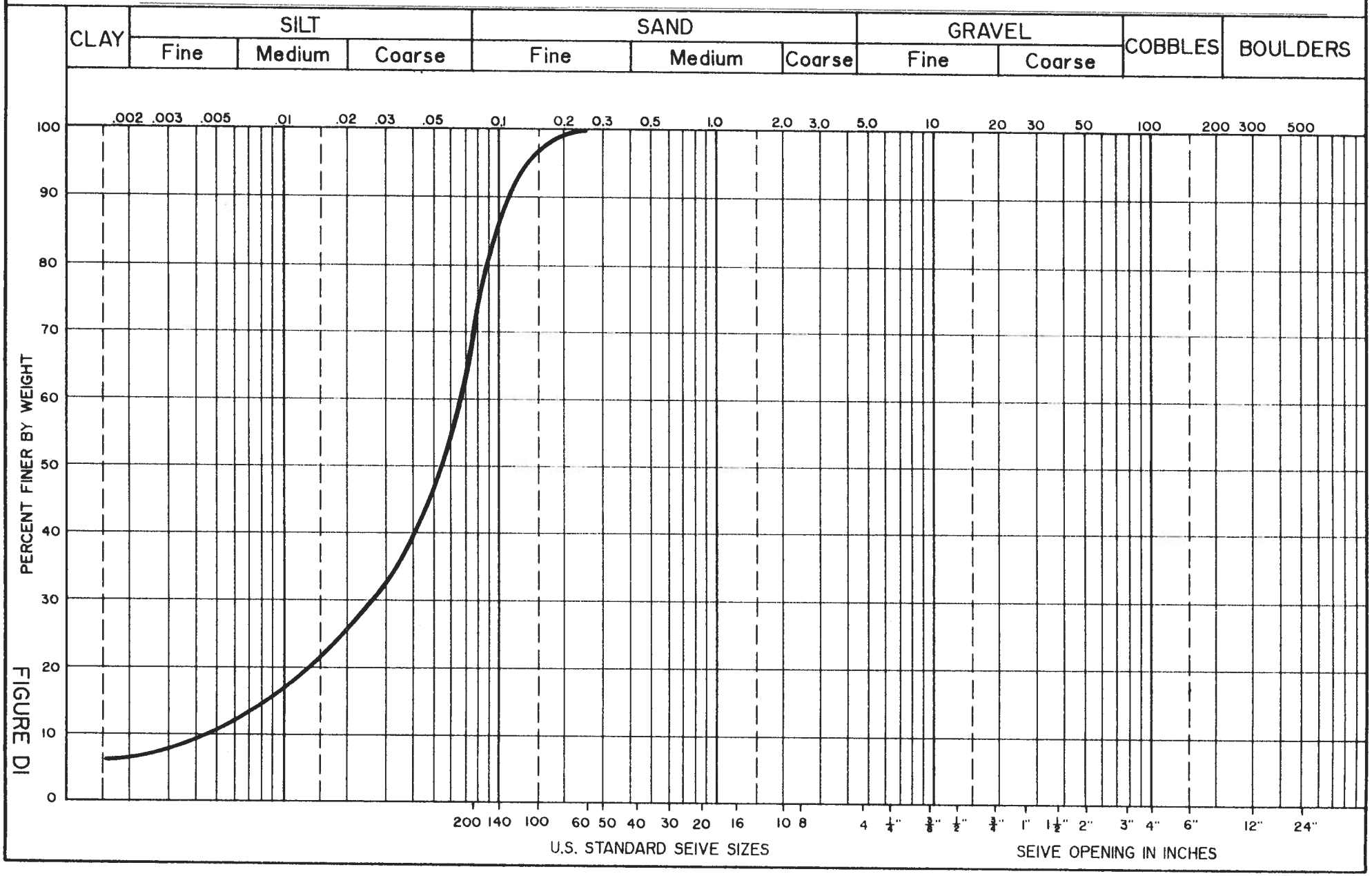

FIGURE D1

IMPERIAL METALS CORPORATION

MT. POLLEY PROJECT

TESTWORK ON TAILINGS

UNDRAINED SETTLING TESTS ON TAILINGS

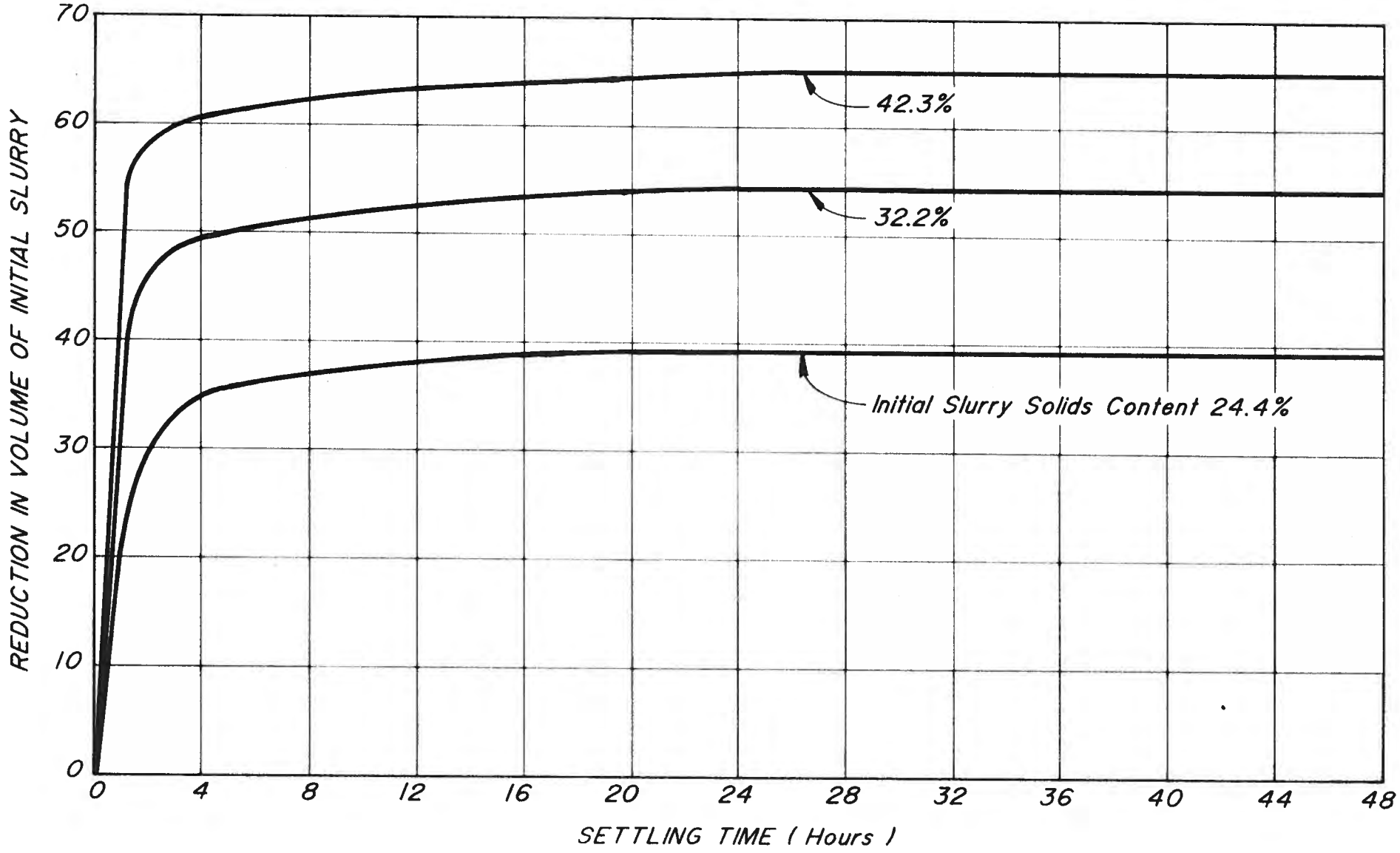

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FIGURE D2

IMPERIAL METALS CORPORATION

MT. POLLEY PROJECT

TESTWORK ON TAILINGS

DRAINED SETTLING TESTS ON TAILINGS

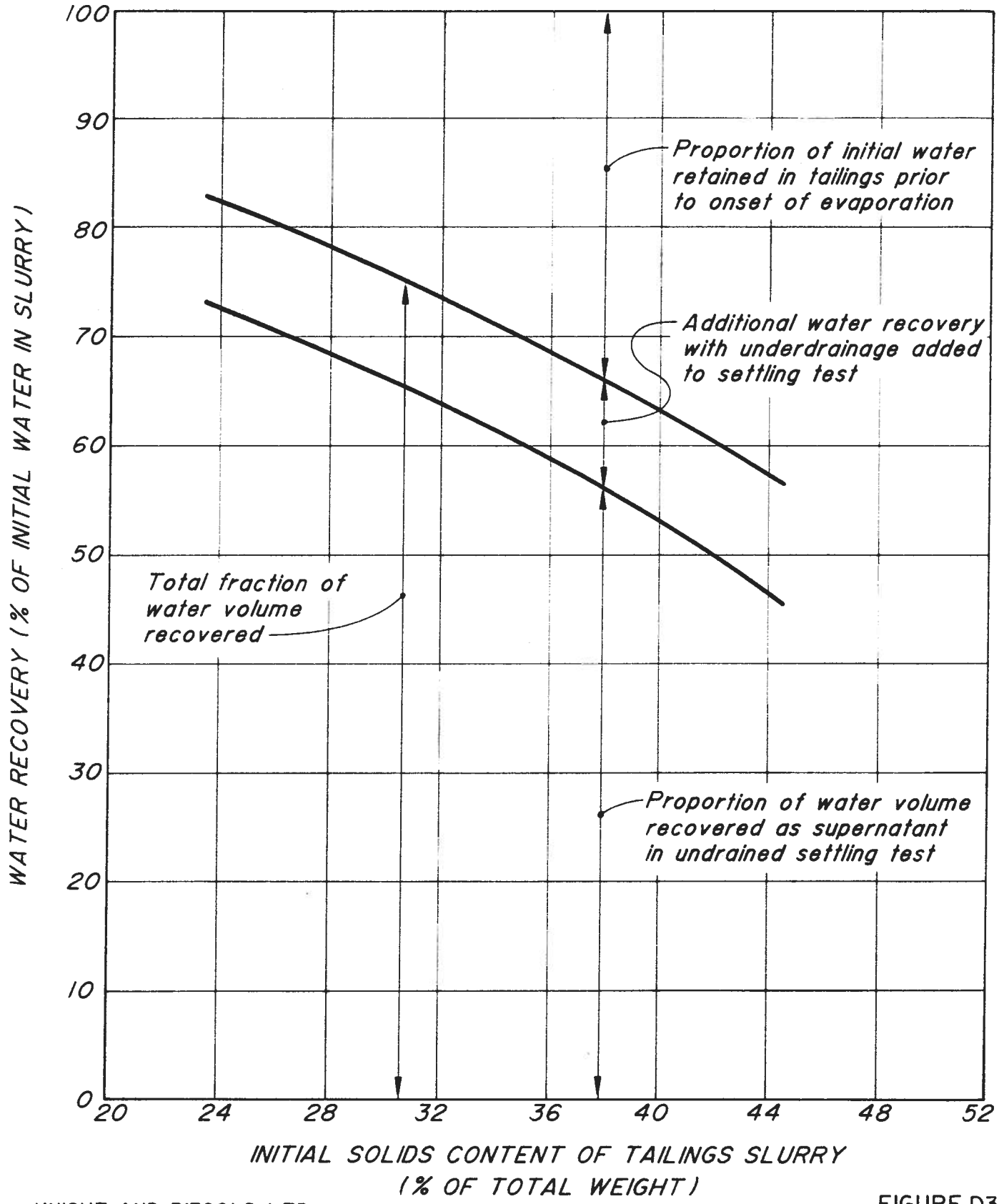

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FIGURE D3

IMPERIAL METALS CORPORATION

MT. POLLEY PROJECT

RELATIONSHIP BETWEEN DENSITIES ACHIEVED AND SOLIDS CONTENT OF INITIAL TAILINGS SLURRY

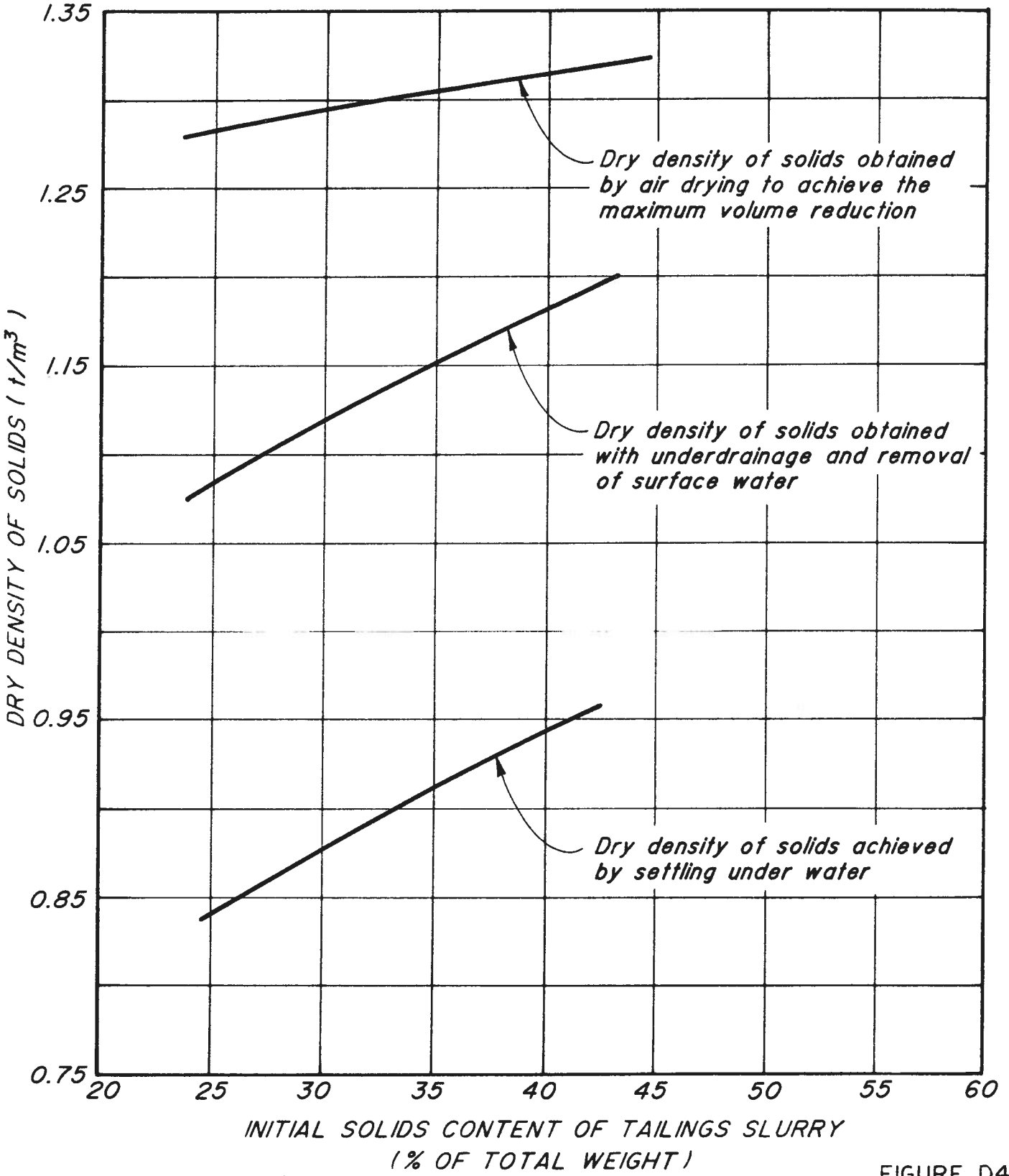

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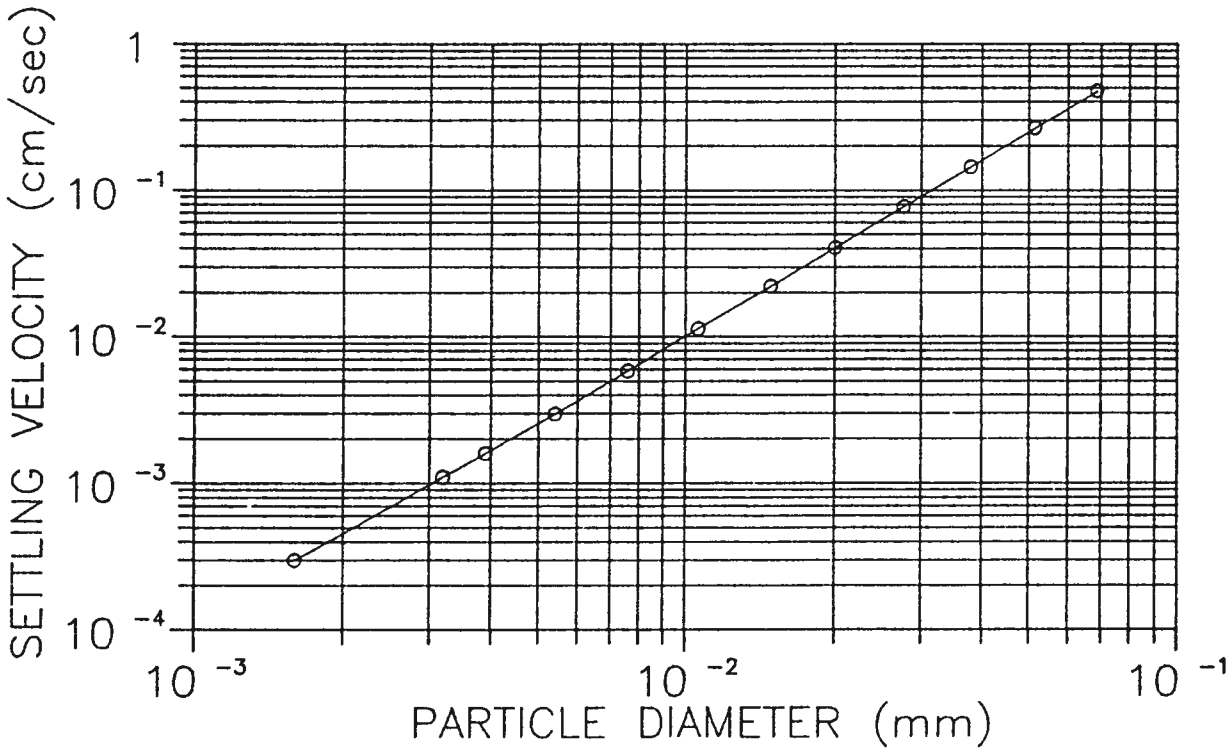
FIGURE D4

NCI - 763

IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT
TESTWORK ON TAILINGS
SETTLING VELOCITY ANALYSIS

% PASSING	PARTICLE DIAMETER (mm)	WATER TEMP (C)	Gs WATER	Gs SOIL	ABSOLUTE VISCOSITY (Poise)	KINEMATIC VISCOSITY (Stoke)	SETTLING VELOCITY (cm/sec)
59.3	0.0685	22.0	0.9978	2.78	0.00955	0.00957	0.4758
47.9	0.0513	22.0	0.9978	2.78	0.00955	0.00957	0.2668
39.0	0.0378	22.0	0.9978	2.78	0.00955	0.00957	0.1449
30.9	0.0276	22.0	0.9978	2.78	0.00955	0.00957	0.0772
25.2	0.0200	22.0	0.9978	2.78	0.00955	0.00957	0.0406
21.9	0.0148	22.0	0.9978	2.78	0.00955	0.00957	0.0222
17.4	0.0106	22.0	0.9978	2.78	0.00955	0.00957	0.0114
13.8	0.0076	22.0	0.9978	2.78	0.00955	0.00957	0.0059
11.0	0.0054	22.5	0.9977	2.78	0.00944	0.00946	0.0030
9.2	0.0039	23.0	0.9976	2.78	0.00933	0.00935	0.0016
8.2	0.0032	24.0	0.9973	2.78	0.00911	0.00914	0.0011
6.2	0.0016	24.0	0.9973	2.78	0.00911	0.00914	0.0003



KNIGHT AND PIESOLD LTD.
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FIGURE D5.

Knight Piésold Ltd.
CONSULTING ENGINEERS

GEOCHEMICAL CHARACTERISTICS

Association of Consulting Engineers of Canada
Association des Ingénieurs-Conseils du Canada

IMPERIAL METALS CORPORATION
EXPLORATORY METALLURGICAL TESTING

ADDENDUM TO
REPORT NO. 4

Project No. 92105

Prepared by

Coastech Research Inc.
80 Niobe Street
North Vancouver, BC V7J 2C9

Prepared by:

Tony Chong, B.Sc. (Eng.) ARSM
Project Engineer

Reviewed and Approved by:

P. Bradley Marchant, M.A.Sc.
President

Richard W. Lawrence, Ph.D.
Vice-President, Technical

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers
212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

To: COASTECH RESEARCH INC.

80 NIOBE ST.
NORTH VANCOUVER, B.C.
V7J 2C9

A8923877

Comments: ALSO ON CERT. A8923876

CERTIFICATE A8923877

COASTECH RESEARCH INC.

Project:
P O # : NONE

Samples submitted to our lab in Vancouver, BC.
This report was printed on 30-OCT-89.

SAMPLE PREPARATION

CHEMEX CODE	NUMBER SAMPLES	DESCRIPTION

ANALYTICAL PROCEDURES

CHEMEX CODE	NUMBER SAMPLES	DESCRIPTION	METHOD	DETECTION LIMIT	UPPER LIMIT
605	2	Hg ppb: Total, H2SO4 digestion	AAS-FLAMELESS	0.1	10000
621	2	As ppb: Total, hydride gen	AAS	0.1	10000
633	2	Sb ppb: Total, organic extract	AAS	4	10000

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers

212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

To: COASTECH RESEARCH INC.
[illegible] NIOBE ST.
NORTH VANCOUVER, B.C.
V7J 2C9

Page Number : [illegible]
Total Pages : [illegible]
Invoice Date. [illegible]0-OCT-89
Invoice No. : [illegible]-8923877
P.O. Number : NONE

Project :
Comments: ALSO ON CERT. A8923876

** CORRECTED COPY

CERTIFICATE OF ANALYSIS A8923877

PARAMETER DESCRIPTIONS	SAMPLE H 5002	SAMPLE H 5003								
Sample preparation code	---	---	---	---	---	---	---	---	---	---
Sample preparation code	---	---	---	---	---	---	---	---	---	---
Hg ppb (total)	< 0.2	1.0								
As ppb (total)	10.6	190.0								
Sb ppb (total)	3	36								

CERTIFICATION : _____

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers

212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

To: COASTECH RESEARCH INC.
50 NIOBE ST.
NORTH VANCOUVER, B.C.
V7J 2C9

A8928325

Comments: ATTN: TONY CHONG

CERTIFICATE A8928325

COASTECH RESEARCH INC.

Project: 2105
P.O. # : 894155

Samples submitted to our lab in Vancouver, BC.
This report was printed on 25-OCT-89.

SAMPLE PREPARATION

CHEMEX CODE	NUMBER SAMPLES	DESCRIPTION
221	2	Water sample

ANALYTICAL PROCEDURES

CHEMEX CODE	NUMBER SAMPLES	DESCRIPTION	METHOD	DETECTION LIMIT	UPPER LIMIT
622	2	As ppb: Dissolved, hydride gen	AAS	0.1	10000
634	2	Sb ppb: Dissolved, organic ext	AAS	4	10000
606	2	Hg ppb: Dissolved, H2SO4 digest	AAS-FLAMELESS	0.1	10000
624	2	Cd ppb: Dissolved, HNO3, org ext	AAS	1	10000
628	2	Cr ppb: Dissolved, HNO3, org ext	AAS	4	10000
626	2	Co ppb: Dissolved, HNO3, org ext	AAS	1	10000
602	2	Cu ppb: Dissolved, HNO3 digest	AAS	1	10000
618	2	Pb ppb: Dissolved, HNO3, org ext	AAS	2	10000
728	2	Ni ppb: Dissolved, HNO3, org ext	AAS	1	10000
620	2	Zn ppb: Dissolved, HNO3, org ext	AAS	1	10000

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers

212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

To: COASTECH RESEARCH INC.

80 NIOBE ST.
NORTH VANCOUVER, B.C.
V7J 2C9

Project : 2105
Comments: ATTN: TONY CHONG

Invoice Date: 25-OCT-89
Invoice No. : I-8928325
P.O. Number : 894155

CERTIFICATE OF ANALYSIS A8928325

PARAMETER DESCRIPTIONS	SAMPLE J2193	SAMPLE J2194								
Sample preparation code	221	221	---	---	---	---	---	---	---	---
Sample preparation code	---	---	---	---	---	---	---	---	---	---
As ppb (dissolved)	363	97.3								
Sb ppb (dissolved)	36	16								
Hg ppb (dissolved)	< 0.1	< 0.1								
Cd ppb (dissolved)	< 1	< 1								
Cr ppb (dissolved)	< 10	< 10								
Co ppb (dissolved)	< 2	< 2								
Cu ppb (dissolved)	2	6								
Pb ppb (dissolved)	2	< 2								
Ni ppb (dissolved)	< 2	< 2								
Zn ppb (dissolved)	4	8								
Bi ppb (dissolved)	< 1	< 1								

CERTIFICATION : _____

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers
212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

NIOBE ST.
NORTH VANCOUVER, B.C.
V7J 2C9

Project : 2105
Comments: ATTN: TONY CHONG

Total Pages
Invoice Date: 5-OCT-89
Invoice No. : I-8928325
P.O. Number : 894155

CERTIFICATE OF ANALYSIS A8928325

PARAMETER DESCRIPTIONS	SAMPLE J2193	SAMPLE J2194								
Sample preparation code	221	221	---	---	---	---	---	---	---	---
Sample preparation code	---	---	---	---	---	---	---	---	---	---
As ppb (dissolved)	363	97.3								
Sb ppb (dissolved)	36	16								
Hg ppb (dissolved)	< 0.1	< 0.1								
Cd ppb (dissolved)	< 1	< 1								
Cr ppb (dissolved)	< 10	< 10								
Co ppb (dissolved)	< 2	< 2								
Cu ppb (dissolved)	2	6								
Pb ppb (dissolved)	2	< 2								
Ni ppb (dissolved)	< 2	< 2								
Zn ppb (dissolved)	4	8								
Bi ppb (dissolved)	< 1	< 1								

CERTIFICATION : _____

IMPERIAL METALS CORPORATION
EXPLORATORY METALLURGICAL TESTING

ADDENDUM TO
REPORT NO. 4

Project No. 92105

Prepared for

IMPERIAL METALS CORPORATION
800 - 601 W Hastings Street
Vancouver, BC V6B 5A6

Attention: Mr. Rad Pesalj

Distribution: Imperial Metals (2)
Kilborn (B. Fukahara) (1)

21 November, 1989

SUMMARY

1.0 TERMS OF REFERENCE

2.0 METHODS AND PROCEDURES

2.1 Acid Base Account Test

2.2 Humidity Cell Test

2.3 Special Waste Test

2.3.1 Acetic Acid
2.3.2 Carbonic Acid

3.0 RESULTS AND CONCLUSIONS

TABLES

FIGURES

APPENDICES

SUMMARY

Acid base accounting, humidity cell weathering tests and special waste tests have been conducted on the tailings from the Phase V locked cycle tests. In addition, a 10 foot column settling test at natural pH was performed. The principal findings and conclusions are as follows:

(a) acid base account test shows the tailings to be net acid consumer with a NET NP value of 24.7 kg $CaCO_3$ (equiv) per tonne of tailings.

(b) the results from both the acetic and carbonic acid tests indicate that the tailings from the locked cycle tests did not exceed the B.C. Waste Management Branch regulations for special wastes.

(c) humidity cell testing demonstrated that the tailings exhibit very low reactivity, with very low sulphate, acidity and conductivity values, and the pH remained stable at above 7.0. The ICP data showed no significant leachability of any metals.

(d) the ultimate solids density was reached after a period of 14 days at natural pH and was calculated at 69.7% (w/w). The decant solution remained turbid at the end of the test. Previous testing indicated that pH adjustment (6.0) with acid is required to clarify the tailings decant solution.

1.0 TERMS OF REFERENCE

This is an addendum to Coastech Report No.4, Project No. 92105, September 6, 1989. This report presents the results and conclusions of the acid base account, humidity cell test, special waste tests and a 10 foot column settling test. These tests were performed on the tailings from the locked cycle tests in the Phase V testwork.

2.0 METHODS AND PROCEDURES

2.1 Acid Base Account Test

A description of the test procedure is provided in Appendix 1. In summary, excess hydrochloric acid was added to a 2.0g sample and the pulp was agitated for 24 hours at ambient temperature. Titration of the residual acid with 0.1N NaOH was then carried out to pH 8.3 to determine the neutralization potential of the tailings. The head sample was submitted for sulphide-sulphur analysis to determine the acid potential.

2.2 Humidity Cell Test

A bed of tailings from the locked cycle tests (approximately 1.0 kg) was subjected to alternating cycles of dry air (3 days), moist air (3 days), and leaching (1 day). The leachates were then analyzed for a number of parameters typically including pH, redox (mV), acidity, alkalinity, sulphate, conductivity, and dissolved metals by ICP. The test was run for 10 weeks. A description of the test procedure is presented in Appendix 1.

2.3 Special Waste Test

2.3.1 Acetic Acid

The test was conducted in according to the procedure published by the B.C. Ministry of the Environment, entitled "B.C. Special Waste List".

The tailings from the locked cycle test (approximately 35% solids) was dewatered by vacuum filtration. The filtrate, referred to as "pore water", was retained for subsequent analysis. 100 g of the filtered cake was then mixed with 1600 mL of distilled water and the pH was maintained at 5.0 for a period of 24 hours with dilute acetic acid. The pulp was agitated throughout the test.

At the end of the test, more distilled water was added so that the total volume (acid + water) was 2000 mL. The pulp was then filtered and the filtrate, referred to as "extract", together with the pore water were submitted for analysis. Total metals analyses are presented in Appendix 2.

2.3.2 Carbonic Acid

The test was conducted in accordance with the ASTM D3987 procedure.

Dilution water was prepared by bubbling carbon dioxide into a beaker of distilled water until the pH of 5.5 was obtained.

The tailings from the locked cycle test was dewatered by vacuum filtration. The filtrate (pore water) was retained for subsequent analysis. Sufficient freshly prepared dilution water was then added to the filtered cake to give a 4:1 liquid to solid ratio (i.e. 20% of solids by weight). The pulp was agitated for 20 hours prior to filtration and the filtrate (extract), together with the pore water were submitted for analysis (Appendix 2).

2.4 Settling Tests

A settling test was conducted on the tailings from the locked cycle tests at approximately 30% solids (w/w) in a 10 foot settling column to determine the ultimate settled density under hydraulic load.

3.0 RESULTS AND CONCLUSIONS

(a) Acid base accounting (Table 1) shows the tailings to be a net acid consumer with a NET NP value of 24.7 kg $CaCO_3$ (equiv) per tonne of tailings. With a sulphur content of only 0.02%, acid generation from this material is very unlikely.

(b) Tables 2 and 3 show the calculated values (ug/g) of the filtered cake from both solutions, pore water and extract, as required by B.C. Waste Management Branch regulations for special wastes. The results from both the acetic and carbonic acids indicate that the tailings from the locked cycle tests did not exceed the B.C. Waste Management Branch regulations for special wastes and are therefore exempt from classification as special waste.

(c) Humidity cell test results, shown in Tables 4 to 6 and Figures 1 to 4, demonstrate that the tailings exhibit very low reactivity, with very low sulphate, acidity and conductivity values, and the pH remained stable at above 7.0. The ICP data show no significant leachability of any metals.

(d) The settling test was allowed to run for a period of 30 days and the ultimate solids density was reached after a period of 14 days at natural pH. The solids density was calculated at 69.7% (w/w). The decant solution remained turbid at the end of the test.

TABLES

IMPERIAL METALS CORPORATION
MOUNT POLLEY PROJECT
PHASE V TESTWORK

TABLE 1
ACID-BASE ACCOUNT

SAMPLE	SULPHUR (%)	PASTE pH	ACID POTENTIAL (kg CaCO3/t)	NEUT. POTENTIAL (kg CaCO3/t)	NET NEUT. POTENTIAL (kg CaCO3/t)
Locked Cycle Tailings	0.02	8.22	0.6	24.6	24.0

NOTE: A negative Net Neutralization Potential (Net NP) indicates that the sample is a potential source of acid mine drainage.

IMPERIAL METALS CORPORATION
MOUNT POLLEY PROJECT
PHASE V TESTWORK

Table 2

Special Waste Test (acetic acid)

Sample : Locked Cycle Tailings

Element	Concentration as ug/Litre in Pore Water	Concentration as ug/Litre in Extract	Concentration as ug/gram in dewatered sample	B.C. Waste Management Branch Regulations (as ug/g of dewatered sample)
Antimony	3.0	36.0	0.73	10
Arsenic	10.6	190.0	3.82	10
Bismuth	< 4.0	< 4.0	< 0.09	-
Cadmium	< 1.0	2.0	< 0.04	1
Chromium	< 2.0	< 2.0	< 0.04	10
Cobalt	< 2.0	8.0	< 0.16	-
Copper	6.0	1360.0	27.21	30
Lead	8.0	16.0	0.34	10
Mercury	< 2.0	1.0	< 0.02	1
Nickel	< 2.0	46.0	< 0.92	10
Zinc	10.0	56.0	1.14	500

< = less than

Test conditions:

Paste pH =9.3

Volume of 0.5N acetic acid required to maintain @pH 5.0 = 58.0 ml.

Volume of water + acetic acid added : 2.0 Litre

Weight of solids : 100.0 g

IMPERIAL METALS CORPORATION
MOUNT POLLEY PROJECT
PHASE V TESTWORK

Table 3

"MODIFIED TEST FOR SHAKE EXTRACTION OF SOLID WASTE WITH WATER" ASTM d3987

Sample : Locked Cycle Tailings

Element	Concentration as ug/Litre in Pore Water	Concentration as ug/Litre in Extract	Concentration as ug/gram in dewatered sample	B.C. Waste Management Branch Regulations (as ug/g of dewatered sample)
Antimony	36	16	0.13	10
Arsenic	363	97.3	1.06	10
Bismuth	< 1	< 1	< 0.01	-
Cadmium	< 1	< 1	< 0.01	1
Chromium	< 10	< 10	< 0.06	10
Cobalt	< 2	< 2	< 0.01	-
Copper	2	6	0.03	30
Lead	2	< 2	< 0.01	10
Mercury	<0.1	< 0.1	< 0.00	1
Nickel	< 2	< 2	< 0.01	10
Zinc	4	8	0.04	500

< less than

Test data:

Paste pH : 9.2

Weight of solid : 117.0 g

Volume of dilution water added: 0.45 L

Volume of extract : 0.43 L

IMPERIAL METALS - MT. POLLEY

Table 4 : HUMIDITY CELL TEST - LOCKED CYCLE TAILINGS

CYCLE	DAYS	pH	REDOX (mV SCE)	CONDUCTIVITY (mS/cm3	ALKALINITY (mg/L CaCO3)	ACIDITY (pH 4.5) --(mg/L CaCO3)--	ACIDITY (pH 8.3) --(mg/L CaCO3)--	CUM. ACIDITY (pH 8.3) (mg CaCO3/100g)	SULPHATE (mg/L)	CUMULATIVE SULPHATE (mg/100g)
1	7	7.64	211	641	40.4	0.0	2.9	0.1	248	6.1
2	14	7.57	288	438	88.9	0.0	9.6	0.5	124	12.2
3	21	7.65	110	597	157.6	0.0	3.8	0.7	43	14.3
4	28	7.81	232	197	46.5	0.0	4.3	0.9	47	15.7
5	35	8.31	228	185	53.4	0.0	0.0	0.9	50	17.3
6	42	8.33	226	265	57.8	0.0	0.0	0.9	24	18.0
7	49	8.27	201	165	62.7	0.0	0.0	0.9	12	18.4
8	56	8.00	220	87	56.2	0.0	0.0	0.9	12	19.0
9	63	7.85	261	96	33.1	0.0	1.2	0.9	13	19.6
10	70	7.52	215	96	76.0	0.0	0.0	0.9	14	20.2

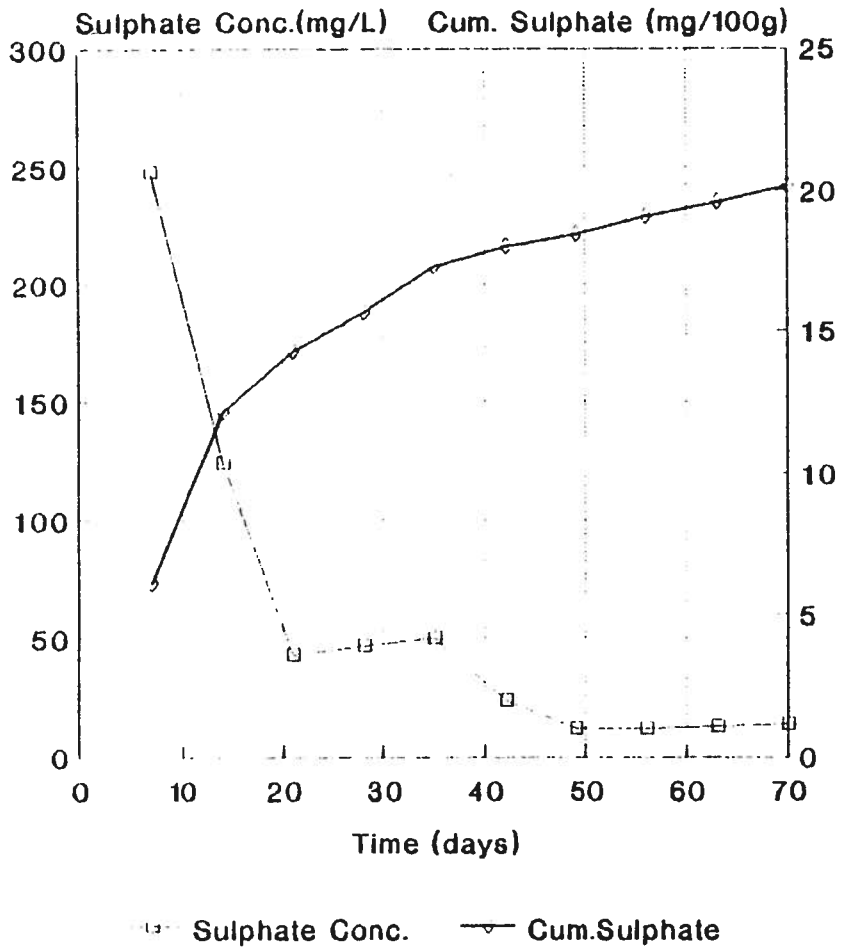

Figure 3

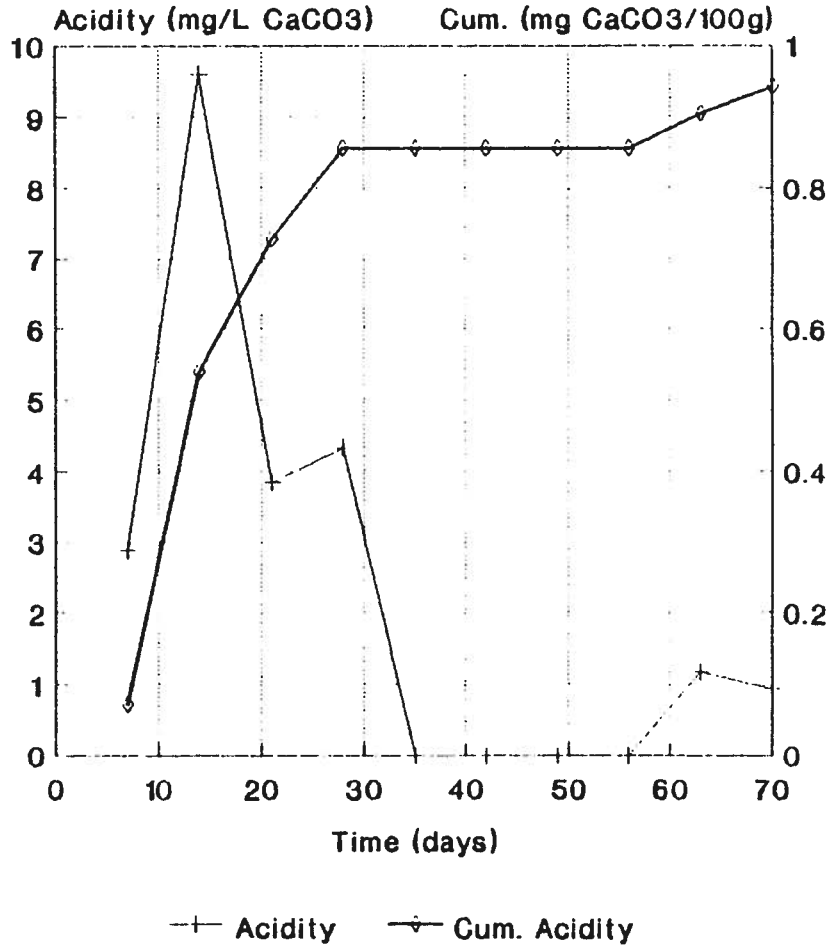

Figure 4

APPENDIX 1
COASTECH AMD PROCEDURES

THE PREDICTION OF THE ACID GENERATING POTENTIAL OF MINE WASTE MATERIALS

CURRENT TEST PROCEDURES

COASTECH RESEARCH INC

80 Niobe Street
North Vancouver
B.C. V7J 2C9

Ph (604) 980 5992 FAX (604) 980 2737

1989

Other Weathering Tests

Other AMD prediction tests which provide a simulation of the long term weathering characteristics of mine waste materials have been shown to be effective and, for certain types of waste and modes of deposition, might be more useful than the humidity cell test. Such methods include soxhlet extraction tests and shake flask tests (non-biological). These and other tests can be carried out at Coastech to meet specific requirements.

DISCUSSION

Static and kinetic procedures can provide a good prediction of the field behaviour of many of the tailing and waste rock samples. However, static test procedures alone are not likely to provide a definitive assessment of whether a particular sample is going to produce AMD. It is more likely that a combination of static and kinetic tests will provide a more confident assessment but even then, for some samples, prediction might be uncertain. The prediction of long term weathering characteristics of a tailing or waste rock will always have some uncertainty factor if the prediction test is carried out on a convenient time scale in the laboratory. Longer term testwork can be carried out for larger waste rock sizes using column leach tests or other larger scale apparatus. Such tests can include the evaluation of various waste management scenarios such as waste rock blending and the use of till covers to minimize AMD formation and impact.

THE PREDICTION OF THE ACID GENERATING POTENTIAL OF MINE WASTE MATERIALS

INTRODUCTION

The disposal of mining and mineral processing wastes can have a significant environmental impact. Acidity and associated heavy metal contamination in run-off and seepage water from waste rock and tailings containing the sulphide minerals pyrite and/or pyrrhotite is a common and costly problem to mining operations throughout the world, often requiring costly remediation measures.

For new mines and new developments in existing operations, it is necessary to characterize tailings and waste rock materials prior to production to predict if AMD will be generated. Accurate prediction would reduce environmental damage and costs to the industry by allowing the implementation of sound waste management practices to both prevent acid generation and to maximize containment and effective treatment if AMD cannot be avoided. Regulatory agencies are now requiring verification that waste materials have been characterized and that AMD control measures will be implemented before permits are issued. Since AMD predictive procedures and their interpretation are by no means definitive, Coastech is involved with the development of procedures and special equipment for more reliable prediction. In this endeavour, discussions and consultation with AMD specialists from research, environmental consultants, industry, and the regulatory authorities is ongoing. The results of recent Coastech work and a discussion on prediction methods can be found in the proceedings of the Symposium on Tailings and Effluent Management held in Halifax, Nova Scotia, August 1989[1].

Predictive techniques include static tests which examine the balance between the acid producing and acid consuming components in a waste material, and kinetic tests which attempt to predict drainage quality over time. The data obtained is useful in characterizing waste materials for waste management planning, and can be used to support permitting applications. At the present time, we use a modified version of the widely used EPA acid-base account method as our standard static test,

---

[1]Lawrence, R.W. et al (1989). Assessment of predictive methods for the determination of AMD potential in mine tailings and waste rock. Proc. Intl. Symp. on Tailings and Effluent Management, Halifax, August, Pergamon Press, New York, 317-31.

although we are familiar with and experienced in other methods if these are requested.

Kinetic tests are usually only carried out if static testing indicates that a sample is potentially a source of AMD. However, we recommend that kinetic tests are also performed for samples which are marginal net acid consumers. Currently we are recommending that kinetic tests such as humidity cells are used as they provide a reasonable simulation of the weathering process and appear to provide an accurate prediction of the field behaviour of tailing and waste rock. On a larger scale, column leach or lysimeter tests can be carried out. We can also perform biological shake flask oxidation tests to confirm the AMD potential predicted by static procedures. This type of procedure has been widely accepted in Canada for a number of years. However, the method does not address the weathering and oxidation characteristics in the approximate pH range of 7 down to 2, nor does it provide kinetic and leachate quality data.

TEST PROCEDURES

Determination of Neutralization Potential (Acid-Base Account)

Acid-base accounting procedures based on those recommended by the U.S. Environmental Protection Agency are currently the methods of choice at Coastech[2]. The method examines the balance between acid producing components (primarily pyrite, FeS_2) and acid consuming components (carbonates and other rock types capable of neutralizing strong acids). One week is required to obtain all test and assay data

The first part of the procedure involves the determination of the paste pH of the sample and an preliminary indication of the quantity of acid consuming constituents of the sample. Excess hydrochloric acid is then added to a known weight of the sample. Once the reaction between the acid and acid consuming constituents of the sample are complete, the amount of acid consumed is determined by titrating the residual acid with alkali. This allows calculation of the neutralization capacity of the sample which can be balanced against the theoretical acid producing potential derived from sulphur assays, to give the net neutralization potential.

The EPA methods have been modified to reduce a perceived bias towards the alkaline side by carrying out the acid

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[2] Sobek, A.A. et al (1978). Field and laboratory methods applicable to overburdens and minesoils. EPA 600/2-78-054, 203pp.

digestion at ambient temperature for 24 hours. Titration of the residual acid is carried out to pH 8.3 and also to pH 3.5 and pH 2.0 to allow better interpretation of kinetic oxidation tests. In addition, sulphide-sulphur analyses are used to calculate the acid potential to avoid error in assessment by neglecting the presence of sulphates such as gypsum.

Humidity Cell Tests

The humidity cell test is a kinetic test which aims to model the processes of geochemical weathering of a mining waste material. A special apparatus is used to provide simple control over air, temperature and moisture, while allowing for the removal of oxidation products which are collected and monitored. Humidity cells have been developed at Coastech to promote more rapid oxidation of sulphides contained in the waste sample. The cells allow the good aeration up through or across the sample bed of tailing or waste rock during sequential dry and moist aeration cycles, and thorough solution contact during the leach cycle.

The test procedure comprises subjecting a bed of the sample in a humidity cell to alternating cycles of dry air (3 days), moist air (3 days), and leaching (1 day). The leachates can then analyzed for a number of parameters typically including pH, redox (mV), acidity, alkalinity, sulphate, conductivity, and dissolved metals by ICP. The test generally is generally specified to run for 10 weeks although it is our experience that a longer time period is required to establish the weathering characteristics of many samples.

Lysimeter and Column Leach Tests

Lysimeters and leach columns are used to provide weathering data for waste rock and tailings on a larger scale and are often used to confirm leaching characteristics or to evaluate AMD control methods (blending, covers) on a larger scale following initial characterization in humidity cells or other kinetic test procedure. Column leach tests are usually conducted in PVC columns of 10 cm diameter x 150 cm high or larger and involves the addition of water at a specified rate to the top of the sample contained in the column. Effluent emerging from the bottom of the column is collected for the analysis of parameters such as listed for humidity cell testing. Lysimeters are columns or rectangular boxes, generally of larger surface area and shallower depth than leach columns, and are sometimes more suitable for the testing of larger quantities of material while evaluating the effect of covers,

simulated water tables and other variables during weathering cycles. For larger lysimeters, the evaluation of changes in mineralogy of the sample with depth and the determination of effluent quality profiles is possible.

Shake Flask Biological Oxidation Test

The shake flask biological oxidation test determines if acid produced due to biological oxidation is sufficient to overcome the acid consuming components of the sample. The test utilizes naturally occurring sulphide-oxidizing bacteria which have the capability of breaking down minerals such as pyrite. These bacteria are maintained as stock cultures in conditions of high activity in the Coastech laboratory and facilitate the rapid assessment of the acid generating potential of a waste material. Usually four weeks is required to complete this test.

The oxidation tests are carried out using procedures based on many years of extensive experience in biological mineral oxidation systems. This ensures optimum test performance through proper selection of test conditions, availability of a selection of bacterial cultures for different waste types, and experienced interpretation of results.

The oxidation test involves the addition of sulphide-oxidizing bacteria to a slurry of the waste material at an acidic pH chosen to promote the rapid development of sulphide oxidation. The progress of oxidation is monitored by measuring pH changes which occur as pyrite is oxidized. The test is continued until oxidative activity is complete. At this time more waste sample, equal to the original weight, is added. If the pH remains within the range suitable for biological oxidation, the acid produced from the pyritic component was more than the alkaline components could consume and the sample is classified as a potential source of AMD. If, however, the acid produced is consumed so that the final pH rises to be outside the range considered to be the limit for biochemical oxidation, the sample is classified as a non-acid producer.

The test is similar to the B.C. Research Confirmation Test but has several procedural differences which have been introduced to overcome some perceived shortcomings in technique and to aid in the interpretation of the results and in the predictive assessment.

APPENDIX 2
PORE WATER AND EXTRACT: TOTAL METALS ANALYSIS

Sample #	Acid used	Sample
H5002	Acetic	Pore Water
H5003	Acetic	Extract
J2193	Carbonic	Pore Water
J2194	Carbonic	Extract

Chemex Labs Ltd.
Analytical Chemists * Geochemists * Registered Assayers
212 BROOKSBANK AVE., NORTH VANCOUVER
BRITISH COLUMBIA, CANADA V7J-2C1
PHONE (604) 984-0221

To: GEOTECH RESEARCH INC.
80 NIOBE ST.
NORTH VANCOUVER, B.C.
V7J 2C9
Project
Comments: ALSO ON CERT A8923877

Page No. 1A
Tot. Pages 1
Date 24-AUG-89
Invoice # I-8923876
P.O. # NONE

CERTIFICATE OF ANALYSIS A8923876

SAMPLE DESCRIPTION	PREP CODE		Mo ug/L	W ug/L	Zn ug/L	P ug/L	Pb ug/L	Bi ug/L	Cd ug/L	Co ug/L	Ni ug/L	Ba ug/L	Fe mg/L	Mn ug/L	Cr ug/L	Mg mg/L
H 5002 PORE	--	--	100	< 20	10	120	8	< 4	< 1	< 2	< 2	20	0.2	18	< 2	1.2
H 5003 EXTRACT	--	--	< 2	< 20	56	40	16	< 4	2	8	46	920	0.8	1020	< 2	3.0

CERTIFICATION : B. Cardi